

Australian Orthopaedic Association National Joint Replacement Registry

2026 ANNUAL REPORT

Hip, Knee
and Shoulder
Arthroplasty



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Australian Orthopaedic Association National Joint Replacement Registry

2026 ANNUAL REPORT

Data Period 1 September 1999 – 31 December 2025

Hip, Knee and Shoulder Arthroplasty



Preface

Modelling lifetime risk
of revision represents an
important evolution in
registry surveillance,
using extensive
population data to
provide clearer guidance
on revision risk over a
patient's lifetime.

It is my privilege to present the 2026 Annual Report of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Established in 1999, the Registry now enters its twenty-seventh year of reporting, having captured almost 100% of all joint replacement procedures performed across Australia.

With a cumulative repository now encompassing over 1.25 million knee replacements, one million hip replacements, and over 120,000 shoulder procedures, the AOANJRR remains an uncompromised global benchmark for independent, high-capacity clinical surveillance.

This year's report exemplifies our uncompromising commitment to analytical precision and data integrity. To ensure complete verification against national mortality records, the release of the 2026 report was deliberately deferred by four weeks following a delay in receiving National Death Index data from the Australian Institute of Health and Welfare. This decision underscores our core principle: every dataset, benchmark, and survivorship curve published by the Registry must reflect absolute accuracy before guiding health policy and clinical practice.

The 2026 report continues to deliver essential long-term perspective by evaluating 10, 15, and 20-year outcomes restricted specifically to modern prostheses still in clinical use. Utilising international standards recommended by the ISAR Benchmarking Working Group, our analysis highlights proven longitudinal success across primary conventional hip, total knee, and shoulder arthroplasties. Identifying devices that achieve 10-year and 15-year superiority benchmarks offers crucial evidence to guide surgeons, health systems, and regulatory authorities in selecting implants with proven durability.

A defining highlight of this year's report is the Special Chapter, Modelling the Lifetime Risk of Revision Arthroplasty. As joint replacement is performed across a broad range of ages and activity levels, understanding revision risk over a patient's lifetime has become increasingly important.

Leveraging our massive cohort data, this analysis models lifetime revision probabilities across age groups, sex, American Society of Anesthesiologists (ASA) scores, body mass index (BMI) categories, fixation methods, and advanced bearing surfaces such as highly cross-linked polyethylene (XLPE). By translating vast data into risk profiles, clinicians are supported in optimising patient selection, surgical technique, and implant choices for lifelong joint health.

Beyond implant performance, the Registry maintains an active role in evaluating prosthesis, patient and surgeon characteristics that influence revision rates across hip, knee, and shoulder procedures. Furthermore, our reporting structure continues to broaden through a comprehensive Lay Summary and 13 specialised Supplementary Reports.

The Registry is also entering an important period of technological renewal. A major upgrade of the AOANJRR's technology infrastructure is underway, including new Registry and PROMs platforms designed to modernise data collection and strengthen the systems that support the Registry's national surveillance activities. This investment will provide a more contemporary and sustainable foundation for the AOANJRR, supporting its continued evolution and capacity to deliver high-quality evidence into the future.

The continued success of the AOANJRR is driven by collaborative dedication across our professional community. I extend sincere gratitude to Clinical Director Paul Smith, Deputy Clinical Directors Peter Lewis, and Michael McAuliffe, Assistant Deputy Clinical Directors Chris Wall, David Gill, and James Stoney. My appreciation also goes to the dedicated teams at the AOANJRR and SAHMRI for their analytical excellence. Most importantly, I thank orthopaedic surgeons and hospital staff across Australia whose faithful data contributions preserve this Registry as a premier resource dedicated to improving patient outcomes nationwide.

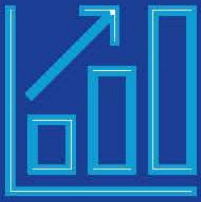
Sincerely,

M. K. Moroney

Mark Moroney

President, Australian Orthopaedic Association

AOANJRR Data Snapshot 2025



2,443,994

Total number of joint replacement procedures reported by the Registry at the end of 2025



123

Data Requests

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Over a billion dollars of estimated benefit to the national health system accruing from AOANJRR activities

Joint replacement procedures performed in 2025

64,085

Hips

81,692

Knees

12,764

Shoulders



19

Hospital Audit Requests



1,200

Individual Surgeon Reports



59

Conference presentations



33

Journal Articles Published

National PROMs Data Collection

June 2026 Update

Participating Hospitals

246

Pre-Op PROMs

178,424

Post-Op PROMs

132,801

Pre-Op Completion Rate

73.6%

Post-Op Completion Rate

62.2%



% patient-reported change following hip, knee, or shoulder joint replacement as "much better"

84.9%

% patient "very satisfied" or "satisfied" following hip, knee, or shoulder joint replacement

87.7%

Total Number of Hospitals Onboard per State /Territory:

- SA: 30
- NSW: 66
- NT: 3
- QLD: 45
- ACT: 6
- VIC: 67
- WA: 21
- TAS: 8



192,626

Patient participation through AOANJRR patient dashboards



904

Total number of surgeons participating



Executive Summary

This summary provides a brief overview of some of the major findings from the 2026 Annual Report. As with last year's Annual Report, to ensure that the relevance and currency of AOANJRR data are maintained, almost all analyses (unless specifically stated) have been confined to hip, knee and shoulder prostheses that were still being used in 2025. Again, historic data are still available in previous Annual Reports on the AOANJRR website.

In addition to the main report, the Registry continues to publish Supplementary Reports. The Supplementary Reports are listed in the introductory chapter and will be available on the AOANJRR website <https://registry.aoa.org.au/annual-reports-2026> from November 2026. They include a Lay Summary of the main report and 13 additional reports on arthroplasty topics, as well as detailed analyses of all prostheses identified as having a higher than anticipated rate of revision.

This year, a one month delay in receiving National Death Index (NDI) data from Australian Institute of Health and Welfare (AIHW) required the surgeon workshop and subsequent release of the Annual Report to be deferred by 4 weeks. The additional time was necessary to ensure the accuracy, completeness and integrity of the data presented in the 2026 Annual Report.

Ten, Fifteen and Twenty Year Outcomes

This section of the report provides 10 and 15 year benchmarks for prostheses used in >350 procedures in primary total conventional hip and primary total knee replacement undertaken for osteoarthritis. Ten year benchmarks for prostheses used in total stemmed anatomic shoulder replacement for osteoarthritis and primary total stemmed reverse shoulder replacement performed for any diagnosis are also included. This chapter reports 20 year outcomes for a small number of prostheses that are still used. All analyses in this chapter are restricted to modern prostheses.

The 10 year benchmark standard is 4.1% for hips and 4.6% for knees. For shoulders, the 10 year benchmark is 7.9% for total stemmed anatomic and 5.4% for total stemmed reverse. The calculated 15 year benchmark standard is 5.9% for hips and 6.2% for knees. The benchmarks reflect proven long-term success.

The AOANJRR uses the benchmark approach recommended by the ISAR International Prosthesis Benchmarking Working Group to identify those devices that have superior and non-inferior performance at 10 years and 15 years. Of those hip, knee and shoulder prosthesis combinations with a sufficient number of procedures and follow-up, 26.1% of hip and 21.6% of knee prosthesis combinations achieved a 10 year superiority benchmark. There was one total stemmed anatomic and two total stemmed reverse shoulder prosthesis combinations that achieved a 10 year superiority benchmark. In addition, 1 one total stemmed anatomic and 1 total stemmed reverse shoulder prosthesis combination qualified for a 10 year non-inferiority benchmark.

At 15 years, 4 of the hip and 3 knee prosthesis combinations still in use achieve a superiority benchmark. There are 8 hip and 8 knee replacement combinations used in >350 procedures for over 20 years. At this time, there is no 20 year benchmark standard established.

Special Chapter: Modelling the Lifetime Risk of Revision

Joint replacement surgery has progressively evolved with increasing success rates due to improvement in material science, surgical technique and the ongoing long-term data available from registries. It has moved from being a procedure thought best suitable for the elderly, low demand patient and now can be offered to younger patients with a reasonable expectation of good longer-term outcomes.

For those patients who require joint replacement, it is important to recognise that despite high levels of success associated with these procedures, a joint replacement is a mechanical device. Each joint replacement, particularly those in use for a long period, carries a risk of failure, which may lead to revision surgery. Particularly for younger patients who are at a higher risk of requiring subsequent surgery, it is important to be able to provide advice on the likely lifetime risk of revision surgery.

The concept of a lifetime revision risk has only been recently addressed in the orthopaedic literature. Bayliss et al. in 2017 published the calculated lifetime risk of revision surgery utilising the dataset on all patients within the UK Clinical Practice Research Datalink who had undergone total hip replacement or total knee replacement. Subsequent analyses dealing with the time-based risk of revision for hip and knee replacements have been published from the Dutch, Scottish and New Zealand joint registries.

Several factors facilitate this analysis of lifetime risk. Firstly, the longevity of the AOANJRR, which was established in 1999, recording over 98% of all joint replacement procedures performed in Australia. Secondly, the AOANJRR dataset is of sufficient size to lend statistical power to such an exercise in modelling, with the recording of over 1.25 million knee replacements, over one million hip replacements and over 100,000 shoulder replacements in the registry. Hence, it is timely to undertake an analysis of lifetime risk of revision in the Australian context.

LIFETIME RISK OF REVISION: HIP REPLACEMENT

Osteoarthritis is the most common diagnosis for hip replacement surgery in Australia. Accordingly, the analysis of lifetime risk of requiring a revision hip replacement is confined to those having their hip replacement for osteoarthritis. In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 486,293 patients with an average age of 69 years; 54.6% are female.

The risk of requiring revision surgery post hip replacement is related to the life expectancy of that patient. The proportion

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of patients less than 50 years of age who undergo hip replacement surgery is low; however, their longer life expectancy places them at a higher lifetime risk of revision surgery. For the cohort of patients having hip replacement aged 46-50 years, the calculated lifetime risk of revision is 28.33%.

Conversely, while the proportion of patients over 85 years of age who undergo hip replacement is also low, their shorter life expectancy means that in this group the risk of revision surgery is very low. In all age groups, males on average have a higher lifetime risk of revision surgery than females.

The AOANJRR has collected ASA score data for patients having joint replacement surgery since 2012, and therefore the lifetime risk of revision analysis according to ASA is based on this cohort with a maximum 13-year follow-up. In each age cohort, patients having their primary joint replacement who have an ASA score greater than one have a higher lifetime risk of revision. This lifetime risk gradually reduces with older age groups.

The AOANJRR has collected body mass index (BMI) data for patients having joint replacement surgery since 2015; therefore, the lifetime risk of revision analysis according to BMI is based on this cohort with a maximum 10-year follow-up. For patients in all BMI categories, the highest lifetime risk of revision occurs in those who have their primary joint replacement at a younger age, with the risk gradually reducing over time.

The analysis of lifetime revision risk according to BMI may be simplified by dichotomising BMI into obese and not obese groups. In all age cohorts, those patients having their primary joint replacement who are obese have a lifetime revision risk that, on average, is at least 50% higher than that of those in the not obese group.

In 2025, the most common reason for requiring revision surgery after primary conventional hip replacement due to osteoarthritis is infection.

The lifetime risk of revision for infection is highest in the younger cohorts. Likewise, the lifetime risk of revision for aseptic reasons is highest in the younger cohorts, also reducing progressively through each age cohort. Until the age of 90, the risk of requiring revision surgery for aseptic reasons is higher than the risk of requiring revision surgery for infection. In each age cohort, the risk of revision for infection in males is approximately twice that for females, with young males at the highest risk. The risk of revision for aseptic reasons for males and females in each age cohort, by contrast, is similar.

The three most common aseptic diagnoses for revision following primary conventional hip replacement for osteoarthritis are fracture, prosthesis dislocation/instability and loosening. Revision for fracture carries the highest risk in each age cohort, followed by prosthesis dislocation/instability and then loosening. For each of these diagnoses,

the lifetime risk of revision surgery is highest for the youngest patients and decreases for each age cohort.

The lifetime risk of revision according to polyethylene type is most apparent in the younger age cohorts, where the lifetime risk of revision where XLPE is used as the bearing surface is lower than when non-XLPE is used. In the youngest 46-50 year cohort, hip replacements performed with non-XLPE have an almost 100% higher lifetime risk of revision than those where XLPE is used.

The use of cementless and hybrid fixation is more common than the use of cemented fixation in all age cohorts. Cemented fixation has a higher lifetime risk of revision in younger patients. This is most evident in patients younger than 55 years of age. The lifetime revision risk using cemented fixation decreases with each age cohort, and in all age cohorts after 65, cementless fixation has the highest lifetime risk of revision. On average, hybrid fixation has the lowest lifetime risk of revision until the 71-75 age cohort; however, after this time, cemented fixation has the lowest lifetime risk of revision.

LIFETIME RISK OF REVISION: KNEE REPLACEMENT

The lifetime risk of revision following knee replacement has been reported for unicompartmental knee replacement and total knee replacement for the primary diagnosis of osteoarthritis. The total cohort assessed comprises 824,326 cases.

Lifetime Risk of Revision: Unicompartmental Knee Replacement

Osteoarthritis is the most common diagnosis for unicompartmental knee replacement (UKR) in Australia. Accordingly, the analysis of lifetime risk of requiring unicompartmental knee revision is confined to those having their primary UKR for osteoarthritis. In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 53,322 patients with an average age of 66.1 years; 43.3% are female.

The risk of requiring revision surgery after UKR is related to the life expectancy of that particular patient. The proportion of patients less than 50 years of age undergoing UKR surgery is low; however, their longer life expectancy places them at a very high lifetime risk (63.43%) of revision surgery. Conversely, while the proportion of patients over 85 years of age undergoing UKR is also low, their shorter life expectancy means that in this group the lifetime risk of revision surgery is 4% or less. In all age groups, females on average have a higher lifetime risk of revision surgery than males, with significant differences from ages 46-75 years.

The AOANJRR has collected ASA score data for patients having joint replacement surgery since 2012, and therefore the lifetime risk of revision analysis according to ASA is based on this 13-year cohort. In each age cohort, UKR patients who have higher ASA scores have, on average, the highest lifetime risk of revision.



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In 2025, the most common reasons for requiring revision surgery after primary UKR for osteoarthritis are the aseptic diagnoses, including progression of disease, loosening, pain, bearing dislocation and fracture. Infection is a comparatively less common reason for revision surgery after primary UKR.

The lifetime risk of revision for infection is highest in the younger cohorts. For patients aged 46-50 years, the risk is 5.05%, and this risk decreases with each age cohort to be under 1% after age 85. Likewise, the lifetime risk of revision for aseptic reasons is highest in the younger cohorts, also reducing progressively through each age cohort.

For all age cohorts, the risk of requiring revision surgery for aseptic reasons is higher than the risk of requiring revision surgery for infection. In each age cohort, the risk of revision for infection in males is approximately twice that for females, with young males at the highest risk. Conversely, the risk of revision for aseptic reasons for females is greater than for males in each age cohort.

The three most common aseptic diagnoses for revision surgery following primary UKR performed for osteoarthritis are progression of disease, loosening and pain. Revision for progression of disease carries a higher lifetime risk than revision for loosening in all age cohorts.

On average, UKR using cemented fixation has a higher lifetime risk of revision in age cohorts up to 60 years, and in age cohorts over 60 years, cementless fixation has a higher lifetime risk of revision. Regardless of the type of fixation, the percentage lifetime risk of revision reduces with each age cohort.

Lifetime Risk of Revision: Total Knee Replacement

Osteoarthritis is the most common diagnosis for knee replacement in Australia. Accordingly, the analysis of lifetime risk of requiring knee replacement is confined to those having their knee replacement for osteoarthritis.

In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 771,004 patients with an average age of 68.7 years; 55.3% are female.

The risk of requiring revision surgery post-knee replacement is related to the life expectancy of that particular patient. The proportion of patients less than 50 years of age requiring knee replacement surgery is low; however, their longer life expectancy places them at a higher lifetime risk of revision surgery of 30.64%.

Conversely, while the proportion of patients over 85 years of age requiring knee replacement is also low, their shorter life expectancy means that in this group the risk of revision surgery is approximately 2%. In all age groups, males have on average a higher lifetime risk of revision surgery than females.

The AOANJRR has collected ASA score data for patients having joint replacement surgery since 2012, and therefore the lifetime risk of revision analysis according to ASA score is based on this cohort with a maximum 13-year follow-up. In

each age cohort, patients having their primary joint replacement who have a higher ASA score have, on average, a higher lifetime risk of revision. Patients with an ASA score of 1 have the lowest lifetime risk of revision, while patients with an ASA score of 2 have a lower lifetime risk of revision until age 60 compared to those with ASA scores of 3 or 4.

The AOANJRR has collected the BMI data for patients having joint replacement surgery since 2015; therefore, the lifetime risk of revision analysis according to BMI is based on this cohort with a maximum 10 year follow-up. For patients in all BMI categories, the highest lifetime risk of revision occurs in those who have their primary total knee replacement at a younger age, with the risk gradually reducing over time. In all age cohorts, those patients having their primary total knee replacement who are obese have a higher lifetime revision risk than those in the not obese group.

In 2025, the most common reason for revision after primary total knee replacement for osteoarthritis is infection.

The lifetime risk of revision for infection is highest in the younger cohorts. Likewise, the lifetime risk of revision for aseptic reasons is highest in the younger cohorts, also reducing progressively through each age cohort. Until age 75 years, the risk of requiring revision surgery for aseptic reasons is higher than the risk of requiring revision surgery for infection. After age 75 years, there is a higher percentage lifetime risk of requiring revision for infection than for aseptic reasons.

In each age cohort, the risk of revision for infection in males is approximately twice that for females, with young males at the highest risk. The risk of revision for aseptic reasons for males and females in each age cohort, by contrast, is similar.

The three most common aseptic diagnoses for revision after primary total knee replacement for osteoarthritis are loosening, instability and patella related diagnoses (patella erosion and patellofemoral pain combined). Revision for loosening carries the highest risk until age 80 years, after which revision for patella related reasons is the most common aseptic reason for revision surgery. For each of these diagnoses, the lifetime risk of revision surgery is highest for the youngest patients and decreases for each age cohort.

For all age cohorts, the lifetime risk of revision where XLPE is used as the bearing surface in total knee replacement is much lower than when non-XLPE is used. This difference is most apparent in the youngest 46-50 year cohort, where knee replacements performed with non-XLPE have a 42.85% lifetime risk of revision versus 22.53% where XLPE is used.

The three most common stability types in primary total knee replacement are minimally stabilised, posterior stabilised and medial pivot designs. On average, medial pivot designs have the lowest lifetime risk of revision in all age cohorts. Posterior stabilised has the highest risk of revision in all age cohorts.

Primary total knee replacement may be performed preserving the native patella surface or where the patella is resurfaced

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using a polyethylene component. In all age cohorts, there is a lower lifetime risk of revision when the patella is resurfaced.

The fixation methods of primary total knee replacement may be cemented, cementless or hybrid (most commonly with the tibia cemented). In each age cohort, on average, hybrid fixation has the lowest lifetime risk of revision. For each type of fixation, the lifetime risk of revision is highest for the youngest age groups and progressively reduces over time.

LIFETIME RISK OF REVISION: SHOULDER REPLACEMENT

The lifetime risk of revision following shoulder replacement has been reported for total anatomic shoulder replacement for the primary diagnosis of osteoarthritis, total stemmed reverse replacement for osteoarthritis, and total stemmed reverse replacement for rotator cuff arthropathy. The total cohort assessed comprises 71,599 cases.

Lifetime Risk of Revision: Total anatomic Shoulder Replacement for Osteoarthritis

Osteoarthritis is the most common diagnosis for total anatomic shoulder replacement (combining total stemless and total stemmed anatomic replacements). In the study population of 11,235 patients, the mean age is 67.5 years, with females predominating (51.9%). It is important to note that patients under the age of 50 years requiring total anatomic shoulder replacement have a higher lifetime risk of revision; conversely, those over 85 have a lower risk. Overall, an individual aged between 46 and 50 has a 39.64% lifetime risk of revision. As the individual ages, the risk falls, such that at age 81 to 85, it has fallen to 11.78%.

The lifetime risk of revision after primary total anatomic shoulder replacement varies with the sex of the individual, with females having a higher rate of revision than males in all age groups. If a patient is obese, their lifetime risk of revision is increased compared with that of non-obese patients.

The lifetime risk of revision for a septic cause is much lower than that for an aseptic cause, such that a patient aged 66 to 70 has a 1% lifetime risk of septic revision compared with a 21.19% lifetime risk of aseptic revision. The lifetime risk of septic revision remains similar for both males and females. The lifetime risk of revision for rotator cuff insufficiency is higher than that for instability/dislocation or loosening in all age groups.

Lifetime Risk of Revision: Total Stemmed Reverse Shoulder Replacement for Osteoarthritis

The most common indication for total stemmed reverse replacement in Australia is osteoarthritis. The cohort analysed comprises 32,142 patients, with a mean age of 73.5 years; most patients are female (60%). The lifetime risk of revision of a total stemmed reverse replacement in a patient under the age of 50 is 34.4%. This decreases with age, such that a patient over 85 years of age has a risk of less than 4%.

At all ages, males have an increased risk of revision compared with females. Non-obese patients have lower lifetime risks of revision than obese patients in all age cohorts. The lifetime risk of revision for septic causes is lower than that for aseptic

causes in all age groups. This is equally reflected in both males and females. The most common reason for revision of a primary total stemmed reverse replacement for osteoarthritis is instability/dislocation. This remains the predominant lifetime risk in all age groups compared with loosening and fracture.

Lifetime Risk of Revision: Total Stemmed Reverse Replacement for Rotator Cuff Arthropathy

Rotator cuff arthropathy is the second most common indication for total stemmed reverse replacement surgery.

The lifetime risk of revision analysis comprises 28,222 patients, with a mean age of 73.5 years; 52.2% are female. The lifetime risk of revision after total stemmed reverse replacement for rotator cuff arthropathy in patients under the age of 50 is 34.47%. This decreases to 9.6% in those aged between 81 and 85.

At all ages, males have a higher lifetime risk of revision after primary total stemmed reverse replacement for rotator cuff arthropathy than females. In contrast to total stemmed reverse replacement for osteoarthritis, there is little difference in lifetime revision risk at any age between obese and non-obese patients. However, revision for infection is less likely than revision for non-infective causes in all age groups. This is also true for both males and females, regardless of age group.

The lifetime risk of revision for instability/dislocation is the most common reason for revision of total stemmed reverse replacement for rotator cuff arthropathy up to the age of 76–80 years. After this age, the other common revision diagnoses of loosening and fracture have similar lifetime revision risks.

Hip Replacement

There are an additional 64,085 hip replacement procedures compared to the number reported last year. The revision burden in 2025 is 6.9%. This equates to 3,821 fewer revision procedures in 2025 than would have been expected if the proportion of revision procedures had remained at the level reported in 2003.

The use of bipolar hip replacement continues to increase at the expense of unipolar modular partial hip replacement. After 2.5 years, bipolar prostheses continue to be associated with the lowest rate of revision for the management of femoral neck fractures requiring arthroplasty.

Of the two types of primary total hip replacement, total conventional hip has a lower cumulative percent revision than total resurfacing hip replacement.

For total conventional hip replacement, the 20 year cumulative percent revision for currently used prostheses undertaken for osteoarthritis is 7.7%. Age has an impact on the risk of revision, particularly in females. Updated information on the effect of ASA score and BMI is provided, with the cumulative percent revision increasing with increasing ASA score and increasing BMI category. There is little difference in outcomes based on fixation except for



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patients aged ≥ 75 years, where the revision rate is lower when either hybrid or cemented fixation is used.

The use of collared cementless stems has increased since 2015. Collarless stems have a higher rate of revision compared to collared stems. Collarless stems have a higher rate of revision for fracture and loosening.

Almost all polyethylene used for hip procedures is XLPE. Ceramic/XLPE is the most commonly used bearing surface. There is a slightly lower revision rate when anti-oxidant is added to XLPE.

There continues to be an increase in the use of dual mobility prostheses. They have the same risk of revision as standard acetabular prostheses when used in the management of osteoarthritis but have half the risk of being revised for dislocation.

The use and outcome of computer navigation, image derived instrumentation (IDI) and robotic assistance to aid implantation of total hip replacements are reported. These have been labelled as 'surgeon assistive tools'. Procedures using traditional instrumentation have decreased to 62.1% of primary hip procedures in 2025. Results for primary total hip replacement for osteoarthritis with the use of these techniques are presented, followed by a comparison of the assistive tools used with XLPE since 2016. Revision outcomes are analysed using each of these methods compared to traditional instrumentation.

When adjusted for age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume, there is no difference in the rate of revision when procedures using computer navigation are compared to procedures using traditional instrumentation.

Using the same adjustments, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation until 1.5 years, after which time robotic assistance has a higher rate of revision. There are increased proportions of revisions for infection and fracture using robotic assistance.

Similarly, using the same adjustments, when procedures using IDI are compared to procedures using traditional instrumentation, IDI usage has a lower rate of revision. There is a lower proportion of revision for dislocation/instability when IDI is used.

When adjusted for age, gender, ASA score, BMI category, femoral fixation, and head size, the anterior approach has a lower rate of revision compared to the lateral and posterior approaches. The posterior approach has a lower rate of revision compared to the lateral approach. The posterior approach also has a lower rate of major revision compared to the other two approaches. There are also differences in the reasons for revision. The anterior approach has a higher rate of revision for loosening and early fracture compared to the posterior and lateral approaches and a lower rate of revision for infection and dislocation.

Data on the outcomes of primary total hip replacement used for the management of femoral neck fracture are also provided, and the cumulative percent revision of primary total conventional hip replacement for fractured neck of femur is 9.8% at 20 years.

A summary table indexing statistically significant characteristic comparisons in hip replacements is located at the beginning of the Hip Chapter, while a comprehensive bibliography of hip replacement research utilising AOANJRR data from 2021–2026 is provided at the conclusion of the chapter.

Knee Replacement

There are an additional 81,692 knee replacement procedures since the last report. The revision burden has remained constant at 6.9%. This equates to 1,514 fewer revision procedures in 2025 than would have been expected if the proportion of revision procedures had remained at the level reported in 2004.

In 2025, the use of partial knee replacement is 6.9% of all knee replacement procedures. Age and sex are not associated with higher rates of revision for patella/trochlea knee replacement. Whereas younger age and female gender are associated with higher rates of revision for unicompartmental knee replacement.

When adjusted for age, gender, ASA, BMI, and mobility, there is no difference in the rate of revision when robotic assistance is used in patella/trochlea knee replacement. With the same adjustments, unicompartmental procedures using robotic assistance have a lower rate of revision compared to procedures using traditional instrumentation after 3.5 years.

Mobile bearings increase revision risk for unicompartmental knee replacement, but their use is restricted to only two prostheses.

Lateral unicompartmental knee replacement has a higher rate of revision compared to medial unicompartmental knee replacement, for the first 3 months only, with no difference after this time.

Primary total knee replacement increased by 1.1% in 2025. The 20 year cumulative percent revision of knee prostheses still used in 2025 for the management of osteoarthritis is 8.0%. The impact of patient and prosthesis factors on the outcome of knee replacement surgery is similar to previous reports.

There are higher revision rates in younger patients and males, and there is an increased risk of revision for infection associated with increasing ASA score and BMI category. There is a reduced rate of revision when patella resurfacing is used from 6 months, and when a patella component is used, the revision rate is lowest with an all-polyethylene rather than a metal-backed prosthesis.

With respect to bearing surface, the use of XLPE continues to increase. Its impact on the revision rate varies depending on

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the prosthesis. When adjusted for age, sex, fixation, bearing mobility, and patella usage, in general XLPE has a lower rate of revision compared to non XLPE except for a brief early period (first 3 months) where the rate of revision is higher.

Femoral components with an alternate bearing surface (that is not cobalt-chrome) have a higher rate of revision, but the rate varies with the material used.

When adjusted for age, gender, fixation, and patella component usage, fixed bearing prostheses have a lower rate of revision compared to mobile bearing prostheses for the majority of the early period, but after 7 years mobile designs have a lower rate of revision.

Posterior stabilised prostheses have higher rates of revision compared to minimally stabilised prostheses. Medial pivot design prostheses have a higher rate of revision compared to minimally stabilised prostheses in the first 1.5 years, no difference between 1.5 and 3 years, and a lower rate after 3 years. Medial pivot designs have a lower rate of revision compared to posterior stabilised prostheses.

The effect of fixation varies depending on prosthesis stability and often with time. For minimally stabilised prostheses, hybrid and cemented fixation have the lowest rates of revision. For posterior stabilised prostheses, cement fixation initially has the lowest initial revision rate. For medial pivot prostheses, the use of cement for tibial fixation is associated with a lower early rate of revision. There has been renewed interest in cementless fixation over the last few years but, at least for minimally stabilised prostheses, cementless tibial component fixation has a higher rate of revision for all age groups and both genders.

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. There has been a continued rise in the use of robotic assistance. Analyses of these tools to aid knee replacement insertion have been undertaken with hazard ratios adjusted for age, gender, ASA, BMI, bearing surface, patella component usage and stability. There is no difference in the rate of revision when procedures using computer navigation are compared to procedures with no technology assistance. Similarly, with the same adjustments for potential confounding factors, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures with no technology assistance.

A summary table indexing statistically significant characteristic comparisons in knee replacements is located at the beginning of the Knee Chapter, while a comprehensive bibliography of knee replacement research utilising AOANJRR data from 2021-2026 is provided at the chapter's conclusion.

Shoulder Replacement

In 2025, shoulder replacement increased by 6.3% compared to the previous year. The revision burden remained low at 7.9%. There has been an increasing interest in partial

shoulder replacements in younger patients (hemi stemmed anatomic), and the outcomes with alternate bearing surfaces. Summary data for partial shoulder anatomic procedures are in the Annual Report and a full analysis in the Partial Shoulder Arthroplasty Supplementary Report.

Of the three classes of primary total shoulder replacement (total stemmed anatomic, total stemless anatomic, and total stemmed reverse), total stemmed reverse shoulder replacement is by far the most common type of total shoulder replacement undertaken in Australia and accounts for 76% of all total shoulder procedures. Total stemless anatomic is more frequently utilised than total stemmed anatomic shoulder replacements.

A special clinical assessment compared implant choices in patients under 60 years of age with osteoarthritis. A hemi stemmed anatomic with a pyrolytic carbon head was not different to traditional total shoulder replacement options in this age group. In a second assessment, total stemmed reverse replacement with personalised (custom made and patient matched) augmented or standard glenoid components found custom glenoid prostheses failed earlier than more conventional options.

The most common primary anatomic shoulder replacement, total stemless, had differing outcomes depending upon age or BMI, stratified by sex. Prosthetic factors including fixation and glenoid component type influenced outcome. By contrast, the outcome of primary total stemmed anatomic shoulders changed depending upon age, sex and sex, stratified by ASA score and BMI. There were also many implant and sizing variations that were associated with the revision rate, including glenoid component type, augmentation, and fixation, along with bearing surface, humeral head size and humeral stem length. Surgeon assistive tools did not reduce rates of revision.

Total stemmed reverse shoulder replacement revision rates are higher when used for rotator cuff arthropathy compared to osteoarthritis. Younger age, male sex, ASA score and BMI are associated with an increased risk of revision. In contrast to anatomic shoulder replacements, surgeon assistive tools, prosthesis characteristics (bearing surface, glenosphere size and fixation), implant sizing variations (glenoid augmentation, humeral stem length and type), along with rotator cuff repair during the joint replacement surgery, influence the outcome depending on the primary diagnosis.

The Registry continues to report on the impact of glenoid morphology on the different types of shoulder replacement. At this point, it appears to have little effect on the early revision rates. This is true for each of the three most common total shoulder designs.

A summary table indexing statistically significant characteristic comparisons in total shoulder replacement is located at the beginning of the Shoulder Chapter, while a comprehensive bibliography of shoulder replacement research utilising AOANJRR data is provided at the chapter's conclusion.



Executive Summary

Prostheses with Higher than Anticipated Rates of Revision

Each year, the AOANJRR identifies prostheses with higher than anticipated rates of revision. This year, 5 total conventional hip prostheses have been identified.



Acknowledgements

The Registry continues to receive support and invaluable assistance from the Australian Government, state and territory health departments and orthopaedic companies.

The Registry acknowledges the cooperation and support provided by those undertaking the surgery and completing the data forms, in particular, all orthopaedic surgeons, registrars and nursing staff.

The Registry acknowledges the ongoing support of all hospitals, both public and private, that undertake arthroplasty surgery nationally. The support provided by each hospital through their nominated coordinator(s) is appreciated. A complete list of participating hospitals and coordinators is presented at the end of the Hip, Knee and Shoulder Arthroplasty Annual Report.

The Registry greatly appreciates the participation of all joint replacement patients throughout Australia. Their contribution allows ongoing improvements in arthroplasty outcomes to be achieved.

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Introduction

The 2026 Hip, Knee and Shoulder Arthroplasty Report is based on the analysis of 2,443,994 (1,036,341 hip, 1,287,308 knee and 120,345 shoulder) primary and revision procedures recorded by the Registry, with a procedure date up to and including 31 December 2025. Shoulder arthroplasty has been included in this report with hip and knee arthroplasty since 2017.

In addition, there are 14 supplementary reports that complete the AOANJRR Annual Report for 2026:

1. Lay Summary – Hip, Knee and Shoulder Replacement
2. Patient Reported Outcome Measures (PROMs): Hip, Knee and Shoulder Arthroplasty
3. Demographics of Hip, Knee and Shoulder Arthroplasty
4. Mortality of Hip, Knee and Shoulder Arthroplasty
5. Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report
6. Shoulder Replacement in Australia
7. Cement in Hip and Knee Arthroplasty
8. Metal/Metal Bearing Surface in Total Conventional Hip Arthroplasty
9. Primary Partial Shoulder Arthroplasty
10. Prosthesis Types with No or Minimal Use
11. Demographics and Outcome of Elbow and Wrist Arthroplasty
12. Demographics and Outcome of Ankle Arthroplasty
13. Demographics of Spinal Disc Arthroplasty
14. Comparative Prosthesis Performance

In addition to the 14 supplementary reports, investigations of prostheses with higher than anticipated rates of revision are published <https://registry.aoa.org.au/annual-reports-2026>.

All hospitals, public and private, undertaking joint replacement submit their data to the Registry. Currently, there are 327 participating hospitals. However, this may vary from time to time due to hospital closures, new hospitals, or changes to services within hospitals.

Background

The Australian Orthopaedic Association (AOA) recognised the need to establish a national joint replacement registry in 1993. At that time, the outcome of joint replacement in Australia was unknown. Patient demographics were not available, and the types of prostheses and techniques used to implant them were unknown.

The need to establish a Registry was, in part, based on the documented success of a number of arthroplasty registries in other countries. In particular, the Swedish arthroplasty registries. In Sweden, the ability to identify factors important in achieving successful outcomes has resulted in both improved standards and significant cost savings.

In 1998, the then Commonwealth Department of Health (DoH) funded the AOA to establish the Registry. The Department of Health, Disability and Ageing continues to

provide funding to maintain the Registry. In June 2009, Federal Parliament passed legislation to enable the government to cost recover this funding from the orthopaedic industry. This legislation was updated in 2015.

The Registry began hip and knee data collection on 1 September 1999. Implementation was undertaken in a staged manner in each of the Australian states and territories, becoming national during 2002. The first year of full national data collection for shoulder procedures was 2008 (Appendix 6).

The AOA contracts the South Australian Health and Medical Research Institute (SAHMRI) to provide data management and independent data analysis services for the Registry. The SAHMRI team contribute crucial data management and analysis expertise through the Registry Working Group and a variety of project working groups.

The AOA also contracts the University of South Australia to provide specific expertise in the ongoing development of analytical techniques for Registry data.

Purpose

The purpose of the Registry is to define, improve and maintain the quality of care for individuals receiving joint replacement surgery. This is achieved by collecting a defined minimum data set that enables outcomes to be determined based on patient characteristics, prosthesis type and features, method of prosthesis fixation and surgical technique used.

The principal outcome measure is time to first revision surgery. This is an unambiguous measure of the need for further intervention. Combined with a careful analysis of potential confounding factors, this can be used as an accurate measure of the success, or otherwise, of a procedure. The Registry also monitors mortality of patients, which is critical when determining the rate of revision.

Aims

1. Establish demographic data related to joint replacement surgery in Australia.
2. Provide accurate information on the use of different types of prostheses.
3. Determine regional variation in the practice of joint surgery.
4. Identify the demographic and diagnostic characteristics of patients that affect outcomes.
5. Analyse the effectiveness of different prostheses and treatment for specific diagnoses.
6. Evaluate the effectiveness of the large variety of prostheses currently on the market by analysing their survival rates.
7. Educate orthopaedic surgeons on the most effective prostheses and techniques to improve patient outcomes.
8. Provide surgeons with an auditing facility.
9. Provide information that can instigate tracking of patients if necessary.

10. Provide information for the comparison of the practice of joint replacement in Australia and other countries.

Benefits

Since its inception, the Registry has enhanced the outcome of joint replacement surgery in Australia.

There are many factors known to influence the outcome of joint replacement surgery. Some of these include age, gender, diagnosis, ASA score and BMI of patients, as well as the type of prosthesis and surgical technique used.

Another coexisting influence is the rapid rate of change in medical technology. There is continual development and use of new types of prostheses and surgical techniques, for many of which the outcome remains uncertain.

Information obtained by the analysis of Registry data is used to benefit the community. The Registry releases this information through publicly available annual and supplementary reports, journal publications and data reports. These data reports are specific analyses requested by surgeons, hospitals, academic institutions, government and government agencies, as well as orthopaedic companies.

The Registry provides surgeons with access to their individual data and downloadable reports through a secure online portal. Separate online facilities are available for orthopaedic companies to monitor their own prostheses, and for Australian and regulatory bodies in other countries to monitor prostheses used in Australia. The data obtained through the online facilities are updated daily and are over 90% complete within six weeks of the procedure date.

The percentage of revision hip procedures has declined from a peak of 12.9% in 2003 to 6.9% in 2025. The percentage of revision knee procedures has declined from a peak of 8.8% in 2004 to 6.9% in 2025. Revision shoulder arthroplasty peaked at 10.9% in 2012 and has declined to 7.9% in 2025.

A major reason for the reduction in revision following hip, knee and shoulder joint replacement is the increased use of the type and class of prostheses shown to have better outcomes, and an associated decline in use of prostheses when less satisfactory outcomes are identified.

There are many examples of AOANJRR data enhancing the outcome of joint replacement surgery in Australia. These include:

- The identification of high revision rates associated with the use of Austin Moore hemiarthroplasty for the treatment of fractured neck of femur (2003). Its use subsequently reduced, particularly in younger patients with this diagnosis.
- The reduction in the use of unicompartmental knee replacement. This reduction followed the identification of high revision rates (2004) and subsequent reporting, that the results of revision of primary unicompartmental knee replacement, were similar to revising primary total knee replacements.

- The identification of the high revision rate associated with unispacer use (2004).
- The AOANJRR was the first to identify ASR Resurfacing and ASR XL THR as prostheses with higher than anticipated rates of revision (2007/2008). These prostheses were subsequently removed from the market in Australia, a year earlier than the global recall.
- The importance of gender, age, and femoral head size to the outcomes of resurfacing prostheses (2007/2008).
- The identification of the entire class of large head metal/metal conventional total hip prostheses (2010).
- The reduction in revision associated with patella resurfacing (2010).
- Detailed analysis of the revision rates relating to bearing surface, including the improved outcomes associated with XLPE for both hips (2011), knees (2013) and shoulders (2017).
- Determining that the rate of revision for total stemmed anatomic shoulder replacement class is confounded by modular metal back glenoids.
- The identification of large numbers of prostheses with higher than anticipated rates of revision. This is almost always associated with a rapid reduction in use. Many of these devices have subsequently been removed from the market.
- The increasing adoption of Registry-identified best practice and use of better performing devices.

Governance

The AOANJRR is an initiative of the AOA funded by the Commonwealth Government. In 2009, the Commonwealth established the AOANJRR Consultative Committee, which was administered and chaired by the Department of Health. The purpose was to provide advice on the overall strategic direction of the Registry. The Consultative Committee has been under review and is not currently meeting.

The National Board of the AOA established the AOA Registry Committee to review and recommend AOANJRR policies to the Board. The Committee reports to the AOA Board. Members include the Chair, Registry Clinical Director with the two Deputy Registry Clinical Directors and three Assistant Deputy Registry Clinical Directors in attendance. In addition, an orthopaedic surgeon from each state, the ACT, and a representative from each of the AOA specialty arthroplasty groups are included. A complete list of the current AOA Registry Committee is provided in the acknowledgements section of this report.

The Registry Clinical Director, Deputy Registry Clinical Directors and Assistant Deputy Registry Clinical Directors are appointed by the AOA Board and are responsible for providing strategic and clinical guidance. Additionally, the Registry Clinical Directors are responsible for ensuring the cooperation of hospitals, surgeons, and government, maintaining the profile and reputation of the Registry,



Introduction

continued collaboration with other arthroplasty registries internationally, and sustaining the current level of excellence.

The AOANJRR staff include the Registry Services Executive Manager, Core Data Coordinator, PROMs Coordinator, Data Requests and Publications Manager, Data Requests Coordinator, Data Requests Officer, Publications Coordinator, and Administrative Officer. The AOANJRR team are responsible for the day-to-day operations, implementing new strategies, provision of data reports, research, and publications activity, and coordinating the preparation of the Annual Report.

Data Quality

Data Collection

Hospitals provide joint replacement data on specific Registry forms which are completed in theatre at the time of surgery. The completed forms are submitted to the Registry each month. Examples of these forms are available on the website: <https://registry.aoa.org.au/data-collection>.

Hard copy forms are sent to the Registry where a small team of expert data entry staff enter the data directly into the database. Onsite Data Managers are available to resolve queries at the time of data entry to reduce any potential data entry errors. The Registry data entry system uses a predictive text function which greatly reduces the possibility of transcription errors and enables the experienced data entry staff to enter the data rapidly and accurately.

The Registry has also established mechanisms to collect data electronically when it becomes feasible for contributing hospitals to do so. To date, there are no hospitals providing data electronically.

Data Validation

The Registry validates data collected from both public and private hospitals by comparing it to data provided by state and territory health departments. Validation of Registry data is a sequential multi-level matching process against health department unit record data

The validation process identifies:

11. Registry procedure records for procedures notified to state/territory health departments by hospitals.
12. State/territory records for procedures not submitted to the Registry by hospitals.
13. 'Exact match' procedures, that is, records held by the Registry and state/territory health departments.
14. Procedures that match on some parameters, but which require additional checking with hospitals to enable verification.

Initial validation is performed using hospital and patient identity numbers with subsequent verification undertaken on relevant procedure codes and appropriate admission periods.

Data errors can occur within Government or Registry data at any of these levels; that is, errors in patient identification, coding, or admission period attribution by either the hospital, state/ territory health department or the Registry. Data mismatches are managed depending on the nature of the error. For example, a health department record for a primary 'knee' may match a Registry-held record for a 'hip' on all parameters except procedure type. The Registry would regard the Registry data to be correct in this instance as the Registry record contains details of the prostheses implanted. Other errors may be resolved by contacting hospitals for clarification. Most commonly, this may include a reassessment of procedure codes or admission period.

The validation process identifies procedures not submitted to the Registry. As in previous years, the majority of these

procedures have an ICD10 code for hemiarthroplasty of the femur. Sufficient information is provided in the state unit record data to enable the Registry to request hospitals to provide forms for unreported procedures.

Outcome Assessment

The Registry describes the time to first revision using the Kaplan-Meier estimates of survivorship. The cumulative percent revision (CPR) at a certain time, for example, 5 years, is the complement in probability) of the Kaplan-Meier survivorship function at that time, multiplied by 100. The cumulative percent revision accounts for right censoring due to death and 'closure' of the database at the time of analysis. Closure of the database occurs in April of the report year for procedures up to 31 December of the preceding year. Due to delays in receipt of the procedure form, some procedures are not included until the following annual report.

Mortality information is obtained by matching all procedures with the National Death Index (NDI) biannually. The NDI is the national mortality database maintained by the Australian Institute of Health and Welfare (AIHW). The AIHW requires ethics approval for access to the NDI data.

Prior to 2013, the Registry reported the revisions per 100 observed component years. This statistic provides a good estimate of the overall rate of revision. However, it does not allow for changes in the rate of revision over time. A more informative estimate of the rate of revision over time is the cumulative percent revision.

Confidence intervals for the cumulative percent revision are unadjusted point-wise Greenwood estimates and should not be used to infer significant differences in revision between groups. Reported hazard ratios should be used when judging statistical significance.

Hazard ratios (HR) from Cox proportional hazards models, adjusting for age and gender where appropriate, are used to compare rates of revision. For each model, the assumption of proportional hazards is checked analytically. If the interaction between the predictor and the log of time is statistically significant in the standard Cox model, then a time varying model is estimated. Time points are iteratively chosen until the assumption of proportionality is met, then the hazard ratios are calculated for each selected time period. If no time period is specified, then the hazard ratio is over the entire follow-up period. All tests are two-tailed at the 5% level of significance.

The cumulative percent revision is displayed until the number at risk for the group reaches 40, unless the initial number for the group is less than 100, in which case the cumulative percent revision is reported until 10% of the initial number at risk remains. This avoids uninformative, imprecise estimates at the right tail of the distribution where the number at risk is



Data Quality

low. Analytical comparisons of revision rates using the proportional hazards model are based on all available data.¹

In the presence of a competing risk for revision, the Kaplan-Meier method is known to overestimate the true probability of revision. Death of the patient before revision presents such a competing risk. In circumstances where the risk of death is high, e.g., in elderly patients with fractured neck of femur, the bias in the Kaplan-Meier estimates may be substantial and the reported cumulative percent revision should be interpreted with caution.

Cumulative incidence is one method of estimating the probability of revision in the presence of competing risks. Cumulative incidence revision diagnosis graphs deal with the competing risks of reasons for revision, highlighting the differences between groups in the pattern of revision over time. They also provide important insight into different mechanisms of failure. A further approach to address the issue of death is to assess the probability of revision in only those patients who are still alive at the time of assessment. This is referred to as conditional probability.

More detailed information on the statistical methods used in this report is presented in Appendix 2.

An important Registry focus has been the continued development of a standardised algorithm to identify prostheses or combination of prostheses not performing to the level of others in the same class. The Registry refers to this group as 'prostheses with a higher than anticipated rate of revision'. A three-stage approach has been developed and is outlined in detail in the relevant chapter of the report.

Annual Report Review Prior To Publication

Prior to publication, three workshops were held to review, comment, and provide advice on all sections of the Annual Report. Members of the AOA, Arthroplasty Society, and Shoulder and Elbow Society were invited to attend these surgeon workshops.

The hip, knee and shoulder surgeon workshops were held in Adelaide on the weekend of 29 and 30 August 2026. In addition to AOANJRR and SAHMRI staff, 30 hip, knee and shoulder arthroplasty specialists from the AOA membership attended the workshops.

Following these meetings, the Annual Report was provided to the AOA Board for consideration and final approval prior to publication.

This year, a one month delay in receiving NDI data from AIHW required the surgeon workshop and subsequent release of the Annual Report to be deferred by 4 weeks. The additional time was necessary to ensure the accuracy, completeness and integrity of the data presented in the 2026 Annual Report.

¹ Pocock SJ, Clayton TC, Altman DG. Survival plots of time to event outcomes in clinical trials: good practice and pitfalls, Lancet 2002; 359: 1686-89.





Ten, Fifteen and Twenty Year Prosthesis Outcomes

Ten, Fifteen and Twenty Year Prosthesis Outcomes

Ten Year Outcomes

The Registry first reported 10-year outcomes in 2011. Since that time, the Registry has reported on an increasing number of hip and knee prostheses that have achieved this length of follow-up. This outcome is widely regarded as an important milestone in assessing the performance of prostheses.

Since the Registry commenced data collection revision rates have declined and many prostheses are no longer used. In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified. This approach has been applied both to the calculation of the benchmark standard used to identify superior and non-inferior performance and the selection of prostheses combinations reported. In addition, the Registry has excluded prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

HIP REPLACEMENT

Individual femoral and acetabular prosthesis combinations are reported. A combination is included if >350 procedures have been reported, and the follow-up period is ≥10 years.

There are 46 femoral and acetabular combinations with 10 year outcome data. These prosthesis combinations have been used in 85.4% of all primary total conventional hip procedures performed for osteoarthritis.

The 10-year cumulative percent revision for the individual prosthesis combinations ranges from 1.9% to 8.0%. In the past, when assessing superior and non-inferior performance the commonly accepted benchmark standard of 5% cumulative percent revision at 10 years was used. In the 2021 Annual Report, the AOANJRR changed the approach to

determining the benchmark so that it is now calculated each year and is based on the aggregate performance of modern prostheses. The 10-year benchmark for this year is 4.1%.

Approaches to benchmarking hip and knee prostheses have been reviewed by the ISAR International Prosthesis Benchmarking Working Group.² An important recommendation was to use confidence intervals (CI) for individual prostheses rather than the revision rate, as the CI reflects the precision in estimating the true population revision rate.

The superiority and inferiority approaches suggested by the ISAR International Prosthesis Benchmarking Working Group are utilised in this chapter to identify better performing hip prosthesis combinations.

Superiority approach: the upper confidence interval is less than, or equal to, the benchmark standard. Using the benchmark of 4.1% for modern prostheses at 10 years, 12 (26.1%) hip prosthesis combinations qualify for the superiority benchmark. These are highlighted in green in Table BM1.

Non-inferiority approach: the permitted upper confidence interval level is 20% above the benchmark standard. For the benchmark standard of 4.1% at 10 years, the accepted upper confidence interval is 4.9% or less. Using this approach, an additional 13 prosthesis combinations can be benchmarked, i.e., 25 (54.3%) prosthesis combinations would receive either a superiority or non-inferiority benchmark. The additional 13 devices with a non-inferiority benchmark are highlighted in blue in Table BM1.

It is important to emphasise that there are many reasons why a prosthesis combination may not achieve a benchmark standard. These include being used in small numbers, higher revision rates due to factors other than the prostheses used, as well as less satisfactory performance. However, it is clear that those prosthesis combinations that have achieved a benchmark standard have done so because they have revision rates that are comparatively lower.

² Report by ISAR International Prosthesis Benchmarking Working Group May 2018: <https://www.isarhome.org/publications>



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Table BM1 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Prosthesis Combinations with 10 Year Data (Primary Diagnosis OA)

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				THR	Femoral	Acetabular	Other			
AMiStem H	Versafitcup CC	129	4221	16	73	19	21	1.5 (1.2, 1.9)	2.6 (2.1, 3.2)	4.4 (3.6, 5.4)
Accolade II	Trident (Shell)	570	20485	54	195	84	237	2.3 (2.1, 2.5)	3.0 (2.7, 3.3)	3.8 (3.4, 4.2)
Accolade II	Trident/Tritanium (Shell)	157	4063	19	46	28	64	3.0 (2.5, 3.6)	3.8 (3.2, 4.4)	4.6 (3.9, 5.5)
Anthology	R3	305	8648	30	86	64	125	2.3 (2.0, 2.7)	2.9 (2.5, 3.3)	3.7 (3.3, 4.2)
C-Stem AMT	Marathon	10	530	2	2	3	3	0.8 (0.3, 2.0)	1.4 (0.7, 3.0)	2.3 (1.2, 4.3)
C-Stem AMT	PINNACLE	173	5547	18	74	18	63	1.6 (1.3, 2.0)	2.7 (2.3, 3.2)	4.1 (3.5, 4.9)
CORAIL	PINNACLE	2699	66053	253	1037	393	1016	2.0 (1.9, 2.1)	2.9 (2.8, 3.1)	4.4 (4.2, 4.6)
CORAIL	Trident (Shell)	27	679	4	7	3	13	2.8 (1.7, 4.4)	3.8 (2.5, 5.7)	6.1 (3.9, 9.6)
CPCS	R3	309	8535	35	95	58	121	2.4 (2.1, 2.7)	3.3 (2.9, 3.7)	4.7 (4.1, 5.3)
CPCS	Reflection (Cup)	92	876	29	7	43	13	1.5 (0.9, 2.6)	2.9 (1.9, 4.3)	8.0 (6.1, 10.5)
CPCS	Reflection (Shell)	119	2845	18	49	15	37	0.9 (0.6, 1.4)	1.6 (1.2, 2.2)	3.2 (2.5, 3.9)
CPT	Continuum	149	2576	10	60	18	61	3.3 (2.7, 4.0)	4.4 (3.7, 5.3)	6.2 (5.2, 7.3)
CPT	Trabecular Metal (Shell)	128	2111	13	55	20	40	2.7 (2.1, 3.5)	4.0 (3.2, 4.9)	6.5 (5.4, 7.9)
CPT	ZCA	47	869	17	11	11	8	1.2 (0.6, 2.2)	2.4 (1.6, 3.7)	4.8 (3.4, 6.6)
Evolve	Logical G	87	3134	9	12	12	54	2.0 (1.6, 2.6)	2.9 (2.3, 3.6)	3.7 (2.9, 4.6)
Exeter V40	Exeter X3 Rimfit	137	4922	34	40	35	28	1.8 (1.4, 2.2)	2.5 (2.1, 3.0)	3.2 (2.7, 3.9)
Exeter V40	Trabecular Metal (Shell)	22	502	2	4	2	14	2.6 (1.5, 4.5)	3.6 (2.2, 5.7)	4.8 (3.1, 7.4)
Exeter V40	Trident (Shell)	2715	85726	382	909	321	1103	1.5 (1.5, 1.6)	2.3 (2.2, 2.4)	3.5 (3.4, 3.7)
Exeter V40	Trident/Tritanium (Shell)	178	5228	23	47	31	77	1.9 (1.5, 2.3)	2.9 (2.4, 3.4)	3.8 (3.3, 4.5)
H-Max	Delta-TT	85	1759	7	40	13	25	2.4 (1.7, 3.2)	3.6 (2.8, 4.6)	5.7 (4.6, 7.2)
MS 30	Continuum	17	924	1	2	3	11	1.6 (1.0, 2.7)	1.9 (1.2, 3.0)	1.9 (1.2, 3.0)
MS 30	Low Profile Cup	18	414	6	1	9	2	0.7 (0.2, 2.3)	1.3 (0.6, 3.2)	3.2 (1.7, 6.0)
Metafix	Trinity	531	24134	62	149	97	223	1.8 (1.6, 2.0)	2.3 (2.1, 2.6)	3.2 (2.8, 3.6)
MiniHip	Trinity	43	1349	3	22	10	8	2.6 (1.9, 3.7)	3.0 (2.2, 4.1)	3.2 (2.4, 4.4)
Optimys	RM Cup	80	3543	11	29	12	28	2.1 (1.6, 2.6)	2.5 (2.0, 3.1)	3.2 (2.3, 4.4)
Origin	Logical G	177	5021	10	49	29	89	2.9 (2.5, 3.4)	3.8 (3.3, 4.5)	5.8 (4.5, 7.3)
Polarstem	R3	698	25057	42	225	106	325	2.2 (2.0, 2.4)	2.8 (2.6, 3.1)	3.7 (3.4, 4.1)
Profemur L	Procotyl L	25	2010	1	15	2	7	1.0 (0.7, 1.6)	1.7 (1.0, 2.7)	2.6 (1.4, 4.7)
Quadra-C	Mpact	119	6471	16	40	21	42	1.4 (1.1, 1.7)	2.0 (1.6, 2.4)	3.3 (2.5, 4.4)
Quadra-C	Versafitcup CC	41	2264	7	9	9	16	1.3 (0.9, 1.9)	1.8 (1.3, 2.5)	2.4 (1.7, 3.4)
Quadra-H	Mpact	269	6384	29	140	31	69	2.4 (2.1, 2.9)	3.8 (3.3, 4.3)	6.2 (5.2, 7.3)
Quadra-H	Versafitcup CC	458	11206	56	214	83	105	2.1 (1.8, 2.4)	3.0 (2.7, 3.4)	4.8 (4.3, 5.3)
S-Rom	PINNACLE	170	2689	18	94	16	42	2.9 (2.3, 3.6)	4.4 (3.7, 5.3)	5.7 (4.9, 6.7)



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				THR	Femoral	Acetabular	Other			
SL-Plus	R3	106	1700	8	28	25	45	3.1 (2.4, 4.0)	4.2 (3.3, 5.3)	5.9 (4.9, 7.2)
Secur-Fit	Trident (Shell)	573	9913	48	252	108	165	2.5 (2.2, 2.8)	3.6 (3.2, 4.0)	4.8 (4.4, 5.3)
Secur-Fit Plus	Trident (Shell)	100	2984	9	34	24	33	1.6 (1.2, 2.1)	2.3 (1.8, 2.9)	3.2 (2.6, 4.0)
Short Exeter V40	Exeter X3 Rimfit	11	533	2	4	4	1	1.5 (0.8, 3.0)	2.0 (1.1, 3.7)	2.8 (1.4, 5.8)
Short Exeter V40	Trident (Shell)	115	5474	12	34	14	55	1.3 (1.1, 1.7)	2.4 (2.0, 2.9)	3.5 (2.7, 4.5)
Spectron EF	R3	109	2184	20	24	21	44	2.5 (1.9, 3.2)	3.8 (3.1, 4.7)	5.1 (4.1, 6.2)
Spectron EF	Reflection (Cup)	128	1406	50	12	57	9	1.3 (0.8, 2.0)	2.9 (2.1, 4.0)	7.2 (5.8, 8.9)
Synergy	R3	206	5571	6	57	49	94	2.2 (1.8, 2.6)	2.8 (2.4, 3.3)	3.5 (3.1, 4.1)
Taper Fit	Trinity	150	6285	18	44	17	71	1.9 (1.6, 2.3)	2.8 (2.3, 3.3)	3.6 (2.8, 4.6)
Taperloc	G7	190	7554	14	53	21	102	2.2 (1.9, 2.6)	2.7 (2.3, 3.1)	3.3 (2.8, 4.0)
Taperloc Microplasty	G7	127	7417	12	54	14	47	1.6 (1.4, 2.0)	1.9 (1.6, 2.3)	2.6 (1.8, 3.7)
Tri-Fit TS	Trinity	150	5302	16	64	25	45	1.9 (1.5, 2.3)	2.5 (2.1, 3.0)	3.3 (2.8, 3.9)
twinSys (cless)	RM Cup	63	1523	7	17	8	31	2.5 (1.8, 3.4)	3.3 (2.5, 4.3)	4.7 (3.6, 6.1)
TOTAL		12812	378621	1459	4515	2006	4832			

Note: Only prostheses with >350 procedures have been listed.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses.



Ten, Fifteen and Twenty Year Prosthesis Outcomes

KNEE REPLACEMENT

The Registry has information on individual femoral and tibial prosthesis combinations. A combination is included if >350 procedures have been reported to the Registry and the follow-up is ≥ 10 years.

The listed prostheses most often represent a family of devices that have a range of different femoral and tibial components, combined with different tibial inserts, listed under one prosthesis name. Prosthesis types are further characterised according to whether they are minimally stabilised (cruciate retaining) or posteriorly stabilised.

As with hips, to ensure that the data reflects contemporary practice only procedures using modern prostheses are included in the analyses. This approach has been applied both to the calculation of the benchmark standard used to identify superior and non-inferior performance and the selection of prosthesis combinations reported. In addition, the Registry has excluded prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

There are 37 total knee replacement combinations with 10-year outcome data. These prosthesis combinations were used in 92.4% of all primary total knee replacement procedures performed for osteoarthritis.

The 10-year cumulative percent revision ranges from 2.9% to 11.6%. In the past, as with primary total conventional hip replacement, when assessing superior and non-inferior performance the benchmark standard used was a cumulative percent revision at 10 years of 5%. The cumulative percent

revision benchmark at 10 years, calculated this year based on the aggregate performance of modern prostheses within the AOANJRR is 4.6%.

The superiority and inferiority approaches suggested by the ISAR International Prosthesis Benchmarking Working Group are utilised in this chapter to identify better performing knee prosthesis combinations.

Applying the recommendations of the ISAR International Prosthesis Benchmarking Working Group, using the new benchmark of 4.6% at 10 years, then 8 (21.6%) knee prosthesis combinations qualify for the superiority benchmark. These are highlighted in green in

Table BM2.

To assess non-inferiority, the permitted upper confidence interval level is 20% above the new benchmark standard which is 5.5% or less. An additional 9 knee prosthesis combinations can be benchmarked, i.e., 17 (45.9%) prosthesis combinations would receive either a superiority or a non-inferiority benchmark. The additional 9 devices with a non-inferiority benchmark are highlighted in blue (Table BM2).

It is important to emphasise that there are many reasons why a prosthesis combination may not achieve a benchmark standard. These include being used in small numbers, patella resurfacing rates, higher revision rates due to factors other than the prostheses used, as well as less satisfactory performance. However, those prosthesis combinations that have achieved a benchmark standard have done so because they have revision rates that are comparatively lower.

Table BM2 Cumulative Percent Revision of Primary Total Knee Replacement Prosthesis Combinations with 10 Year Data (Primary Diagnosis OA)

Femoral Component	Tibial Component	N Revised	N Total	TKR	Type of Revision			2 Yrs	5 Yrs	10 Yrs
					Femora l	Tibial	Other			
ACS	ACS Fixed	186	3934	54	11	21	100	2.8 (2.3, 3.4)	4.2 (3.5, 4.9)	5.5 (4.7, 6.4)
Active Knee	Active Knee	988	11363	301	30	43	614	2.4 (2.1, 2.7)	4.5 (4.1, 4.9)	7.7 (7.2, 8.3)
Anatomic	Anatomic	104	2990	36	10	1	57	2.6 (2.0, 3.3)	4.0 (3.2, 4.9)	5.2 (4.2, 6.4)
Apex Knee CR	Apex Knee	322	16061	75	24	15	208	1.4 (1.2, 1.6)	2.2 (2.0, 2.5)	3.1 (2.7, 3.5)
Apex Knee PS	Apex Knee	256	8099	105	11	21	119	1.7 (1.4, 2.0)	3.1 (2.7, 3.5)	4.8 (4.2, 5.6)
Attune CR	Attune	958	42548	258	51	58	591	1.5 (1.4, 1.6)	2.6 (2.4, 2.8)	3.7 (3.4, 4.0)
Attune PS	Attune	503	19400	159	27	60	257	1.6 (1.5, 1.8)	2.7 (2.5, 3.0)	4.4 (3.9, 4.9)
BalanSys	BalanSys	163	5293	55	9	10	89	1.5 (1.2, 1.8)	2.5 (2.1, 2.9)	3.8 (3.2, 4.4)
Columbus	Columbus	317	9207	86	14	17	200	1.9 (1.7, 2.2)	3.7 (3.3, 4.2)	5.8 (5.0, 6.8)
E.Motion	E.Motion	80	1041	24	9	4	43	4.3 (3.2, 5.7)	6.4 (5.1, 8.2)	8.5 (6.8, 10.5)
Evolution	Evolution	414	14346	107	2	16	289	1.6 (1.4, 1.8)	2.8 (2.6, 3.1)	4.0 (3.6, 4.5)
GMK Primary	GMK Primary	165	4197	49	5	17	94	2.4 (1.9, 2.9)	3.7 (3.1, 4.3)	5.2 (4.4, 6.1)
GMK Sphere Primary	GMK Primary	784	31209	196	26	49	513	2.0 (1.9, 2.2)	3.1 (2.9, 3.4)	4.3 (3.9, 4.8)
GMK Sphere Primary	GMK Sphere Primary	129	4605	37	2	9	81	2.0 (1.6, 2.5)	3.5 (2.9, 4.2)	4.7 (3.8, 5.8)



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Femoral Component	Tibial Component	N Revised	N Total	TKR	Type of Revision			2 Yrs	5 Yrs	10 Yrs
					Femora I	Tibial	Other			
Genesis II CR	Genesis II	1366	26966	302	79	58	927	2.0 (1.8, 2.1)	3.4 (3.2, 3.7)	5.0 (4.7, 5.3)
Genesis II Oxinium CR (ctd)	Genesis II	739	11740	148	38	28	525	2.0 (1.7, 2.2)	3.5 (3.2, 3.9)	5.9 (5.5, 6.4)
Genesis II Oxinium PS (ctd)	Genesis II	1664	23143	268	37	181	1178	2.7 (2.5, 3.0)	4.8 (4.6, 5.1)	7.0 (6.6, 7.3)
Genesis II PS	Genesis II	1049	21165	192	34	62	761	2.0 (1.8, 2.2)	3.5 (3.3, 3.8)	4.9 (4.6, 5.2)
Journey II Oxinium	Journey	72	6382	10	3	3	56	1.4 (1.1, 1.8)	3.9 (2.2, 6.9)	3.9 (2.2, 6.9)
LCS CR	LCS	645	8351	263	24	90	268	2.5 (2.1, 2.8)	4.5 (4.0, 4.9)	6.4 (5.9, 7.0)
Legion CR	Genesis II	412	10940	87	30	16	279	2.0 (1.8, 2.3)	3.7 (3.3, 4.1)	5.2 (4.7, 5.8)
Legion Oxinium CR	Genesis II	414	13911	103	32	12	267	1.7 (1.5, 1.9)	3.1 (2.8, 3.4)	4.3 (3.8, 4.8)
Legion Oxinium FS	Legion	35	371	2	2	0	31	6.4 (4.3, 9.5)	9.0 (6.3, 12.7)	11.6 (8.2, 16.2)
Legion Oxinium PS	Genesis II	896	20419	140	24	71	661	2.1 (1.9, 2.3)	3.7 (3.4, 4.0)	5.2 (4.8, 5.5)
Legion PS	Genesis II	251	6572	65	5	13	168	2.0 (1.7, 2.4)	3.1 (2.7, 3.6)	4.2 (3.7, 4.8)
Nexgen LCCK	Nexgen	60	985	12	3	1	44	3.1 (2.2, 4.4)	4.7 (3.5, 6.3)	6.1 (4.6, 8.0)
Nexgen LPS Flex	Nexgen	1586	31637	474	66	217	829	1.9 (1.7, 2.0)	3.2 (3.0, 3.4)	4.9 (4.6, 5.1)
Nexgen RH	Nexgen	50	905	4	5	4	37	3.1 (2.1, 4.5)	5.3 (3.9, 7.2)	8.6 (6.4, 11.5)
Persona CR	Persona	1561	94101	302	75	144	1040	1.5 (1.4, 1.6)	2.4 (2.3, 2.5)	3.0 (2.5, 3.7)
Persona PS	Persona	185	7446	34	12	5	134	1.8 (1.5, 2.2)	2.9 (2.5, 3.4)	3.4 (2.9, 4.1)
SAIPH	SAIPH	141	7389	36	4	0	101	1.1 (0.9, 1.4)	2.0 (1.7, 2.4)	2.9 (2.3, 3.5)
Score	Score	484	6803	203	24	12	245	3.0 (2.6, 3.4)	5.6 (5.0, 6.2)	8.7 (7.9, 9.5)
Trekking	Trekking	80	1294	37	8	3	32	3.1 (2.3, 4.2)	4.7 (3.7, 6.1)	6.3 (5.1, 7.9)
Triathlon CR	Triathlon	4203	160652	863	168	189	2983	1.3 (1.3, 1.4)	2.3 (2.2, 2.4)	3.4 (3.3, 3.5)
Triathlon PS	Triathlon	732	15750	151	38	86	457	2.3 (2.0, 2.5)	3.7 (3.4, 4.1)	5.2 (4.9, 5.6)
Triathlon TS	Triathlon	29	522	7	2	1	19	3.9 (2.5, 6.0)	6.1 (4.2, 8.8)	6.5 (4.5, 9.3)
Vanguard CR	Vanguard	1313	27181	346	47	72	848	1.7 (1.5, 1.9)	2.9 (2.7, 3.1)	4.6 (4.3, 4.9)
TOTAL		23336	678918	5591	991	1609	15145			

Note: Only prostheses with >350 procedures have been listed.

CR 'cruciate retaining' refers to minimally stabilised.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses.



Ten, Fifteen and Twenty Year Prosthesis Outcomes

SHOULDER REPLACEMENT

The Registry is reporting 10-year outcomes for primary total shoulder replacements. Individual humeral and glenoid prosthesis combinations are reported. A combination is included if >50 procedures have been reported to the Registry and the follow-up is ≥ 10 years.

As with hips and knees, to ensure that the data reflects contemporary practice only procedures using modern prostheses are included in the analyses. This approach has been applied both to the calculation of the benchmark standard used to identify superior and non-inferior performance and the selection of prosthesis combinations reported. In addition, the Registry has excluded prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

Total Stemmed Anatomic Shoulder Replacement

There are 6 total stemmed anatomic shoulder replacement combinations with a primary diagnosis of osteoarthritis with 10 year outcomes. These prosthesis combinations were used in 97.5% of all primary total stemmed anatomic shoulder replacement procedures performed for osteoarthritis.

The 10 year cumulative percent revision ranges from 3.7% to 24.6%. The cumulative percent revision benchmark at 10 years, calculated this year is based on the aggregate performance of modern prostheses where cemented polyethylene glenoid components are used for a primary diagnosis of osteoarthritis, which is 7.9%.

Using the benchmark of 7.9% at 10 years, then one total stemmed anatomic shoulder prosthesis combination qualifies for the superiority benchmark. This is highlighted in green.

To assess non-inferiority, the permitted upper confidence interval level is 20% above the new benchmark standard

which is 9.5% or less. One additional total stemmed anatomic shoulder prosthesis combination qualified for a non-inferiority benchmark and this is highlighted in blue (Table BM3).

Primary Total Stemmed Reverse Shoulder Replacement

There are 8 total stemmed reverse shoulder replacement combinations undertaken for all diagnoses with 10 year outcomes.

These prosthesis combinations were used in 79.5% of primary total stemmed reverse shoulder replacement procedures performed for any diagnosis reported to the Registry.

The 10 year cumulative percent revision ranges from 3.2% to 9.5%. The cumulative percent revision benchmark at 10 years, calculated this year based on the aggregate performance of modern prostheses with cementless fixation is 5.4%.

Applying a benchmark of 5.4% at 10 years then 2 total stemmed reverse shoulder prosthesis combinations qualify for the superiority benchmark. These are highlighted in green.

To assess non-inferiority, the permitted upper confidence interval level is 20% above the new benchmark standard which is 6.5% or less. Using this approach, an additional total stemmed reverse shoulder replacement combinations can be benchmarked, i.e. 3 (50%) prosthesis combinations would receive either a superiority or a non-inferiority benchmark. The additional device with a non-inferiority benchmark is highlighted in blue (Table BM4).

It is important to emphasise that there are many reasons why a prosthesis combination may not achieve a benchmark standard. These include being used in small numbers, higher revision rates due to factors other than the prostheses used, as well as less satisfactory performance. However, it is clear that those prosthesis combinations that have achieved a benchmark standard have done so because they have revision rates that are comparatively lower.

Ten, Fifteen and Twenty Year Prosthesis Outcomes

Table BM3 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Combinations with 10 Year Data (Primary Diagnosis OA)

Humeral Component	Glenoid Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				TSR	Humeral	Glenoid	Other			
Affinis	Affinis	22	208	8	1	7	6	1.1 (0.3, 4.1)	5.0 (2.6, 9.4)	8.8 (5.4, 14.2)
Ascend Flex	Perform	57	1526	50	1	0	6	1.6 (1.1, 2.5)	3.3 (2.4, 4.5)	7.6 (5.4, 10.8)
Comprehensive	Comprehensive	63	937	46	3	1	13	4.6 (3.5, 6.2)	5.9 (4.5, 7.6)	7.8 (6.0, 10.0)
Equinox	Equinox	100	747	69	7	4	20	4.9 (3.6, 6.8)	9.4 (7.4, 12.0)	24.6 (19.5, 30.8)
Global Unite	Global	39	1327	33	0	1	5	1.7 (1.1, 2.6)	2.7 (1.9, 3.8)	3.7 (2.7, 5.1)
SMR	SMR	37	562	29	1	1	6	4.5 (3.0, 6.6)	5.5 (3.9, 7.9)	6.9 (4.9, 9.5)
TOTAL		318	5307	235	13	14	56			

Note: Only prostheses with > 50 procedures have been listed.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses.

Table BM4 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement Combinations with 10 Year Data (All Diagnoses)

Humeral Component	Glenoid Component	N Revised	N Total	Type of Revision				2 Yrs	5 Yrs	10 Yrs
				TSR	Humeral	Glenoid	Other			
Aequalis	Aequalis	237	4710	15	43	17	162	2.8 (2.4, 3.3)	4.3 (3.8, 5.0)	6.8 (5.9, 7.8)
Ascend Flex	Aequalis	192	4591	42	112	2	36	3.4 (2.9, 4.0)	4.9 (4.2, 5.7)	7.2 (5.6, 9.3)
Comprehensive	Comprehensive Reverse	216	11456	92	77	4	43	1.9 (1.6, 2.1)	2.5 (2.2, 2.9)	3.2 (2.4, 4.2)
Delta Xtend	Delta Xtend	527	13004	32	75	31	389	2.7 (2.5, 3.0)	3.7 (3.4, 4.1)	4.9 (4.5, 5.4)
Equinox	Equinox	336	8272	29	150	3	154	3.1 (2.8, 3.5)	4.7 (4.2, 5.3)	9.5 (7.2, 12.5)
Global Unite	Delta Xtend	70	2295	3	18	1	48	2.9 (2.2, 3.7)	3.9 (3.1, 5.0)	4.9 (3.5, 6.9)
SMR	SMR L1	541	12719	36	126	42	337	3.6 (3.2, 3.9)	4.2 (3.9, 4.6)	5.1 (4.7, 5.6)
Trabecular Metal	Trabecular Metal	112	2057	2	8	36	66	3.7 (2.9, 4.6)	5.2 (4.3, 6.3)	6.3 (5.2, 7.7)
TOTAL		2231	59104	251	609	136	1235			

Note: Only prostheses with > 50 procedures have been listed.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses.



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Fifteen Year Outcomes

This year, the Registry is reporting 15 year outcomes for 22 hip and 19 knee prosthesis combinations. A combination is included if >350 procedures have been reported to the Registry, and the follow-up period is 15 or more years.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

HIP REPLACEMENT

The 22 listed prosthesis combinations were used in 57% of all primary total conventional hip replacement procedures performed for osteoarthritis.

The 15-year cumulative percent revision ranges from 4.2% to 17.0%. The benchmark used to assess superiority and non-inferiority performance at 15 years was calculated based on modern prostheses. This year, the 15 year benchmark is 5.9%. There are 4 (18.2%) hip prosthesis combinations that qualify for a superiority benchmark and these are highlighted in green (Table BM5).

An additional 4 prosthesis combinations qualify for a non-inferiority benchmark, (7.1 or less) i.e., 8 (36.4%) qualify for either a superiority or non-inferiority benchmark. Those prosthesis combinations that qualify for a non-inferiority benchmark are highlighted in blue (Table BM5).

KNEE REPLACEMENT

The listed 19 prosthesis combinations were used in 56.2% of all primary total knee replacement procedures performed for osteoarthritis.

The 15-year cumulative percent revision ranges from 4.7% to 11.1%. This year, the benchmark used to assess superiority and non-inferiority at 15 years is 6.2%. There are 3 (15.8%) knee prosthesis combinations that qualify for a superiority benchmark and these are highlighted in green (Table BM6).

There are an additional 5 prosthesis combinations that qualify for a non-inferiority benchmark, (7.4 or less) i.e., 8 (42.1%) qualify for either a superiority or non-inferiority benchmark. Those prostheses that qualify for a non-inferiority benchmark are highlighted in blue (Table BM6).

Table BM5 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Prosthesis Combinations with 15 Year Data (Primary Diagnosis OA)

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				5 Yrs	10 Yrs	15 Yrs
				THR	Femoral	Acetabular	Other			
Anthology	R3	305	8648	30	86	64	125	2.9 (2.5, 3.3)	3.7 (3.3, 4.2)	4.5 (3.9, 5.1)
C-Stem AMT	PINNACLE	173	5547	18	74	18	63	2.7 (2.3, 3.2)	4.1 (3.5, 4.9)	6.6 (4.7, 9.0)
CORAIL	PINNACLE	2699	66053	253	1037	393	1016	2.9 (2.8, 3.1)	4.4 (4.2, 4.6)	6.9 (6.6, 7.2)
CPCS	R3	309	8535	35	95	58	121	3.3 (2.9, 3.7)	4.7 (4.1, 5.3)	5.6 (4.8, 6.5)
CPCS	Reflection (Cup)	92	876	29	7	43	13	2.9 (1.9, 4.3)	8.0 (6.1, 10.5)	17.0 (13.6, 21.2)
CPCS	Reflection (Shell)	119	2845	18	49	15	37	1.6 (1.2, 2.2)	3.2 (2.5, 3.9)	5.2 (4.2, 6.4)
CPT	Continuum	149	2576	10	60	18	61	4.4 (3.7, 5.3)	6.2 (5.2, 7.3)	7.1 (6.0, 8.5)
CPT	Trabecular Metal (Shell)	128	2111	13	55	20	40	4.0 (3.2, 4.9)	6.5 (5.4, 7.9)	9.1 (7.4, 11.2)
CPT	ZCA	47	869	17	11	11	8	2.4 (1.6, 3.7)	4.8 (3.4, 6.6)	6.3 (4.5, 8.7)
Exeter V40	Trabecular Metal (Shell)	22	502	2	4	2	14	3.6 (2.2, 5.7)	4.8 (3.1, 7.4)	5.2 (3.4, 8.0)
Exeter V40	Trident (Shell)	2715	85726	382	909	321	1103	2.3 (2.2, 2.4)	3.5 (3.4, 3.7)	4.9 (4.7, 5.2)
Exeter V40	Trident/Tritanium (Shell)	178	5228	23	47	31	77	2.9 (2.4, 3.4)	3.8 (3.3, 4.5)	6.5 (4.8, 8.7)
MS 30	Low Profile Cup	18	414	6	1	9	2	1.3 (0.6, 3.2)	3.2 (1.7, 6.0)	6.3 (3.5, 11.3)
Polarstem	R3	698	25057	42	225	106	325	2.8 (2.6, 3.1)	3.7 (3.4, 4.1)	5.1 (4.0, 6.6)
Quadra-H	Versafitcup CC	458	11206	56	214	83	105	3.0 (2.7, 3.4)	4.8 (4.3, 5.3)	8.1 (6.6, 9.9)
S-Rom	PINNACLE	170	2689	18	94	16	42	4.4 (3.7, 5.3)	5.7 (4.9, 6.7)	6.8 (5.8, 8.0)
SL-Plus	R3	106	1700	8	28	25	45	4.2 (3.3, 5.3)	5.9 (4.9, 7.2)	7.3 (6.0, 8.9)
Secur-Fit	Trident (Shell)	573	9913	48	252	108	165	3.6 (3.2, 4.0)	4.8 (4.4, 5.3)	6.5 (6.0, 7.1)
Secur-Fit Plus	Trident (Shell)	100	2984	9	34	24	33	2.3 (1.8, 2.9)	3.2 (2.6, 4.0)	4.2 (3.4, 5.2)
Spectron EF	R3	109	2184	20	24	21	44	3.8 (3.1, 4.7)	5.1 (4.1, 6.2)	6.8 (5.5, 8.3)
Spectron EF	Reflection (Cup)	128	1406	50	12	57	9	2.9 (2.1, 4.0)	7.2 (5.8, 8.9)	12.8 (10.7, 15.2)
Synergy	R3	206	5571	6	57	49	94	2.8 (2.4, 3.3)	3.5 (3.1, 4.1)	4.9 (4.2, 5.7)
TOTAL		9502	252640	1093	3375	1492	3542			

Note: Only prostheses with >350 procedures have been listed.

Green: prosthesis combination qualifies for a superiority benchmark.

Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Table BM6 Cumulative Percent Revision of Primary Total Knee Replacement Prosthesis Combinations with 15 Year Data (Primary Diagnosis OA)

Femoral Component	Tibial Component	N Revised	N Total	Type of Revision				5 Yrs	10 Yrs	15 Yrs
				TKR	Femoral	Tibial	Other			
Active Knee	Active Knee	988	11363	301	30	43	614	4.5 (4.1, 4.9)	7.7 (7.2, 8.3)	11.1 (10.4, 11.8)
BalanSys	BalanSys	163	5293	55	9	10	89	2.5 (2.1, 2.9)	3.8 (3.2, 4.4)	4.7 (3.7, 5.9)
Columbus	Columbus	317	9207	86	14	17	200	3.7 (3.3, 4.2)	5.8 (5.0, 6.8)	7.9 (6.5, 9.6)
E.Motion	E.Motion	80	1041	24	9	4	43	6.4 (5.1, 8.2)	8.5 (6.8, 10.5)	8.5 (6.8, 10.5)
Genesis II CR	Genesis II	1366	26966	302	79	58	927	3.4 (3.2, 3.7)	5.0 (4.7, 5.3)	6.1 (5.7, 6.4)
Genesis II Oxinium CR (ctd)	Genesis II	739	11740	148	38	28	525	3.5 (3.2, 3.9)	5.9 (5.5, 6.4)	8.3 (7.7, 9.0)
Genesis II Oxinium PS (ctd)	Genesis II	1664	23143	268	37	181	1178	4.8 (4.6, 5.1)	7.0 (6.6, 7.3)	9.2 (8.7, 9.7)
Genesis II PS	Genesis II	1049	21165	192	34	62	761	3.5 (3.3, 3.8)	4.9 (4.6, 5.2)	6.2 (5.8, 6.6)
LCS CR	LCS	645	8351	263	24	90	268	4.5 (4.0, 4.9)	6.4 (5.9, 7.0)	8.1 (7.5, 8.8)
Legion CR	Genesis II	412	10940	87	30	16	279	3.7 (3.3, 4.1)	5.2 (4.7, 5.8)	7.2 (6.1, 8.4)
Legion Oxinium CR	Genesis II	414	13911	103	32	12	267	3.1 (2.8, 3.4)	4.3 (3.8, 4.8)	5.3 (4.6, 6.2)
Legion Oxinium PS	Genesis II	896	20419	140	24	71	661	3.7 (3.4, 4.0)	5.2 (4.8, 5.5)	7.3 (6.6, 8.1)
Legion PS	Genesis II	251	6572	65	5	13	168	3.1 (2.7, 3.6)	4.2 (3.7, 4.8)	5.9 (4.9, 7.2)
Nexgen LCCK	Nexgen	60	985	12	3	1	44	4.7 (3.5, 6.3)	6.1 (4.6, 8.0)	8.9 (6.4, 12.2)
Nexgen LPS Flex	Nexgen	1586	31637	474	66	217	829	3.2 (3.0, 3.4)	4.9 (4.6, 5.1)	6.3 (6.0, 6.7)
Score	Score	484	6803	203	24	12	245	5.6 (5.0, 6.2)	8.7 (7.9, 9.5)	10.7 (9.7, 11.9)
Triathlon CR	Triathlon	4203	160652	863	168	189	2983	2.3 (2.2, 2.4)	3.4 (3.3, 3.5)	4.7 (4.5, 4.8)
Triathlon PS	Triathlon	732	15750	151	38	86	457	3.7 (3.4, 4.1)	5.2 (4.9, 5.6)	6.4 (5.9, 6.9)
Vanguard CR	Vanguard	1313	27181	346	47	72	848	2.9 (2.7, 3.1)	4.6 (4.3, 4.9)	7.0 (6.6, 7.5)
TOTAL		17362	413119	4083	711	1182	11386			

Note: Only prostheses with >350 procedures have been listed.

■ Green: prosthesis combination qualifies for a superiority benchmark.

■ Blue: prosthesis combination qualifies for non-inferiority benchmark.

Restricted to modern prostheses



Ten, Fifteen and Twenty Year Prosthesis Outcomes

Twenty Year Outcomes

The Registry is able to report 20-year outcomes for 8 hip and 8 knee prosthesis combinations. A combination is included if >350 procedures have been reported to the Registry, the follow-up period is ≥20 years, and the prosthesis is still used, with the exception of those eligible prostheses where a single surgeon performed more than 50% of procedures.

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

HIP REPLACEMENT

The 8 listed prosthesis combinations have been used in 38.5% of all primary total conventional hip replacement procedures performed for osteoarthritis. The 20-year cumulative percent revision ranges from 6.2% to 25.7% (Table BM7).

KNEE REPLACEMENT

The 8 listed prosthesis combinations were used in 40.2% of all primary total knee replacement procedures performed for osteoarthritis. The 20-year cumulative percent revision ranges from 7.0% to 14.1% (Table BM7).

Table BM7 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Prosthesis Combinations with 20 Year Data (Primary Diagnosis OA)

Femoral Component	Acetabular Component	N Revised	N Total	Type of Revision				10 Yrs	15 Yrs	20 Yrs
				THR	Femoral	Acetabular	Other			
CORAIL	PINNACLE	2699	66053	253	1037	393	1016	4.4 (4.2, 4.6)	6.9 (6.6, 7.2)	8.5 (7.7, 9.4)
CPCS	Reflection (Cup)	92	876	29	7	43	13	8.0 (6.1, 10.5)	17.0 (13.6, 21.2)	25.7 (20.4, 32.2)
CPCS	Reflection (Shell)	119	2845	18	49	15	37	3.2 (2.5, 3.9)	5.2 (4.2, 6.4)	8.8 (6.8, 11.4)
CPT	ZCA	47	869	17	11	11	8	4.8 (3.4, 6.6)	6.3 (4.5, 8.7)	9.8 (6.9, 13.9)
Exeter V40	Trident (Shell)	2715	85726	382	909	321	1103	3.5 (3.4, 3.7)	4.9 (4.7, 5.2)	6.2 (5.9, 6.6)
S-Rom	PINNACLE	170	2689	18	94	16	42	5.7 (4.9, 6.7)	6.8 (5.8, 8.0)	9.1 (7.2, 11.4)
Secur-Fit	Trident (Shell)	573	9913	48	252	108	165	4.8 (4.4, 5.3)	6.5 (6.0, 7.1)	8.2 (7.4, 9.0)
Spectron EF	Reflection (Cup)	128	1406	50	12	57	9	7.2 (5.8, 8.9)	12.8 (10.7, 15.2)	15.3 (12.7, 18.5)
TOTAL		6543	170377	815	2371	964	2393			

Note: Restricted to modern prostheses

Table BM8 Cumulative Percent Revision of Primary Total Knee Replacement Combinations with 20 Year Data (Primary Diagnosis OA)

Femoral Component	Tibial Component	N Revised	N Total	Type of Revision				10 Yrs	15 Yrs	20 Yrs
				TKR	Femoral	Tibial	Other			
Active Knee	Active Knee	988	11363	301	30	43	614	7.7 (7.2, 8.3)	11.1 (10.4, 11.8)	14.1 (13.2, 15.2)
Genesis II CR	Genesis II	1366	26966	302	79	58	927	5.0 (4.7, 5.3)	6.1 (5.7, 6.4)	7.4 (6.9, 8.0)
Genesis II Oxinium CR (ctd)	Genesis II	739	11740	148	38	28	525	5.9 (5.5, 6.4)	8.3 (7.7, 9.0)	10.9 (10.0, 11.9)
Genesis II Oxinium PS (ctd)	Genesis II	1664	23143	268	37	181	1178	7.0 (6.6, 7.3)	9.2 (8.7, 9.7)	11.9 (11.1, 12.9)
Genesis II PS	Genesis II	1049	21165	192	34	62	761	4.9 (4.6, 5.2)	6.2 (5.8, 6.6)	7.4 (6.8, 8.1)
LCS CR	LCS	645	8351	263	24	90	268	6.4 (5.9, 7.0)	8.1 (7.5, 8.8)	9.3 (8.6, 10.1)
Nexgen LPS Flex	Nexgen	1586	31637	474	66	217	829	4.9 (4.6, 5.1)	6.3 (6.0, 6.7)	8.0 (7.3, 8.7)
Triathlon CR	Triathlon	4203	160652	863	168	189	2983	3.4 (3.3, 3.5)	4.7 (4.5, 4.8)	7.0 (6.1, 8.2)
TOTAL		12240	295017	2811	476	868	8085			

Note: Restricted to modern prostheses. CR 'cruciate retaining' refers to minimally stabilised





Modelling the Lifetime Risk of Revision



Modelling the Lifetime Risk of Revision

Introduction

Joint replacement has revolutionised the treatment of end stage arthritic disease throughout the world, to the great benefit of our communities. The current successful status of joint replacement is multifactorial but has been significantly contributed to by ongoing pressure from national joint replacement registries to identify better performing devices, techniques and technologies. Surgeons thereby have the information on which to make sound choices regarding the treatment of their patients. Patients also have contemporaneous information available on which to make informed decisions regarding their care.

Joint replacement, however, was not an “overnight success”, and the early days of development saw many devices that had high failure rates. Material science advances, design optimisation, improvements in surgical technique, and perioperative management have all incrementally occurred. Current generation joint replacement systems have superior long-term performance compared to devices used in the latter part of the 20th century. As such, joint replacement is no longer a procedure offered preferentially to older age groups but can be offered to younger patients with a reasonable expectation of good longer-term outcomes.

For those patients who require joint replacement, it is important to recognise that despite high levels of success associated with these procedures, a joint replacement is a mechanical device. Each joint replacement, particularly those in use for a long period, carries a risk of failure, which may lead to revision surgery.

Therefore, the consideration of an individual’s lifetime risk of requiring revision surgery is an important part of decision making, for both the patient and the treating surgeon. For patients less than 50 years of age who have a longer life expectancy than the average patient, there is a lack of information about implant survival later in their lives, when prosthesis wear becomes a factor.

The concept of the risk of revision surgery over time has previously been considered using large datasets. In 2017, Bayliss et al³ evaluated the effect of patient age at intervention on risk of implant revision following hip or knee replacement. More recently, authors from the Dutch⁴, Scottish⁵ and New Zealand⁶ joint replacement registries have also reported on revision risk for differing age cohorts.

Given the current level of technological sophistication in joint replacement and the maturity of the Australian Orthopaedic Association National Joint Replacement Registry, which has recorded all joint replacement procedures performed in Australia for over 25 years, it is timely to consider the issue of lifetime risk of revision for surgery undertaken in Australia.

Methodology

Accurate estimates of lifetime risk of revision not only utilise complete, accurate revision data but also require accurate mortality data. Therefore, registry data that are directly linked to mortality data sources and have a long follow-up provide an appropriate platform for estimating lifetime risk.⁷

Lifetime risk of revision describes the probability of a revision occurring over the course of a patient’s life, starting from their age at primary joint replacement. Cumulative lifetime risk of revision is calculated by multiplying the probability of being revision-free to over 86 years of age and subtracting this from 1.

While the AOANJRR has collected data for over 25 years, it is important to recognise that the estimation of the risk of revision over patients’ lifetime is a calculation based on the data available and forecasts after this time period has elapsed will be less accurate.

The relative contribution of different revision diagnoses may vary over time. Despite this, estimates of lifetime revision risk can be useful to both clinicians and patients as they offer a straightforward concept that is easier to communicate and interpret than time-dependent incidence rates.⁸

The Kaplan Meier (KM) estimates reported in this annual report are unadjusted and are heavily influenced by the older population (40% in the 66-75 age group), contributing to the data estimates. Whereas lifetime risk takes into account the age of the patient, an important factor in revision risk. Both KM and lifetime risks are estimates – however, they do not test for differences between groups, unlike Hazard Ratios. While informative and useful, they are descriptive in nature. Differences between age cohorts can be assessed by the lack of overlapping confidence intervals.

³ [PMID: 28209371](#)

⁴ [PMID 33478320](#)

⁵ [PMID 36453048](#)

⁶ [PMID: 35094573](#)

⁷ [PMID: 33641431](#)

⁸ [PMID: 33641431](#)



Modelling the Lifetime Risk of Revision

Modelling the Lifetime Risk of Revision – Hip Replacement

Osteoarthritis is the most common diagnosis for hip replacement surgery in Australia. Accordingly, the analysis of lifetime risk of requiring a revision hip replacement is confined to those having their hip replacement for

osteoarthritis. In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 486,293 patients with an average age of 69 years, 54.6% of whom are female. The demographics of this study population are found in Table N1.

Table N1 Summary of Primary Total Conventional Hip Replacement Patients (Primary Diagnosis OA)

Variable		Total Conventional Hip Replacement (n=486,293)
Follow Up Years	Mean (SD)	6.5 (4.9)
	Median (IQR)	5.5 (2.4, 9.5)
	Minimum	0
	Maximum	25.9
Age	Mean (SD)	69 (9.7)
	Median (IQR)	69 (62, 76)
Age Group	<55	39,863 (8.2%)
	55-64	117,142 (24.1%)
	65-74	178,420 (36.7%)
	≥75	150,868 (31%)
Sex	Male	220,827 (45.4%)
	Female	265,466 (54.6%)
BMI ¹	Underweight (<18.5)	2,591 (0.7%)
	Normal (18.5-24.9)	71,942 (20.6%)
	Pre Obese (25.0-29.9)	127,568 (36.6%)
	Obese Class 1 (30.0-34.9)	89,934 (25.8%)
	Obese Class 2 (35.0-39.9)	38,369 (11%)
	Obese Class 3 (≥40.0)	18,199 (5.2%)
Obesity	Obese	146,502 (42%)
	Not Obese	202,101 (58%)
ASA Score ²	1	27,089 (7%)
	2	205,841 (53.1%)
	3	149,531 (38.6%)
	4	5,257 (1.4%)
	5	28 (0%)
Femoral Fixation	Cementless	296,049 (60.9%)
	Cemented	190,244 (39.1%)
Fixation	Cemented	11,736 (2.4%)
	Cementless	295,643 (60.8%)
	Hybrid (Femur Cemented)	178,508 (36.7%)
	Reverse Hybrid (Femur Cementless)	406 (0.1%)
Polyethylene Type ³	Non XLPE	12,088 (2.9%)
	XLPE	400,673 (97.1%)

Abbreviations: SD - standard deviation, IQR - interquartile range, BMI - Body Mass Index (kg/m²), ASA - American Society of Anesthesiologists

¹Excludes 137,690 procedures with unknown BMI

²Excludes 98,547 procedures with unknown ASA Score

³Excludes 73,532 procedures with unknown polyethylene type



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE

The risk of requiring revision surgery post hip replacement is related to the life expectancy of that patient. The proportions of patients having primary hip replacement for osteoarthritis in 5 yearly cohorts, together with the proportions of mortality and revision surgery during the study period are shown in Table N2. The 10, 15 and 20 year revision-free survival estimates for each 5 year age cohort are shown in Table N3.

The proportion of patients less than 50 years of age who undergo hip replacement surgery is low; however, their longer life expectancy places them at a higher lifetime risk of revision surgery. Conversely, while the proportion of patients over 85 years of age who undergo hip replacement is also low, their shorter life expectancy means that in this group the risk of revision surgery is very low. The percentage lifetime risk of revision for patients undergoing primary conventional total hip replacement for osteoarthritis is shown in Table N4 and in Figure N1.

Table N2 Characteristics of Primary Total Conventional Hip Replacement Patients at the Time of the Primary Procedure* (Primary Diagnosis OA)

Age Group (years)	Total, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	15990	6.27 (2.84, 10.46)	520 (3.25%)	677 (4.23%)
51-55	31638	6.22 (2.65, 10.52)	1244 (3.93%)	1196 (3.78%)
56-60	51935	6.23 (2.78, 10.49)	2892 (5.57%)	1867 (3.59%)
61-65	73708	6.06 (2.61, 10.47)	5822 (7.9%)	2464 (3.34%)
66-70	88851	5.95 (2.59, 10.1)	10659 (12%)	2914 (3.28%)
71-75	90854	5.4 (2.43, 9.33)	16250 (17.89%)	2811 (3.09%)
76-80	73088	4.98 (2.17, 8.72)	19368 (26.5%)	2227 (3.05%)
81-85	42055	4.68 (2.17, 7.86)	15958 (37.95%)	1252 (2.98%)
86+	18174	4.06 (1.9, 6.66)	8944 (49.21%)	450 (2.48%)

Note: Restricted to modern prostheses. *This includes 83,613 bilateral procedures, which were a median of 1.90 (0.59, 4.81) years apart

Table N3 Revision-Free Survival (95% CI) Estimates after Primary Total Conventional Hip Replacement by Revision Free Years (Primary Diagnosis OA)

Age Group (years)	10 Years	15 Years	20 Years
46-50	95.2 (94.8, 95.6)	92.5 (91.7, 93.2)	90.5 (89.1, 91.7)
51-55	95.5 (95.2, 95.7)	93.5 (93.0, 93.9)	91.1 (90.2, 91.9)
56-60	95.9 (95.6, 96.1)	94.0 (93.7, 94.4)	91.4 (90.6, 92.0)
61-65	96.0 (95.8, 96.2)	94.2 (93.9, 94.5)	92.6 (92.0, 93.1)
66-70	96.0 (95.8, 96.2)	94.2 (93.9, 94.4)	92.7 (92.2, 93.2)
71-75	96.0 (95.9, 96.2)	94.3 (94.0, 94.6)	93.2 (92.7, 93.7)
76-80	95.9 (95.7, 96.1)	94.5 (94.1, 94.8)	93.7 (93.1, 94.3)
81-85	95.9 (95.6, 96.1)	94.4 (93.8, 95.0)	94.1 (93.1, 94.9)
86+	96.4 (95.9, 96.8)	95.3 (94.2, 96.2)	95.3 (94.2, 96.2)

Note: Restricted to modern prostheses



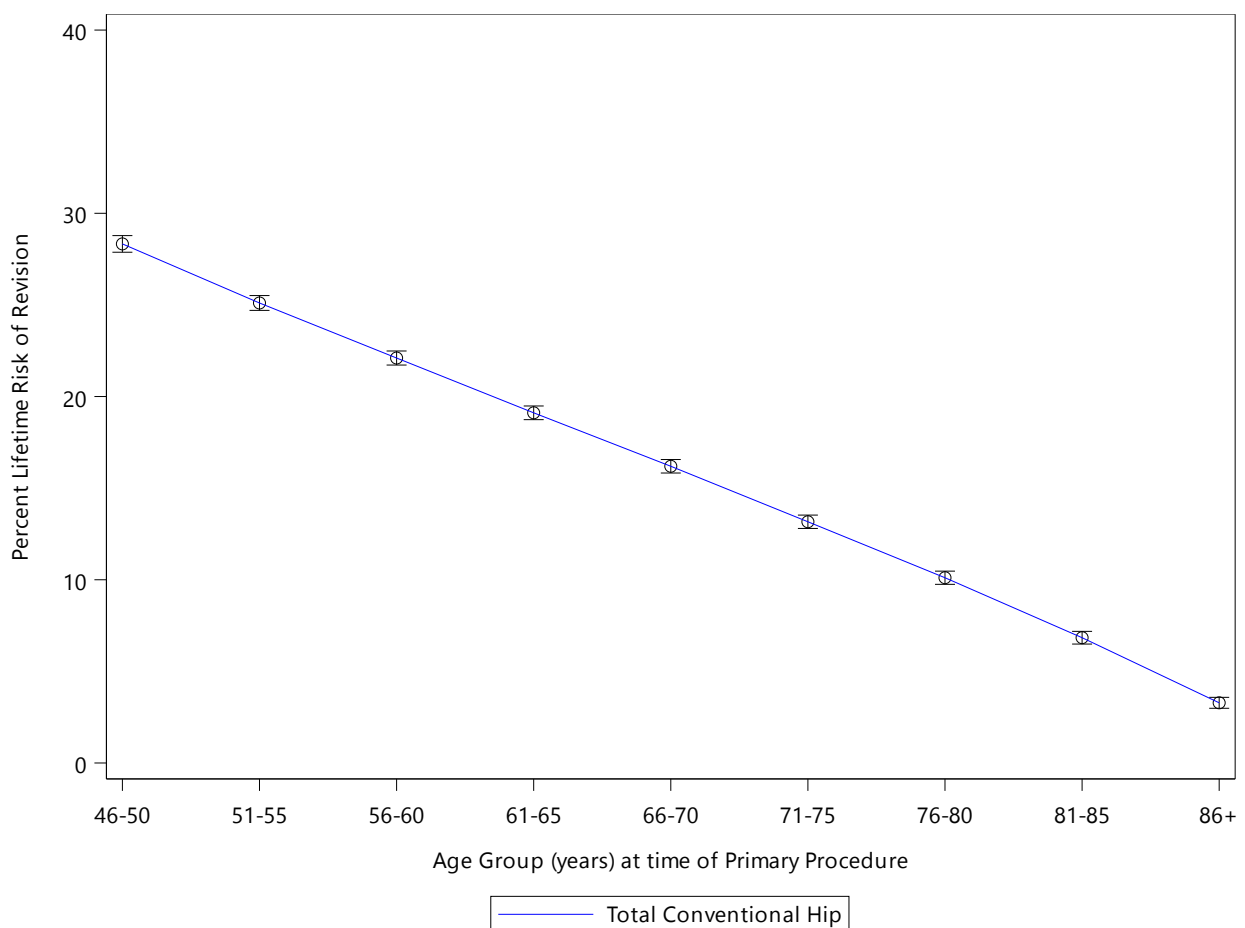
Modelling the Lifetime Risk of Revision

Table N4 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)
46-50	28.33 (27.87, 28.78)
51-55	25.11 (24.7, 25.51)
56-60	22.1 (21.72, 22.48)
61-65	19.11 (18.74, 19.48)
66-70	16.19 (15.83, 16.56)
71-75	13.16 (12.8, 13.53)
76-80	10.11 (9.75, 10.47)
81-85	6.84 (6.49, 7.18)
86+	3.28 (2.99, 3.58)

Note: Restricted to modern prostheses

Figure N1 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE AND SEX

The number of patients having primary conventional hip replacement for osteoarthritis in 5 yearly cohorts, together with the proportions of mortality and revision surgery during the study period for males and females, are shown in Table N5 and Table N6, respectively.

The percentage of lifetime risk of revision after primary conventional hip replacement for osteoarthritis in each 5 year age cohort for males and females is shown in Table N7. In all age groups, males have a higher lifetime risk of revision surgery than females (Figure N2).

Table N5 Characteristics of Male Primary Total Conventional Hip Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Males, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	9060	6.34 (2.94, 10.33)	317 (3.5%)	361 (3.98%)
51-55	17259	6.17 (2.68, 10.22)	756 (4.38%)	632 (3.66%)
56-60	27087	6.07 (2.74, 10.17)	1742 (6.43%)	950 (3.51%)
61-65	35853	5.88 (2.54, 10.29)	3264 (9.1%)	1201 (3.35%)
66-70	40202	5.88 (2.54, 9.95)	5719 (14.23%)	1346 (3.35%)
71-75	39020	5.32 (2.43, 9.13)	8100 (20.76%)	1331 (3.41%)
76-80	29928	4.79 (2.1, 8.27)	8866 (29.62%)	984 (3.29%)
81-85	16011	4.32 (2, 7.28)	6495 (40.57%)	540 (3.37%)
86+	6407	3.55 (1.71, 5.94)	3243 (50.62%)	184 (2.87%)

Note: Restricted to modern prostheses

Table N6 Characteristics of Female Primary Total Conventional Hip Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Females, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	6930	6.19 (2.7, 10.67)	203 (2.93%)	316 (4.56%)
51-55	14379	6.34 (2.61, 10.89)	488 (3.39%)	564 (3.92%)
56-60	24848	6.45 (2.82, 10.87)	1150 (4.63%)	917 (3.69%)
61-65	37855	6.16 (2.67, 10.68)	2558 (6.76%)	1263 (3.34%)
66-70	48649	6.04 (2.63, 10.19)	4940 (10.15%)	1568 (3.22%)
71-75	51834	5.46 (2.41, 9.5)	8150 (15.72%)	1480 (2.86%)
76-80	43160	5.16 (2.21, 9.1)	10502 (24.33%)	1243 (2.88%)
81-85	26044	4.92 (2.28, 8.25)	9463 (36.33%)	712 (2.73%)
86+	11767	4.36 (2.06, 7.04)	5701 (48.45%)	266 (2.26%)

Note: Restricted to modern prostheses



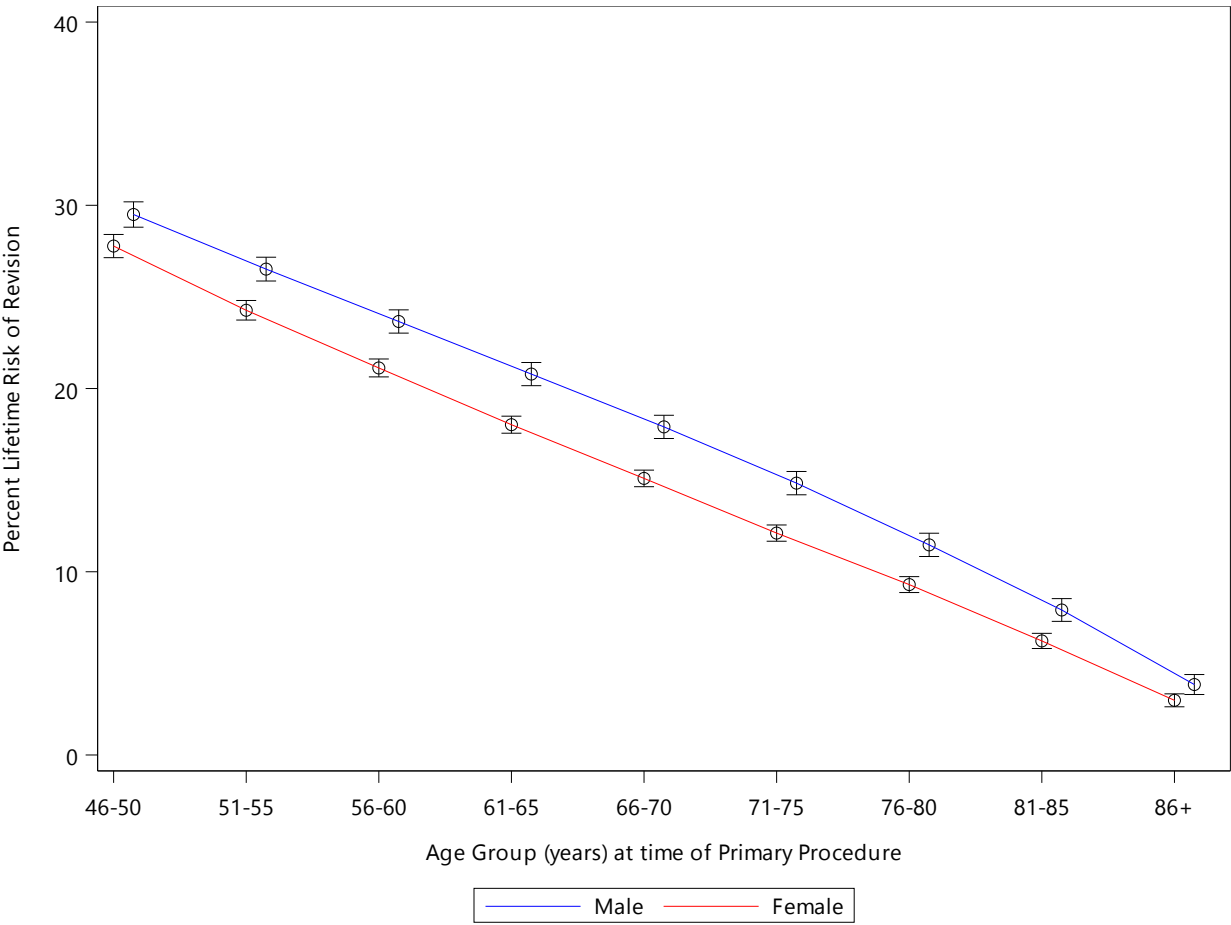
Modelling the Lifetime Risk of Revision

Table N7 **Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Sex**

Age Group (years)	Total, % (95% CI)	Male, % (95% CI)	Female, % (95% CI)
46-50	28.33 (27.87, 28.78)	29.5 (28.8, 30.19)	27.77 (27.14, 28.41)
51-55	25.11 (24.7, 25.51)	26.52 (25.87, 27.17)	24.27 (23.74, 24.8)
56-60	22.1 (21.72, 22.48)	23.66 (23.02, 24.29)	21.12 (20.63, 21.61)
61-65	19.11 (18.74, 19.48)	20.79 (20.16, 21.42)	18.03 (17.56, 18.49)
66-70	16.19 (15.83, 16.56)	17.91 (17.27, 18.54)	15.09 (14.64, 15.55)
71-75	13.16 (12.8, 13.53)	14.84 (14.2, 15.47)	12.11 (11.67, 12.55)
76-80	10.11 (9.75, 10.47)	11.47 (10.83, 12.1)	9.3 (8.86, 9.73)
81-85	6.84 (6.49, 7.18)	7.91 (7.29, 8.53)	6.22 (5.81, 6.64)
86+	3.28 (2.99, 3.58)	3.84 (3.3, 4.39)	2.98 (2.63, 3.34)

Note: Restricted to modern prostheses

Figure N2 **Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Sex (Primary Diagnosis OA)**



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO ASA SCORE

The AOANJRR has collected ASA score data for patients having joint replacement surgery since 2012, and therefore the lifetime risk of revision analysis according to ASA is based on this cohort with a maximum 13 year follow-up. The percentage lifetime revision risk for patients in each 5 year cohort having their primary joint replacement according to ASA score is shown in Table N8 and Figure N3.

The number of patients in each ASA score for each 5 year age cohort is shown in Table N9.

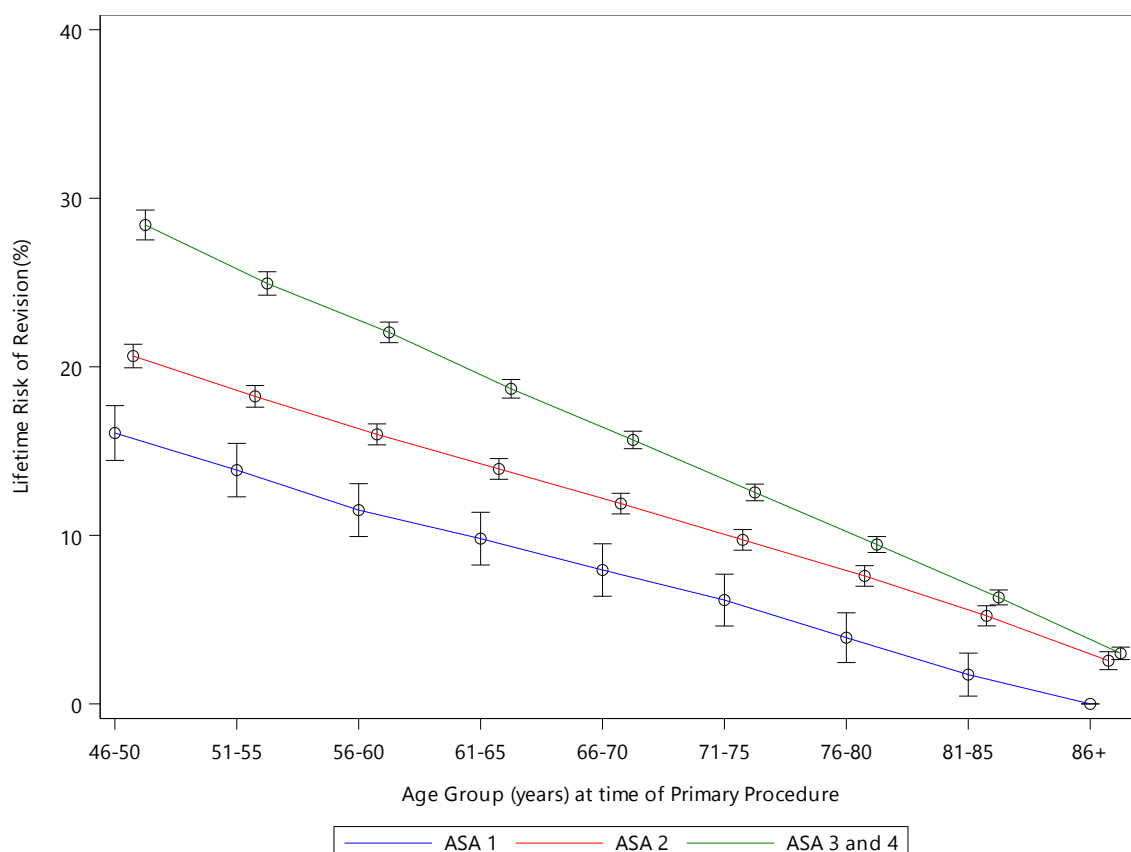
In each age cohort, patients having their primary joint replacement who have an ASA score greater than one have a higher lifetime risk of revision. This lifetime risk gradually reduces with older age groups.

Table N8 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement Since 2012 by ASA Score (Primary Diagnosis OA)

Age Group (years)	ASA 1, % (95% CI)	ASA 2, % (95% CI)	ASA 3 and 4, % (95% CI)
46-50	16.07 (14.45, 17.7)	20.64 (19.94, 21.34)	28.41 (27.53, 29.3)
51-55	13.87 (12.29, 15.46)	18.25 (17.6, 18.89)	24.94 (24.25, 25.64)
56-60	11.5 (9.93, 13.06)	15.99 (15.37, 16.61)	22.04 (21.43, 22.65)
61-65	9.8 (8.24, 11.37)	13.94 (13.33, 14.55)	18.69 (18.14, 19.25)
66-70	7.94 (6.39, 9.5)	11.88 (11.27, 12.5)	15.66 (15.14, 16.18)
71-75	6.16 (4.62, 7.7)	9.73 (9.12, 10.34)	12.55 (12.05, 13.04)
76-80	3.93 (2.45, 5.4)	7.59 (6.98, 8.2)	9.46 (8.98, 9.93)
81-85	1.74 (0.46, 3.01)	5.22 (4.63, 5.82)	6.32 (5.87, 6.76)
86+	0 (0, 0)	2.56 (2.03, 3.09)	3 (2.63, 3.37)

Note: Restricted to modern prostheses

Figure N3 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement Since 2012 by ASA Score (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N9 Number of Primary Total Conventional Hip Replacement by Age and ASA Score (Primary Diagnosis OA)

Age Group (years)	ASA 1, N	ASA 2, N	ASA 3 & 4, N
46-50	2784	7398	2824
51-55	4229	15248	6213
56-60	5472	25081	11020
61-65	5437	35058	18141
66-70	4379	41570	25347
71-75	2874	38724	31360
76-80	1359	26627	29759
81-85	440	12078	20003
86+	113	4053	10115

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO BMI

The AOANJRR has collected body mass index (BMI) data for patients having joint replacement surgery since 2015; therefore, the lifetime risk of revision analysis according to BMI is based on this cohort with a maximum 10 year follow-up. The percentage lifetime revision risk for patients in each BMI category is shown in Table N10. The number of patients in each BMI category for each 5 year age cohort is shown in Table N11.

For patients in all BMI categories, the highest lifetime risk of revision occurs in those who have their primary joint replacement at a younger age, with the risk gradually reducing over time.

For patients having their primary joint replacement in the age cohorts less than 65, on average, lifetime revision risk is highest for those in obese class 3, followed by those in class 1, class 2, normal and pre-obese BMI groups, respectively.

For patients having their joint replacement after 65 years of age, the lifetime risk of revision for those in obese class 3 reduces progressively, becoming less than that of those in obese class 1. This trend of reducing lifetime risk of revision for those patients in obese class 3 having their primary joint replacement continues through each age cohort, with the risk gradually reducing below that of those patients in the normal or underweight BMI group after the 81-85 age cohort. After 65 years of age, in each 5 year age cohort, obese class 1 patients having their primary joint replacement continue to have the highest lifetime revision risk.

The analysis of lifetime revision risk according to BMI may be simplified by dichotomising BMI into obese and not obese groups. This analysis is shown in Table N12 and Figure N4. In all age cohorts, those patients having their primary joint replacement who are obese have a lifetime revision risk that, on average, is at least 50% higher than that of those in the not obese group.

Table N10 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by BMI (Primary Diagnosis OA)

Age Group (years)	Underweight or Normal, % (95% CI)	Pre Obese, % (95% CI)	Obese Class 1, % (95% CI)	Obese Class 2, % (95% CI)	Obese Class 3, % (95% CI)
46-50	18.67 (17.64, 19.69)	19.49 (18.7, 20.28)	22.29 (21.26, 23.33)	26.83 (25.05, 28.62)	36.5 (33.03, 39.98)
51-55	16.42 (15.57, 17.28)	17.34 (16.64, 18.03)	20.15 (19.19, 21.1)	23.92 (22.22, 25.63)	32.8 (29.27, 36.32)
56-60	14.31 (13.56, 15.07)	15.35 (14.7, 15.99)	18.28 (17.36, 19.21)	21.45 (19.76, 23.14)	29.34 (25.7, 32.98)
61-65	12.42 (11.71, 13.12)	13.56 (12.94, 14.18)	16.05 (15.14, 16.97)	18.56 (16.86, 20.26)	25.75 (21.98, 29.53)
66-70	10.8 (10.12, 11.47)	11.71 (11.1, 12.31)	13.69 (12.78, 14.6)	15.91 (14.19, 17.63)	22.11 (18.19, 26.03)
71-75	9.04 (8.39, 9.69)	9.69 (9.1, 10.29)	11.31 (10.4, 12.22)	12.95 (11.21, 14.68)	18.13 (14.05, 22.2)
76-80	7.13 (6.51, 7.76)	7.61 (7.03, 8.19)	8.76 (7.85, 9.66)	9.81 (8.05, 11.56)	13.8 (9.57, 18.02)
81-85	5.12 (4.53, 5.7)	5.25 (4.7, 5.81)	6.03 (5.14, 6.92)	6.15 (4.42, 7.89)	9.28 (4.96, 13.59)
86+	2.58 (2.1, 3.07)	2.64 (2.16, 3.12)	2.85 (2.06, 3.63)	2.22 (0.7, 3.74)	4.26 (0.17, 8.34)

Note: Restricted to modern prostheses

Table N11 Number Primary Total Conventional Hip Replacement by Age and BMI (Primary Diagnosis OA)

Age Group (years)	Underweight (<18.5), N	Normal (18.5-24.9), N	Pre Obese (25.0-29.9), N	Obese Class 1 (30.0-34.9), N	Obese Class 2 (35.0-39.9), N	Obese Class 3 (≥40.0), N
46-50	39	1949	3940	3147	1637	936
51-55	98	3628	7661	6235	3300	2049
56-60	185	6217	12719	10461	5045	2909
61-65	297	9374	18234	14437	6866	3547
66-70	385	12002	22879	17276	7786	3660
71-75	458	13514	24782	17454	7005	2930
76-80	477	12196	20546	12837	4524	1531
81-85	374	8367	11764	6071	1780	521
86+	278	4683	5009	1996	422	112

Note: Restricted to modern prostheses



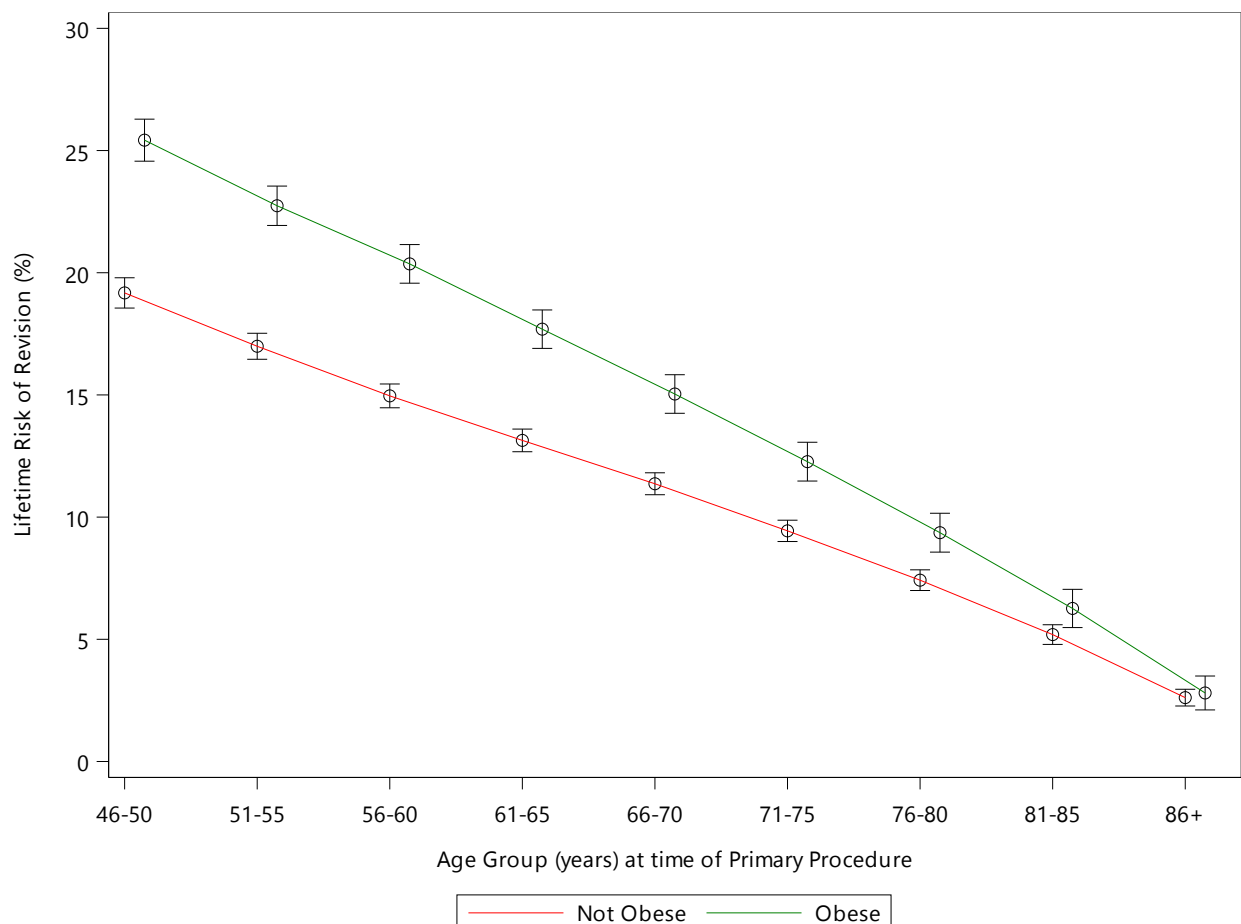
Modelling the Lifetime Risk of Revision

Table N12 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Obesity (Primary Diagnosis OA)

Age Group (years)	Not Obese, % (95% CI)	Obese, % (95% CI)
46-50	19.17 (18.55, 19.79)	25.42 (24.56, 26.28)
51-55	16.99 (16.46, 17.52)	22.74 (21.93, 23.55)
56-60	14.96 (14.47, 15.45)	20.36 (19.57, 21.15)
61-65	13.14 (12.68, 13.6)	17.69 (16.9, 18.48)
66-70	11.36 (10.92, 11.81)	15.04 (14.25, 15.83)
71-75	9.44 (9, 9.87)	12.27 (11.48, 13.06)
76-80	7.42 (7, 7.84)	9.36 (8.57, 10.16)
81-85	5.19 (4.79, 5.6)	6.26 (5.48, 7.04)
86+	2.61 (2.27, 2.96)	2.8 (2.11, 3.5)

Note: Restricted to modern prostheses

Figure N4 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Obesity (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC VERSUS SEPTIC

In 2025, the most common reason for requiring revision surgery after primary conventional hip replacement due to osteoarthritis is infection. Therefore, this analysis considers lifetime revision risk for the diagnosis of infection and aseptic diagnoses (Table N13 and Figure N5).

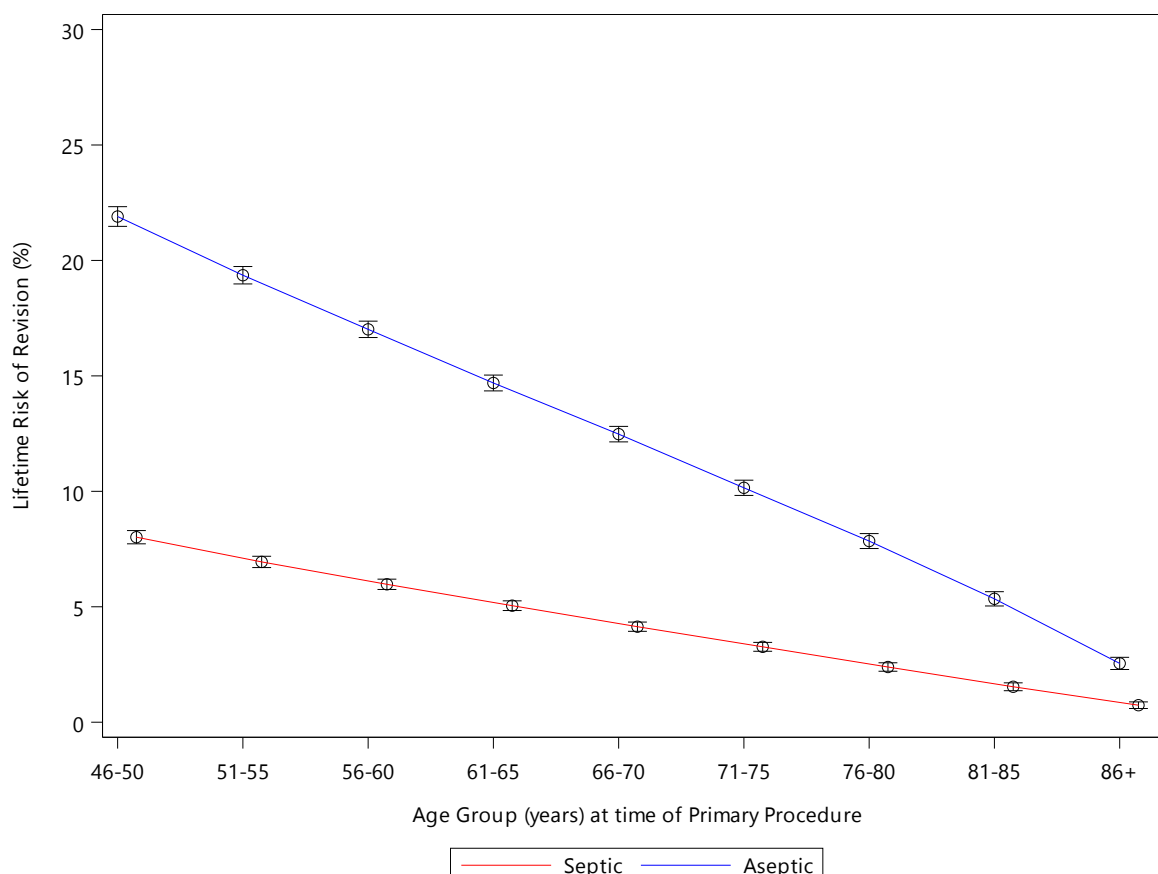
The lifetime risk of revision for infection is highest in the younger cohorts. For patients aged 46-50 years, the risk is 8.01%, and this risk decreases with each age cohort to be under 1% by age 81-85. Likewise, the lifetime risk of revision for aseptic reasons is highest in the younger cohorts, also reducing progressively through each age cohort. The risk of requiring revision surgery for aseptic reasons is higher than the risk of requiring revision surgery for infection.

Table N13 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	8.01 (7.73, 8.3)	21.9 (21.48, 22.33)
51-55	6.94 (6.7, 7.19)	19.36 (18.98, 19.74)
56-60	5.97 (5.75, 6.2)	17.02 (16.66, 17.37)
61-65	5.05 (4.84, 5.26)	14.69 (14.35, 15.03)
66-70	4.14 (3.94, 4.34)	12.48 (12.14, 12.81)
71-75	3.27 (3.07, 3.46)	10.15 (9.82, 10.48)
76-80	2.39 (2.21, 2.57)	7.85 (7.52, 8.17)
81-85	1.54 (1.36, 1.71)	5.34 (5.03, 5.65)
86+	0.74 (0.59, 0.88)	2.55 (2.28, 2.81)

Note: Restricted to modern prostheses

Figure N5 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO SEX AND DIAGNOSIS- ASEPTIC VERSUS SEPTIC

The lifetime risk of revision surgery after primary conventional total hip replacement for osteoarthritis differs according to age, sex and whether the diagnosis for revision is infection (septic) or aseptic reasons. The lifetime risk of revision for males in each 5 year cohort according to the underlying diagnosis is shown in Table N14 and Figure N6.

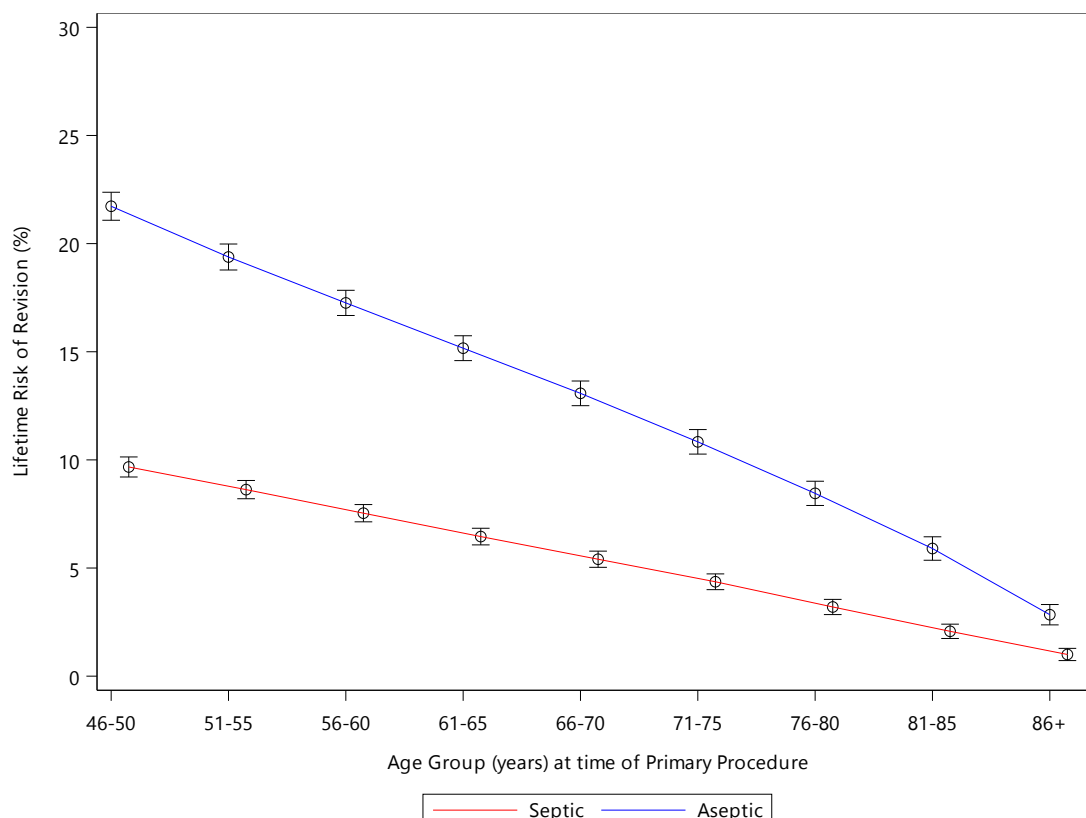
The lifetime risk of revision for females in each 5 year cohort according to the underlying diagnosis is shown in Table N15 and Figure N7. In each age cohort, the risk of revision for infection in males is approximately 50% higher than that for females, with young males at the highest risk. The risk of revision for aseptic reasons for males and females in each age cohort, by contrast, is similar.

Table N14 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	9.67 (9.21, 10.14)	21.73 (21.08, 22.37)
51-55	8.63 (8.2, 9.05)	19.38 (18.78, 19.98)
56-60	7.54 (7.14, 7.93)	17.26 (16.68, 17.84)
61-65	6.45 (6.07, 6.84)	15.16 (14.59, 15.74)
66-70	5.41 (5.03, 5.78)	13.08 (12.51, 13.65)
71-75	4.36 (4, 4.73)	10.83 (10.27, 11.4)
76-80	3.2 (2.85, 3.55)	8.45 (7.89, 9.01)
81-85	2.07 (1.74, 2.4)	5.9 (5.36, 6.44)
86+	1 (0.72, 1.29)	2.84 (2.37, 3.31)

Note: Restricted to modern prostheses

Figure N6 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

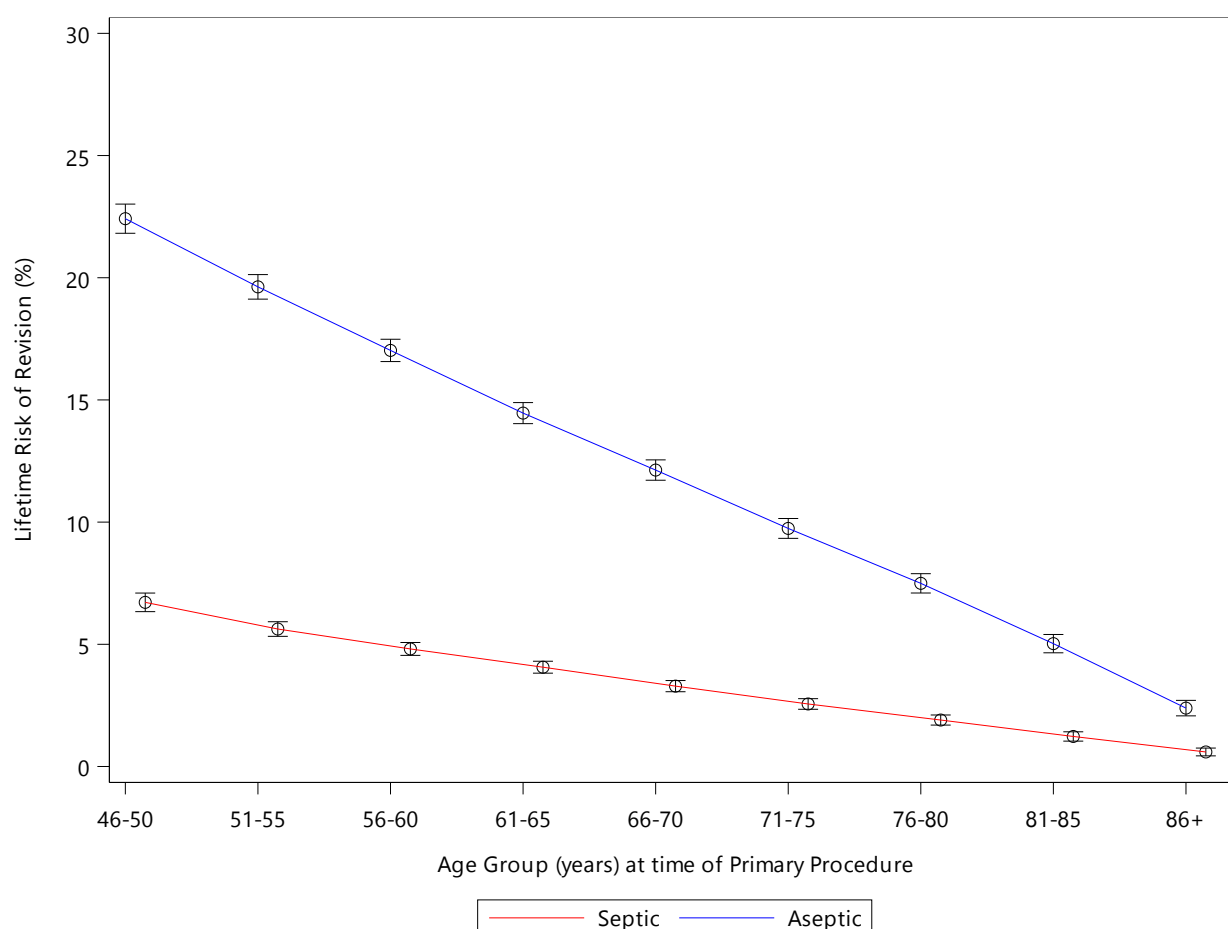
Modelling the Lifetime Risk of Revision

Table N15 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	6.72 (6.34, 7.1)	22.42 (21.82, 23.01)
51-55	5.62 (5.33, 5.92)	19.63 (19.12, 20.13)
56-60	4.81 (4.55, 5.07)	17.03 (16.57, 17.48)
61-65	4.06 (3.82, 4.31)	14.46 (14.03, 14.89)
66-70	3.29 (3.06, 3.52)	12.13 (11.71, 12.55)
71-75	2.56 (2.34, 2.78)	9.74 (9.34, 10.15)
76-80	1.9 (1.69, 2.11)	7.49 (7.1, 7.89)
81-85	1.23 (1.04, 1.42)	5.03 (4.65, 5.4)
86+	0.59 (0.43, 0.75)	2.39 (2.07, 2.71)

Note: Restricted to modern prostheses

Figure N7 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC REASONS

The three most common aseptic diagnoses for revision following primary conventional hip replacement for osteoarthritis are fracture, prosthesis dislocation/instability and loosening.

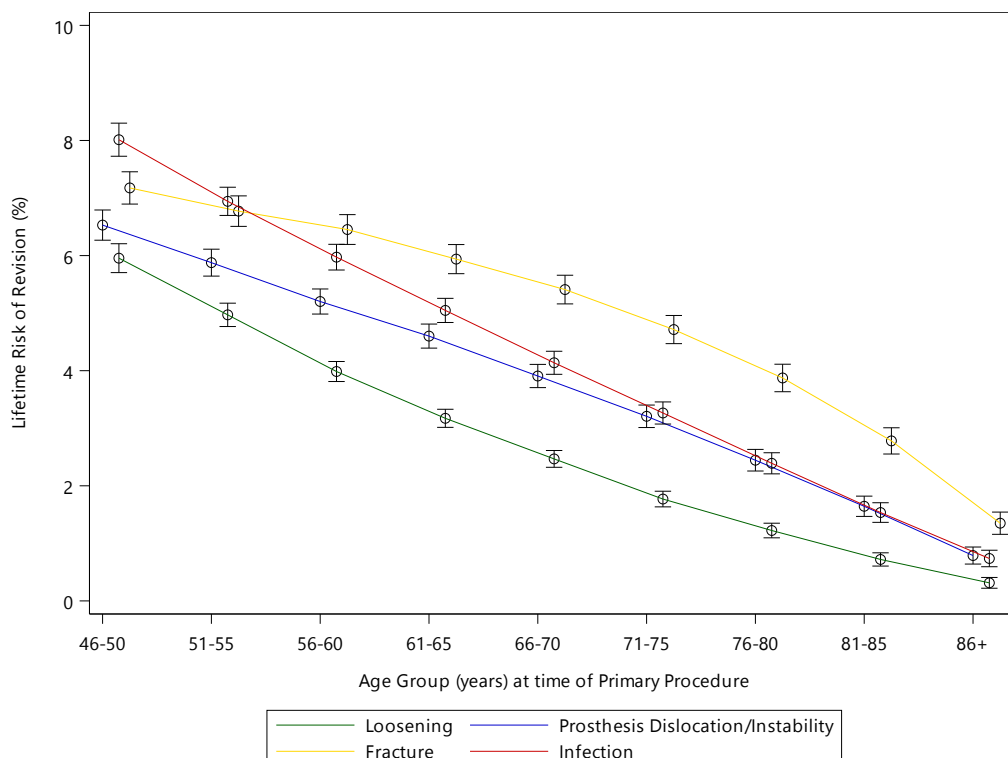
The percentage lifetime risks of revision surgery for each of these reasons post primary conventional hip replacement for osteoarthritis are shown in Table N16 and Figure N8. Revision for infection carries the highest risk in two youngest age cohorts. After 56 years of age, fracture carries the highest risk, followed by infection, prosthesis dislocation/instability and then loosening. For each of these diagnoses, the lifetime risk of revision surgery is highest for the youngest patients and decreases for each age cohort.

Table N16 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Loosening, % (95% CI)	Prosthesis Dislocation/Instability, % (95% CI)	Fracture, % (95% CI)	Infection, % (95% CI)
46-50	5.95 (5.7, 6.21)	6.53 (6.27, 6.79)	7.18 (6.89, 7.46)	8.01 (7.73, 8.3)
51-55	4.97 (4.77, 5.17)	5.88 (5.64, 6.11)	6.77 (6.51, 7.04)	6.94 (6.7, 7.19)
56-60	3.99 (3.81, 4.16)	5.2 (4.98, 5.42)	6.45 (6.19, 6.71)	5.97 (5.75, 6.2)
61-65	3.17 (3.02, 3.33)	4.6 (4.39, 4.81)	5.94 (5.69, 6.19)	5.05 (4.84, 5.26)
66-70	2.47 (2.32, 2.61)	3.91 (3.71, 4.11)	5.41 (5.16, 5.66)	4.14 (3.94, 4.34)
71-75	1.77 (1.63, 1.91)	3.21 (3.01, 3.4)	4.71 (4.47, 4.96)	3.27 (3.07, 3.46)
76-80	1.22 (1.1, 1.35)	2.44 (2.26, 2.63)	3.87 (3.63, 4.11)	2.39 (2.21, 2.57)
81-85	0.72 (0.61, 0.84)	1.64 (1.47, 1.82)	2.78 (2.55, 3.01)	1.54 (1.36, 1.71)
86+	0.31 (0.22, 0.41)	0.79 (0.64, 0.94)	1.35 (1.16, 1.54)	0.74 (0.59, 0.88)

Note: Restricted to modern prostheses

Figure N8 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO POLYETHYLENE TYPE

One of the major advances in joint replacement technology has been the introduction of highly cross-linked polyethylene (XLPE), a bearing material which has markedly reduced wear rates compared to polyethylene that is not highly cross-linked. Landmark studies from the AOANJRR have previously demonstrated reduced revision risks with XLPE compared to non-XLPE.

The percentage lifetime risk of revision for those patients having their primary joint replacement in each 5 year cohort according to polyethylene type is shown in Table N17 and Figure N9. The number of patients in each group for each 5

year age cohort is shown in Table N18. Due to the more frequent use of XLPE, there are few procedures using non-XLPE for analysis.

For age cohorts less than 76, the lifetime risk of revision where XLPE is used as the bearing surface is lower than when non-XLPE is used. This difference is most apparent in the youngest 46-50 year cohort, where hip replacements performed with non-XLPE have an almost 100% higher lifetime risk of revision than those where XLPE is used, which have a less than 31% lifetime risk of revision. For both types of polyethylene, the lifetime risk of revision reduces progressively with older age for surgery.

Table N17 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)

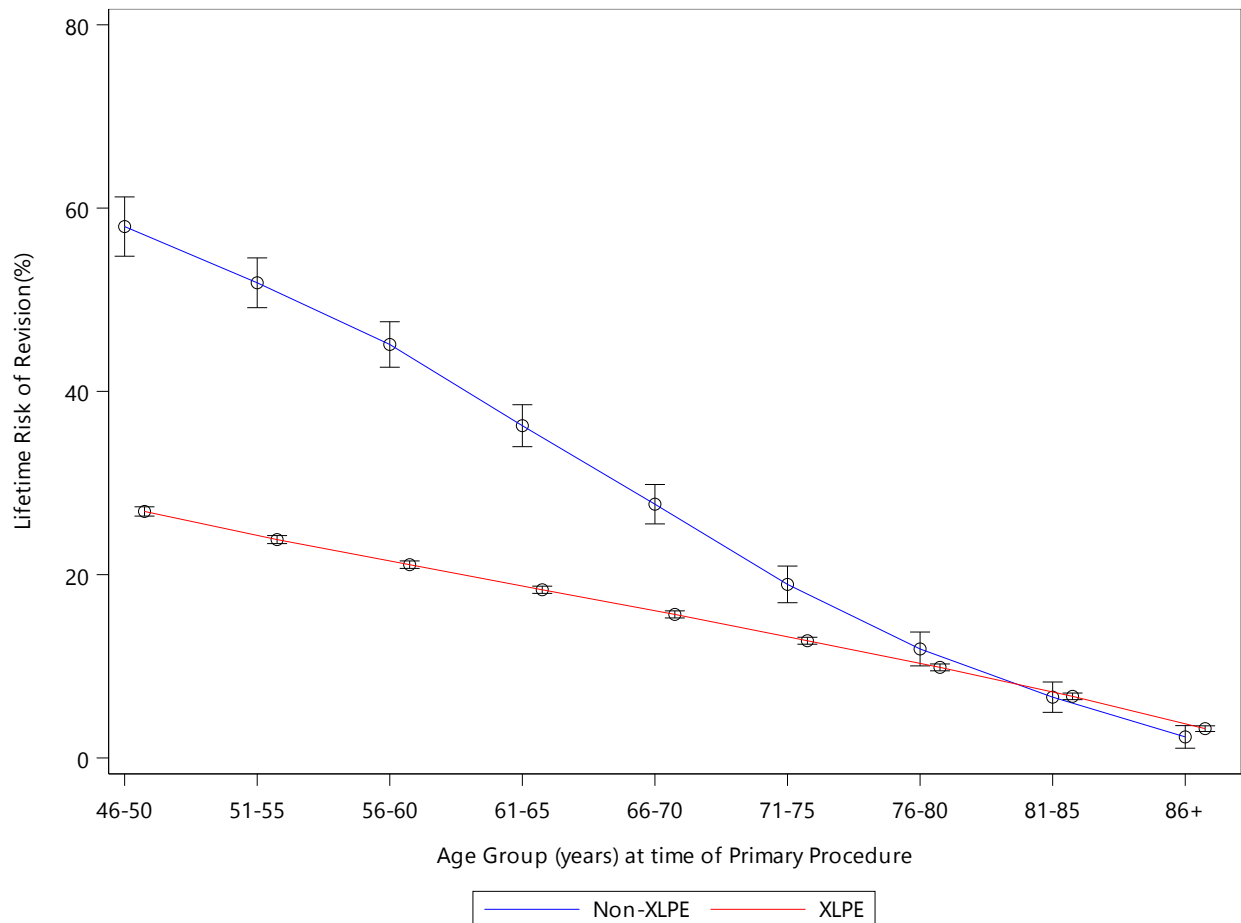
Age Group (years)	Non-XLPE, % (95% CI)	XLPE, % (95% CI)
46-50	57.98 (54.75, 61.22)	26.9 (26.39, 27.4)
51-55	51.85 (49.13, 54.56)	23.83 (23.39, 24.26)
56-60	45.12 (42.64, 47.6)	21.09 (20.68, 21.5)
61-65	36.26 (33.97, 38.54)	18.35 (17.96, 18.74)
66-70	27.69 (25.54, 29.84)	15.66 (15.28, 16.05)
71-75	18.94 (16.94, 20.94)	12.79 (12.41, 13.17)
76-80	11.89 (10.04, 13.74)	9.88 (9.51, 10.26)
81-85	6.63 (4.98, 8.29)	6.72 (6.36, 7.08)
86+	2.29 (1.06, 3.53)	3.2 (2.89, 3.51)

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Figure N9 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table N18 Number of Primary Total Conventional Hip Replacement by Age and Polyethylene Type (Primary Diagnosis OA)

Age Group (years)	Non XLPE, N	XLPE, N
46-50	210	10844
51-55	492	22803
56-60	879	38813
61-65	1410	57805
66-70	1975	73153
71-75	2421	78164
76-80	2355	64758
81-85	1541	37902
86+	805	16431

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO FIXATION

The percentage lifetime risk of revision following primary conventional total hip replacement according to fixation method is shown in Table N19 and Figure N10. The number of patients in this analysis for each 5 year age cohort and for each type of fixation is shown in Table N20.

The use of cementless and hybrid fixation is more common than the use of cemented fixation in all age cohorts.

Cemented fixation has a higher lifetime risk of revision in younger patients. This is most evident in patients younger than 70 years of age. The lifetime revision risk using cemented fixation decreases with each age cohort, and in all age cohorts after 65, cementless fixation has the highest lifetime risk of revision. On average, hybrid fixation has the lowest lifetime risk of revision until the 81-85 age cohort; however, after this time, cemented fixation has the lowest lifetime risk of revision.

Table N19 **Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)**

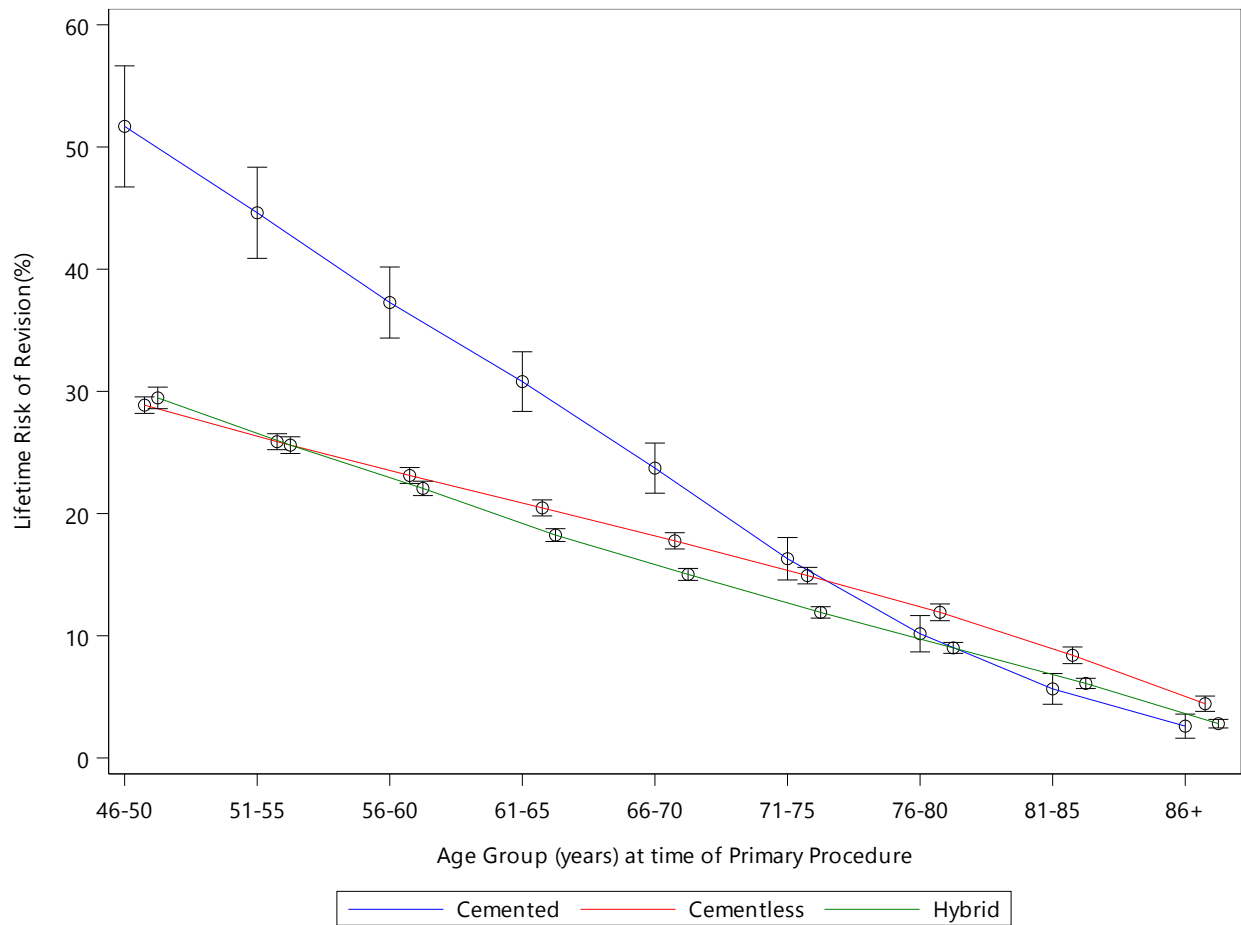
Age Group (years)	Cemented, % (95% CI)	Cementless, % (95% CI)	Hybrid, % (95% CI)
46-50	51.69 (46.73, 56.64)	28.87 (28.2, 29.55)	29.47 (28.58, 30.35)
51-55	44.62 (40.89, 48.34)	25.88 (25.23, 26.53)	25.6 (24.91, 26.28)
56-60	37.27 (34.36, 40.18)	23.12 (22.47, 23.77)	22.06 (21.47, 22.65)
61-65	30.8 (28.36, 33.24)	20.46 (19.81, 21.12)	18.24 (17.71, 18.76)
66-70	23.72 (21.67, 25.77)	17.77 (17.1, 18.43)	15.02 (14.53, 15.51)
71-75	16.3 (14.57, 18.04)	14.92 (14.24, 15.6)	11.91 (11.44, 12.38)
76-80	10.17 (8.68, 11.65)	11.92 (11.23, 12.6)	9.01 (8.56, 9.45)
81-85	5.65 (4.39, 6.91)	8.4 (7.72, 9.08)	6.1 (5.68, 6.52)
86+	2.6 (1.61, 3.59)	4.44 (3.81, 5.06)	2.81 (2.46, 3.15)

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Figure N10 Percent Lifetime Risk of Revision (95% CI) after Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table N20 Number of Primary Total Conventional Hip Replacement by Age and Fixation (Primary Diagnosis OA)

Age Group (years)	Cemented, N	Cementless, N	Hybrid, N
46-50	101	12895	2994
51-55	233	24538	6867
56-60	481	39277	12177
61-65	858	52387	20463
66-70	1506	58263	29082
71-75	2225	52107	36522
76-80	2623	34691	35774
81-85	2275	16087	23693
86+	1434	5398	11342

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Modelling the Lifetime Revision Risk - Unicompartmental Knee Replacement

Osteoarthritis is the most common diagnosis for unicompartmental knee replacement (UKR) in Australia. Accordingly, the analysis of lifetime risk of requiring unicompartmental knee revision is confined to those having their primary UKR for osteoarthritis.

In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 53,322 patients with an average age of 66.1 years, 43.3% of whom are female. The demographics of this study population are found in Table N21.

Table N21 Summary of Primary Unicompartmental Knee Replacement Patients (Primary Diagnosis OA)

Variable		Unicompartmental (n =53,322)
Follow Up Years	Mean (SD)	7.9 (5.9)
	Median (IQR)	6.6 (3, 11.6)
	Minimum	0
	Maximum	26
Age	Mean (SD)	66.1 (9.3)
	Median (IQR)	66 (59, 73)
Age Group	<55	6,210 (11.6%)
	55-64	17,598 (33%)
	65-74	18,916 (35.5%)
	≥75	10,598 (19.9%)
Sex	Male	30,224 (56.7%)
	Female	23,098 (43.3%)
BMI ¹	Underweight (<18.50)	54 (0.2%)
	Normal (18.50-24.99)	4,599 (14.4%)
	Pre Obese (25.00-29.99)	13,016 (40.8%)
	Obese Class 1 (30.00-34.99)	9,725 (30.5%)
	Obese Class 2 (35.00-39.99)	3,381 (10.6%)
	Obese Class 3 (≥40.00)	1,150 (3.6%)
Obesity	Obese	14,256 (44.7%)
	Not Obese	17,669 (55.3%)
ASA Score ²	1	3,477 (9.8%)
	2	21,632 (60.7%)
	3	10,365 (29.1%)
	4	166 (0.5%)
Fixation	Cemented	40,958 (76.8%)
	Cementless	11,519 (21.6%)
	Hybrid (Tibial Cemented)	633 (1.2%)
	Hybrid (Tibial Cementless)	212 (0.4%)

Abbreviations: SD - standard deviation, IQR - interquartile range, BMI - Body Mass Index (kg/m²), ASA - American Society of Anesthesiologists

¹Excludes 21,397 procedures with unknown BMI

²Excludes 17,682 procedures with unknown ASA Score



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE

The risk of requiring revision surgery after UKR is related to the life expectancy of that particular patient. The proportions of patients having primary UKR for osteoarthritis in 5 year cohorts, together with the proportions of mortality and revision surgery during the study period, are shown in Table N22. The 10, 15 and 20 year revision free survival estimates for each 5 year age cohort are shown in Table N23.

Conversely, while the proportion of patients over 85 years of age undergoing UKR is also low, their shorter life expectancy means that in this group the lifetime risk of revision surgery is 4% or less. The percentage lifetime risk of revision for patients undergoing primary UKR for osteoarthritis is shown in Table N23 and Figure N11.

Table N22 Characteristics of Primary Unicompartmental Knee Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Total, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	2330	7.09 (3.2, 12.71)	74 (3.18%)	416 (17.85%)
51-55	5271	6.98 (2.96, 12.5)	203 (3.85%)	871 (16.52%)
56-60	8192	7.37 (3.28, 12.98)	443 (5.41%)	1155 (14.1%)
61-65	10127	7.19 (3.27, 12.85)	875 (8.64%)	1093 (10.79%)
66-70	9970	6.69 (3.12, 11.79)	1345 (13.49%)	956 (9.59%)
71-75	8271	6.16 (2.93, 10.71)	1773 (21.44%)	562 (6.79%)
76-80	5618	5.77 (2.55, 10.17)	1771 (31.52%)	318 (5.66%)
81-85	2670	5.17 (2.51, 8.81)	1112 (41.65%)	99 (3.71%)
86+	873	4.57 (2.07, 7.18)	418 (47.88%)	26 (2.98%)

Note: Restricted to modern prostheses. This includes 9,155 bilateral procedures that were a median of 0.4 (0, 2.7) years apart

Table N23 Revision-Free Survival (95% CI) Estimates after Primary Unicompartmental Knee Replacement by Revision-Free Years (Primary Diagnosis OA)

Age Group (years)	10 Years	15 Years	20 Years
46-50	84.0 (82.0, 85.7)	74.0 (71.2, 76.6)	60.5 (56.3, 64.5)
51-55	84.6 (83.3, 85.8)	74.8 (72.9, 76.5)	62.8 (60.0, 65.4)
56-60	87.4 (86.5, 88.3)	78.1 (76.7, 79.5)	67.3 (65.1, 69.4)
61-65	89.4 (88.6, 90.1)	82.7 (81.5, 83.8)	75.2 (73.4, 77.0)
66-70	89.1 (88.3, 89.8)	83.5 (82.3, 84.6)	78.5 (76.7, 80.2)
71-75	91.5 (90.6, 92.2)	87.7 (86.5, 88.8)	84.5 (82.5, 86.4)
76-80	92.0 (91.0, 92.9)	90.7 (89.5, 91.8)	89.0 (86.5, 91.1)
81-85	94.1 (92.7, 95.3)	94.1 (92.7, 95.3)	90.5 (80.4, 95.5)
86+	96.7 (95.2, 97.8)	96.7 (95.2, 97.8)	-

Note: Restricted to modern prostheses

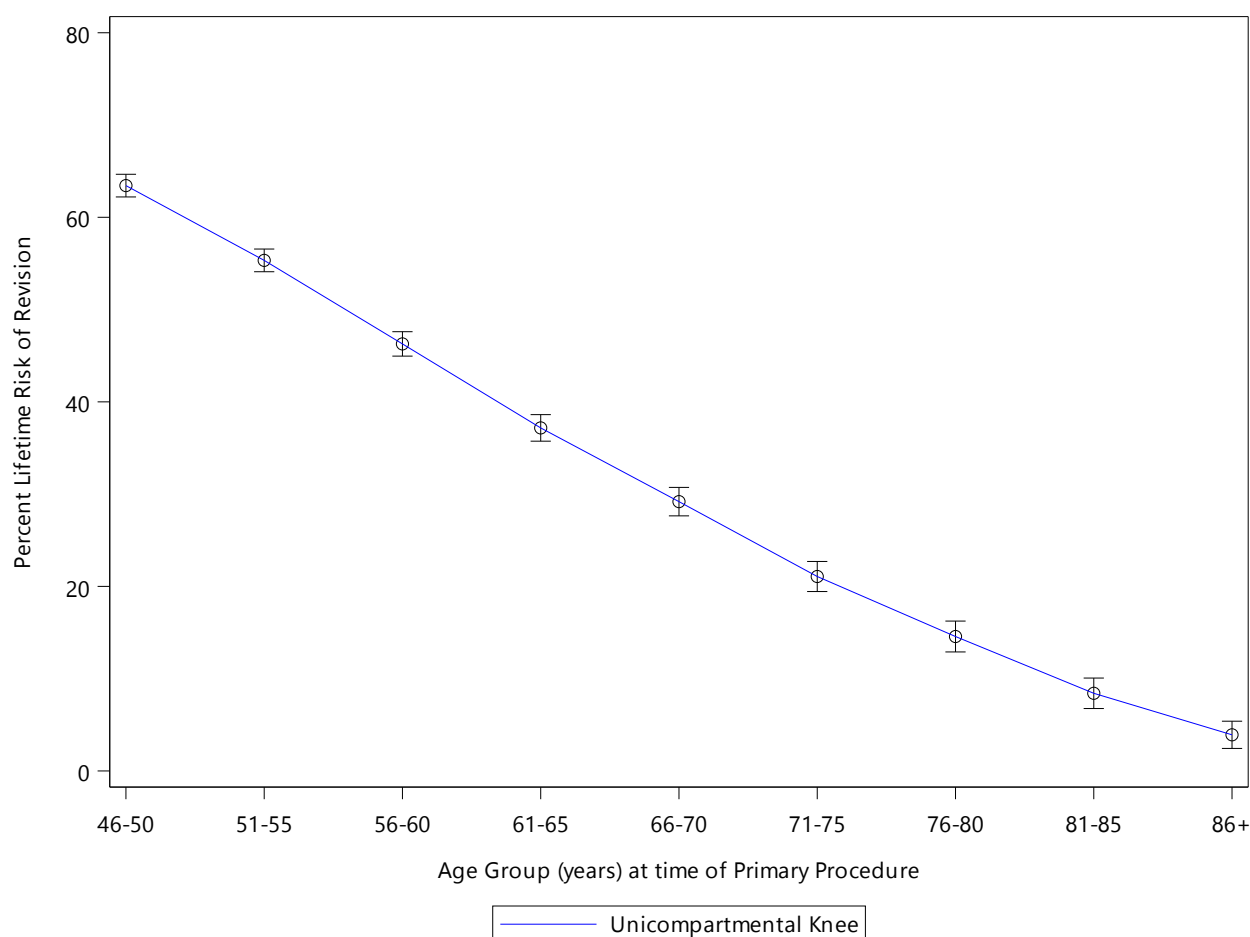
Modelling the Lifetime Risk of Revision

Table N24 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)
46-50	63.43 (62.21, 64.66)
51-55	55.33 (54.1, 56.56)
56-60	46.28 (44.96, 47.6)
61-65	37.17 (35.74, 38.61)
66-70	29.19 (27.65, 30.73)
71-75	21.07 (19.44, 22.7)
76-80	14.57 (12.9, 16.24)
81-85	8.42 (6.76, 10.07)
86+	3.92 (2.44, 5.39)

Note: Restricted to modern prostheses

Figure N11 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE AND SEX

The number of patients having primary UKR for osteoarthritis in 5 year cohorts, together with the proportions of mortality and revision surgery during the study period for males and females, are shown in Table N25 and Table N26, respectively.

The percentage of lifetime risk of revision after primary UKR for osteoarthritis in each 5 year age cohort for males and females is shown in Table N27. Until 80 years of age, females on average have a higher lifetime risk of revision surgery than males, with significant differences from ages 46-75 years (Figure N12).

Table N25 Characteristics of Male Primary Unicompartmental Knee Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Males, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	1079	6.2 (2.95, 11.5)	33 (3.06%)	183 (16.96%)
51-55	2668	6.08 (2.6, 11.15)	99 (3.71%)	388 (14.54%)
56-60	4629	6.86 (2.96, 12.06)	283 (6.11%)	579 (12.51%)
61-65	5963	6.64 (3.04, 12.11)	568 (9.53%)	560 (9.39%)
66-70	5867	6.46 (2.98, 11.38)	886 (15.1%)	476 (8.11%)
71-75	4805	5.84 (2.76, 9.98)	1042 (21.69%)	272 (5.66%)
76-80	3206	5.29 (2.3, 9.44)	1002 (31.25%)	147 (4.59%)
81-85	1509	4.72 (2.36, 8.24)	640 (42.41%)	52 (3.45%)
86+	498	4.23 (1.86, 6.61)	245 (49.2%)	16 (3.21%)

Note: Restricted to modern prostheses

Table N26 Characteristics of Female Primary Unicompartmental Knee Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Females, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	1251	7.82 (3.47, 13.64)	41 (3.28%)	233 (18.63%)
51-55	2603	8.07 (3.52, 13.8)	104 (4%)	483 (18.56%)
56-60	3563	8.2 (3.67, 14.25)	160 (4.49%)	576 (16.17%)
61-65	4164	8.01 (3.74, 13.8)	307 (7.37%)	533 (12.8%)
66-70	4103	7.11 (3.38, 12.42)	459 (11.19%)	480 (11.7%)
71-75	3466	6.81 (3.33, 11.7)	731 (21.09%)	290 (8.37%)
76-80	2412	6.5 (2.91, 11.28)	769 (31.88%)	171 (7.09%)
81-85	1161	5.98 (2.76, 9.73)	472 (40.65%)	47 (4.05%)
86+	375	5.01 (2.12, 7.65)	173 (46.13%)	10 (2.67%)

Note: Restricted to modern prostheses

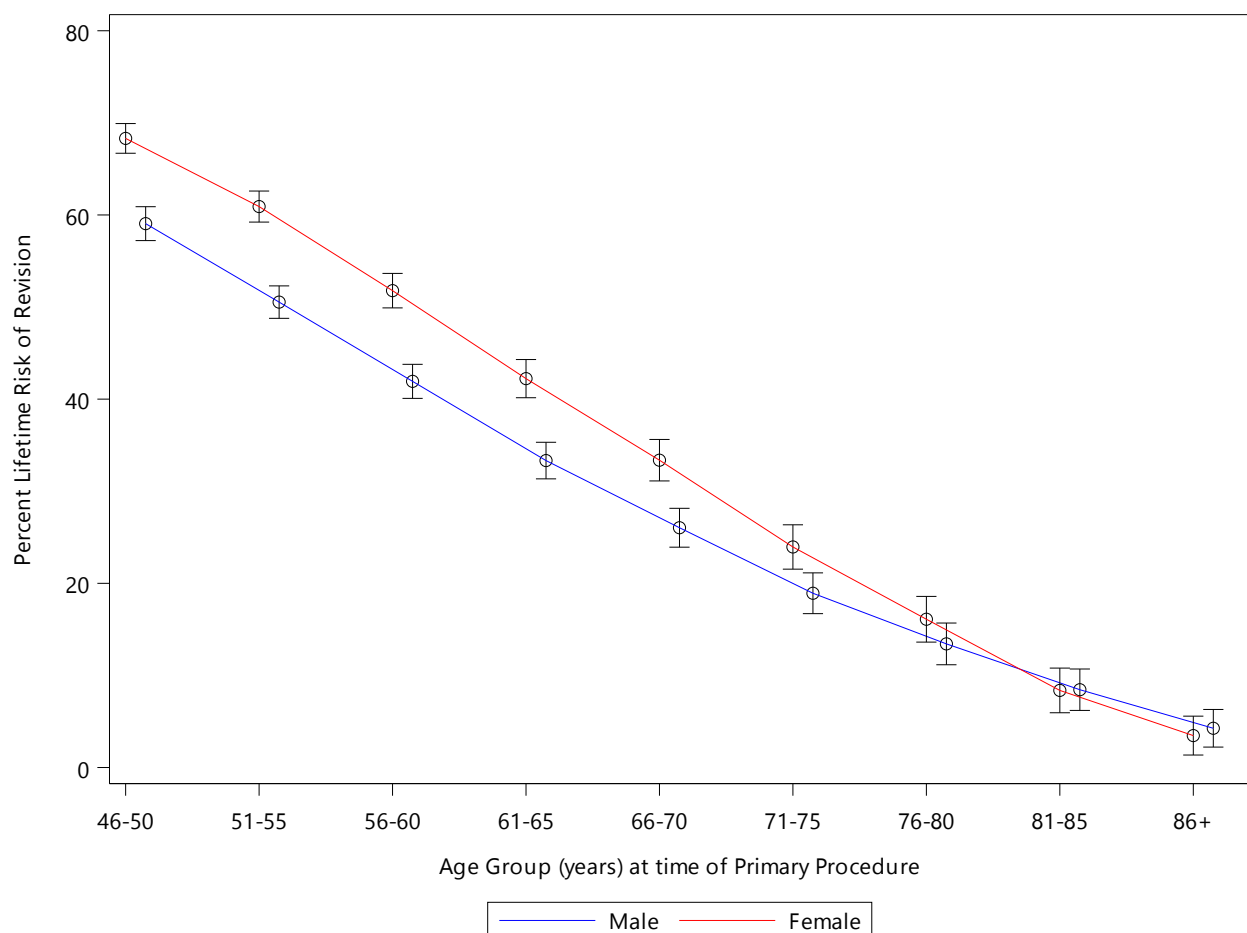
Modelling the Lifetime Risk of Revision

Table N27 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by Sex (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)	Male, % (95% CI)	Female, % (95% CI)
46-50	63.43 (62.21, 64.66)	59.06 (57.21, 60.9)	68.31 (66.7, 69.92)
51-55	55.33 (54.1, 56.56)	50.54 (48.77, 52.3)	60.91 (59.22, 62.6)
56-60	46.28 (44.96, 47.6)	41.93 (40.08, 43.78)	51.78 (49.91, 53.65)
61-65	37.17 (35.74, 38.61)	33.33 (31.34, 35.32)	42.23 (40.15, 44.3)
66-70	29.19 (27.65, 30.73)	26.04 (23.93, 28.15)	33.37 (31.12, 35.62)
71-75	21.07 (19.44, 22.7)	18.92 (16.71, 21.13)	23.95 (21.54, 26.36)
76-80	14.57 (12.9, 16.24)	13.42 (11.16, 15.69)	16.1 (13.62, 18.58)
81-85	8.42 (6.76, 10.07)	8.45 (6.2, 10.7)	8.37 (5.95, 10.8)
86+	3.92 (2.44, 5.39)	4.26 (2.22, 6.3)	3.47 (1.36, 5.58)

Note: Restricted to modern prostheses

Figure N12 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO ASA SCORE

The AOANJRR has collected ASA score data for patients having joint replacement surgery since 2012, and therefore the lifetime risk of revision analysis according to ASA is based on this 13 year cohort. The percentage lifetime revision risk for patients in each 5 year cohort having their primary UKR

for osteoarthritis according to ASA score is shown in Table N28 and Figure N13. The number of patients in each ASA score for each 5 year age cohort is shown in Table N29.

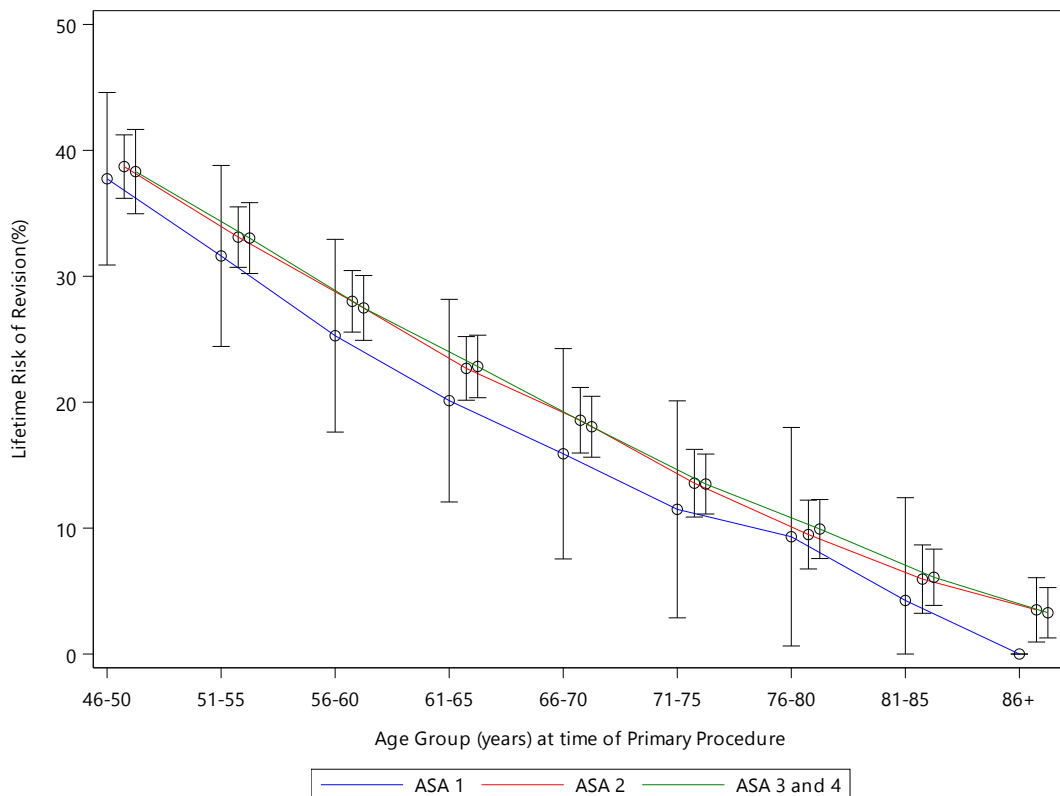
In each age cohort, UKR patients who have a higher ASA score than 1 have, on average, the highest lifetime risk of revision.

Table N28 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)

Age Group (years)	ASA 1, % (95% CI)	ASA 2, % (95% CI)	ASA 3 and 4, % (95% CI)
46-50	37.74 (30.89, 44.59)	38.71 (36.19, 41.23)	38.31 (34.97, 41.66)
51-55	31.61 (24.43, 38.8)	33.11 (30.71, 35.51)	33.03 (30.22, 35.85)
56-60	25.28 (17.63, 32.93)	28.01 (25.57, 30.45)	27.49 (24.91, 30.06)
61-65	20.12 (12.08, 28.17)	22.68 (20.16, 25.21)	22.84 (20.36, 25.32)
66-70	15.9 (7.55, 24.26)	18.57 (15.96, 21.17)	18.05 (15.63, 20.47)
71-75	11.49 (2.87, 20.11)	13.57 (10.88, 16.25)	13.5 (11.12, 15.88)
76-80	9.32 (0.64, 17.99)	9.49 (6.76, 12.22)	9.93 (7.58, 12.27)
81-85	4.26 (0, 12.42)	5.95 (3.24, 8.66)	6.1 (3.86, 8.33)
86+	0 (0, 0)	3.51 (0.96, 6.06)	3.28 (1.28, 5.28)

Note: Restricted to modern prostheses

Figure N13 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N29 **Number of Primary Unicompartamental Knee Replacement by Age and ASA Score (Primary Diagnosis OA)**

Age Group (years)	ASA 1, N	ASA 2, N	ASA 3 and 4, N
46-50	359	879	282
51-55	641	2185	638
56-60	778	3408	1117
61-65	722	4434	1492
66-70	527	4328	1957
71-75	296	3368	2107
76-80	118	1987	1601
81-85	26	818	956
86+	10	225	380

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC VERSUS SEPTIC

In 2025, the most common reasons for requiring revision surgery after primary UKR for osteoarthritis are the aseptic diagnoses, including progression of disease, loosening, pain, bearing dislocation and fracture. Infection is a comparatively less common reason for revision surgery after primary UKR. The percentage lifetime risk for revision for infection versus aseptic diagnoses for each 5 year cohort is shown in Table N30 and Figure N14.

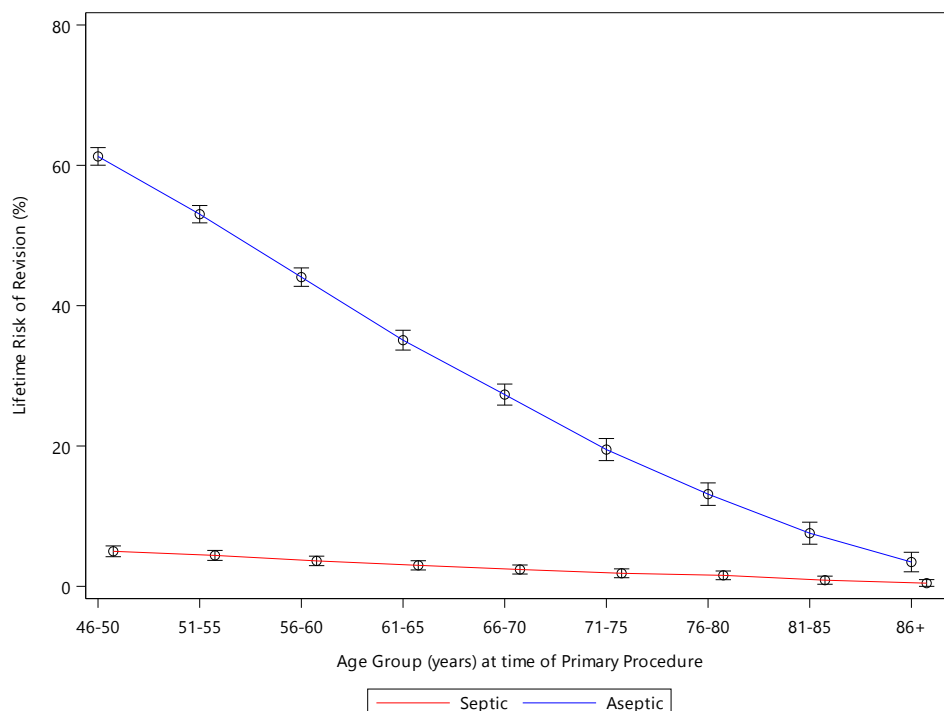
The lifetime risk of revision for infection is highest in the younger cohorts. For patients aged 46-50 years, the risk is 4.99%, and this risk decreases with each age cohort to be under 1% after age 85. Likewise, the lifetime risk of revision for aseptic reasons is highest in the younger cohorts, also reducing progressively through each age cohort. For all age cohorts, the risk of requiring revision surgery for aseptic reasons is higher than the risk of requiring revision surgery for infection.

Table N30 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	4.99 (4.22, 5.76)	61.27 (60.02, 62.52)
51-55	4.41 (3.7, 5.12)	53.04 (51.8, 54.27)
56-60	3.63 (2.95, 4.3)	44.07 (42.75, 45.38)
61-65	2.99 (2.33, 3.65)	35.08 (33.67, 36.5)
66-70	2.4 (1.75, 3.04)	27.33 (25.83, 28.83)
71-75	1.86 (1.23, 2.49)	19.49 (17.92, 21.06)
76-80	1.57 (0.95, 2.19)	13.14 (11.54, 14.74)
81-85	0.88 (0.3, 1.45)	7.57 (6, 9.14)
86+	0.45 (0, 0.96)	3.46 (2.07, 4.85)

Note: Restricted to modern prostheses

Figure N14 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO SEX AND DIAGNOSIS- ASEPTIC VERSUS SEPTIC

The lifetime risk of revision surgery following primary UKR for osteoarthritis differs according to age, sex and whether the diagnosis for revision is infection or aseptic reasons. The lifetime risk of revision for males in each 5 year cohort according to the underlying diagnosis is shown in Table N31 and Figure N15.

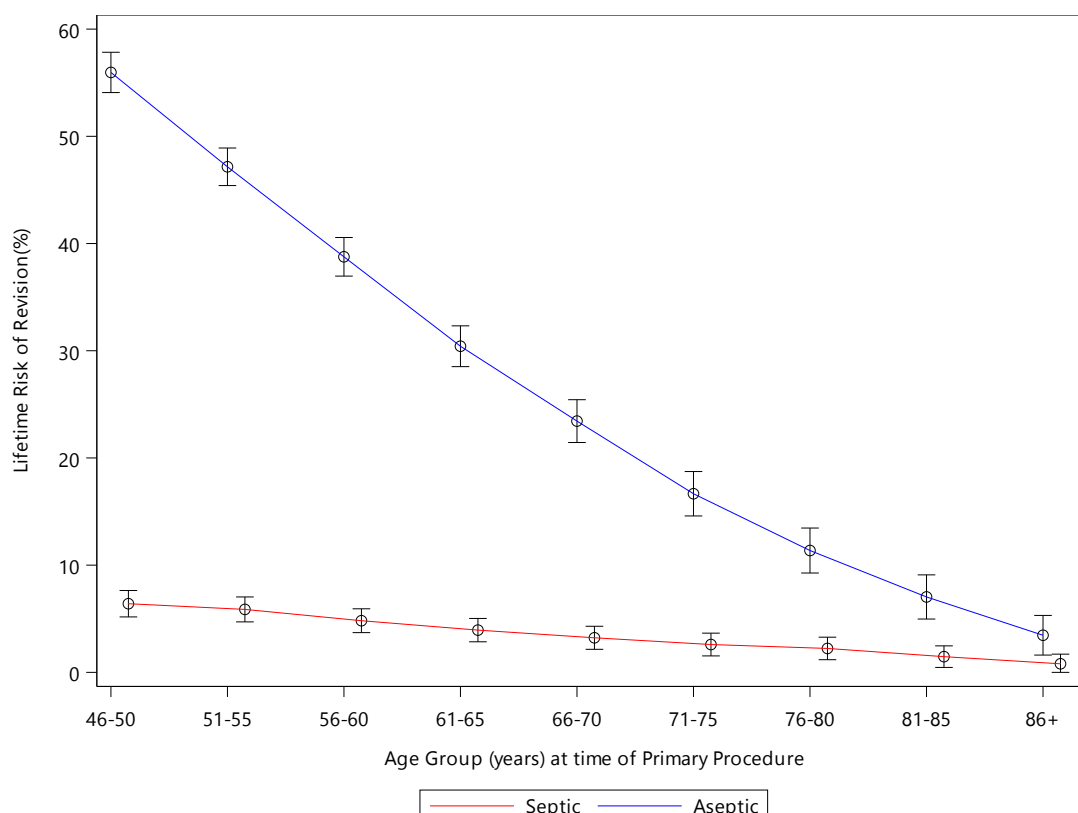
The lifetime risk of revision for females in each 5 year cohort according to the underlying diagnosis is shown in Table N32 and Figure N16. In each age cohort, the risk of revision for infection in males is approximately twice that for females, with young males at the highest risk. Conversely, the risk of revision for aseptic reasons for females is greater than for males in each age cohort.

Table N31 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	6.4 (5.17, 7.64)	55.96 (54.08, 57.84)
51-55	5.87 (4.71, 7.04)	47.16 (45.41, 48.91)
56-60	4.82 (3.71, 5.93)	38.76 (36.96, 40.56)
61-65	3.94 (2.85, 5.03)	30.42 (28.52, 32.32)
66-70	3.23 (2.15, 4.3)	23.44 (21.44, 25.43)
71-75	2.6 (1.54, 3.66)	16.66 (14.59, 18.73)
76-80	2.23 (1.18, 3.28)	11.36 (9.27, 13.46)
81-85	1.47 (0.46, 2.47)	7.03 (4.97, 9.09)
86+	0.8 (0, 1.7)	3.46 (1.61, 5.31)

Note: Restricted to modern prostheses

Figure N15 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



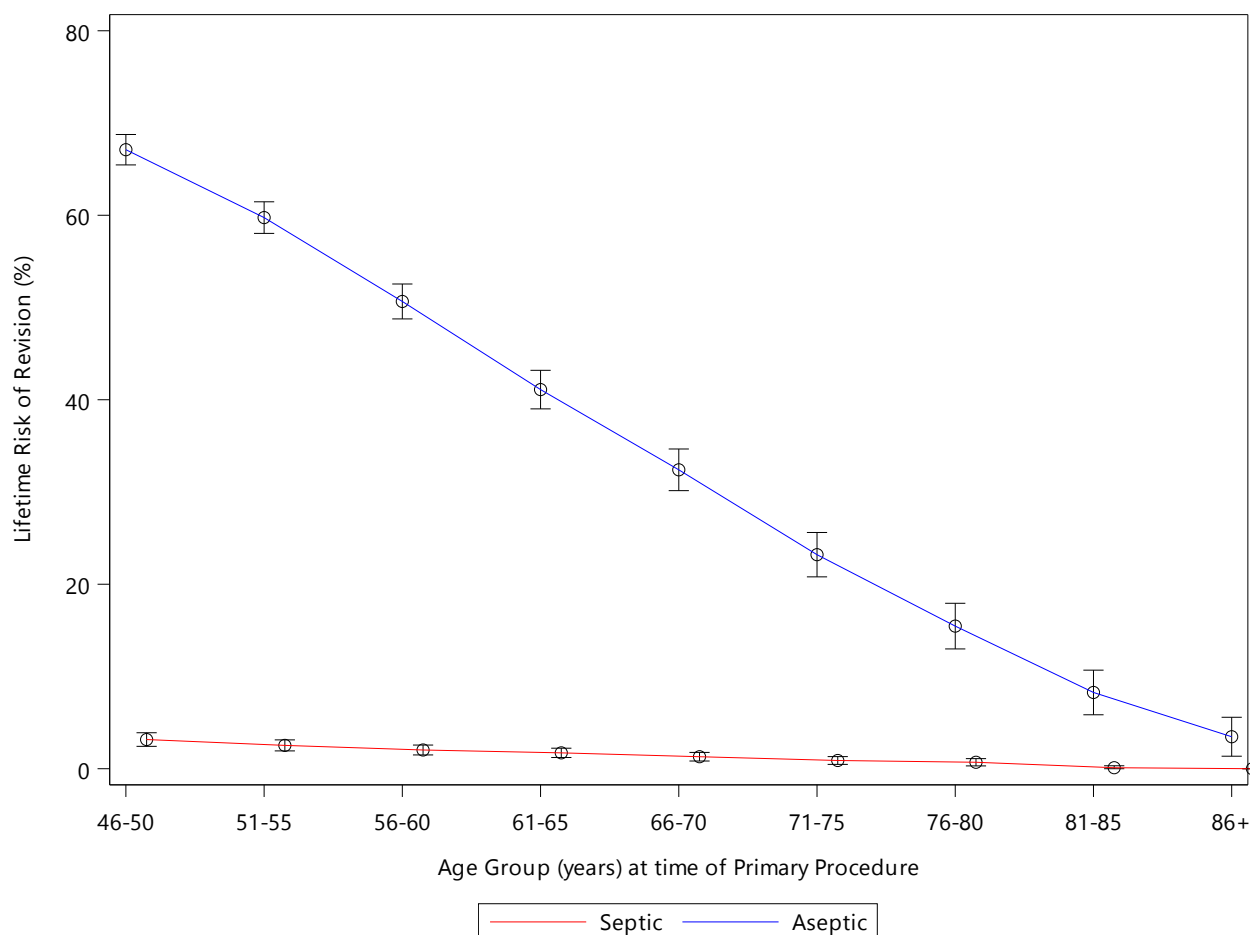
Modelling the Lifetime Risk of Revision

Table N32 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	3.16 (2.43, 3.9)	67.11 (65.46, 68.75)
51-55	2.53 (1.93, 3.13)	59.75 (58.03, 61.46)
56-60	2.03 (1.49, 2.57)	50.66 (48.76, 52.55)
61-65	1.72 (1.21, 2.22)	41.1 (39.01, 43.19)
66-70	1.3 (0.83, 1.77)	32.4 (30.14, 34.66)
71-75	0.89 (0.47, 1.31)	23.2 (20.8, 25.61)
76-80	0.7 (0.3, 1.09)	15.46 (12.99, 17.94)
81-85	0.11 (0, 0.32)	8.27 (5.85, 10.69)
86+	0 (0, 0)	3.47 (1.36, 5.58)

Note: Restricted to modern prostheses

Figure N16 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC REASONS

The three most common aseptic diagnoses for revision surgery following primary UKR performed for osteoarthritis are progression of disease, loosening and pain.

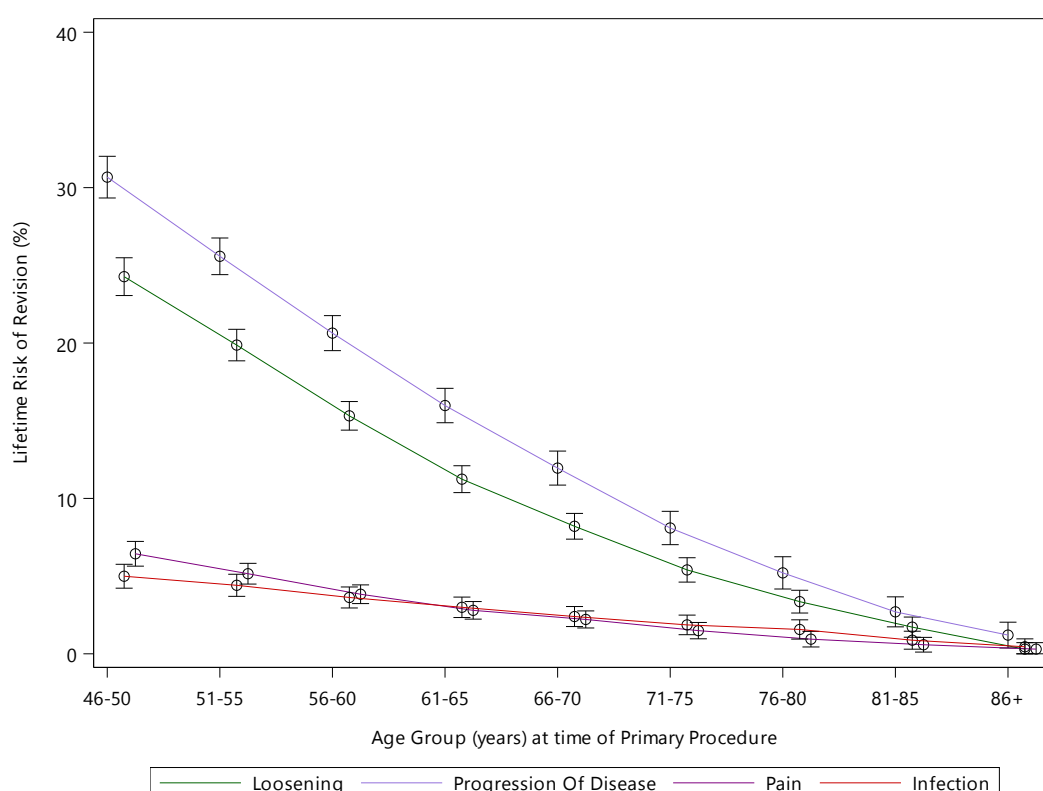
The percentage lifetime risks of revision surgery for each of these reasons post primary UKR for osteoarthritis are shown in Table N33 and Figure N17. Revision for progression of disease carries the highest lifetime risk of revision in all age cohorts, followed by loosening, pain and infection. For each of these diagnoses, the lifetime risk of revision surgery is highest for the youngest patients and decreases for each age cohort.

Table N33 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartamental Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Loosening, % (95% CI)	Progression of Disease, % (95% CI)	Pain, % (95% CI)	Infection, % (95% CI)
46-50	24.27 (23.06, 25.49)	30.68 (29.33, 32.02)	6.44 (5.64, 7.23)	4.99 (4.22, 5.76)
51-55	19.87 (18.85, 20.88)	25.58 (24.4, 26.76)	5.15 (4.49, 5.82)	4.41 (3.7, 5.12)
56-60	15.31 (14.39, 16.23)	20.64 (19.51, 21.76)	3.83 (3.23, 4.44)	3.63 (2.95, 4.3)
61-65	11.24 (10.37, 12.1)	15.98 (14.87, 17.08)	2.8 (2.23, 3.36)	2.99 (2.33, 3.65)
66-70	8.21 (7.38, 9.03)	11.95 (10.86, 13.05)	2.21 (1.66, 2.76)	2.4 (1.75, 3.04)
71-75	5.4 (4.61, 6.18)	8.1 (7.02, 9.17)	1.49 (0.97, 2.02)	1.86 (1.23, 2.49)
76-80	3.36 (2.62, 4.09)	5.21 (4.17, 6.25)	0.94 (0.44, 1.44)	1.57 (0.95, 2.19)
81-85	1.72 (1.07, 2.37)	2.7 (1.73, 3.67)	0.58 (0.11, 1.06)	0.88 (0.3, 1.45)
86+	0.3 (0, 0.72)	1.2 (0.37, 2.03)	0.3 (0, 0.72)	0.45 (0, 0.96)

Note: Restricted to modern prostheses

Figure N17 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartamental Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO FIXATION

The percentage lifetime risk of revision following primary unicompartmental knee replacement for osteoarthritis according to fixation is shown in Table N34 and Figure N18. The number of patients in each 5 year age cohort is shown in Table N35.

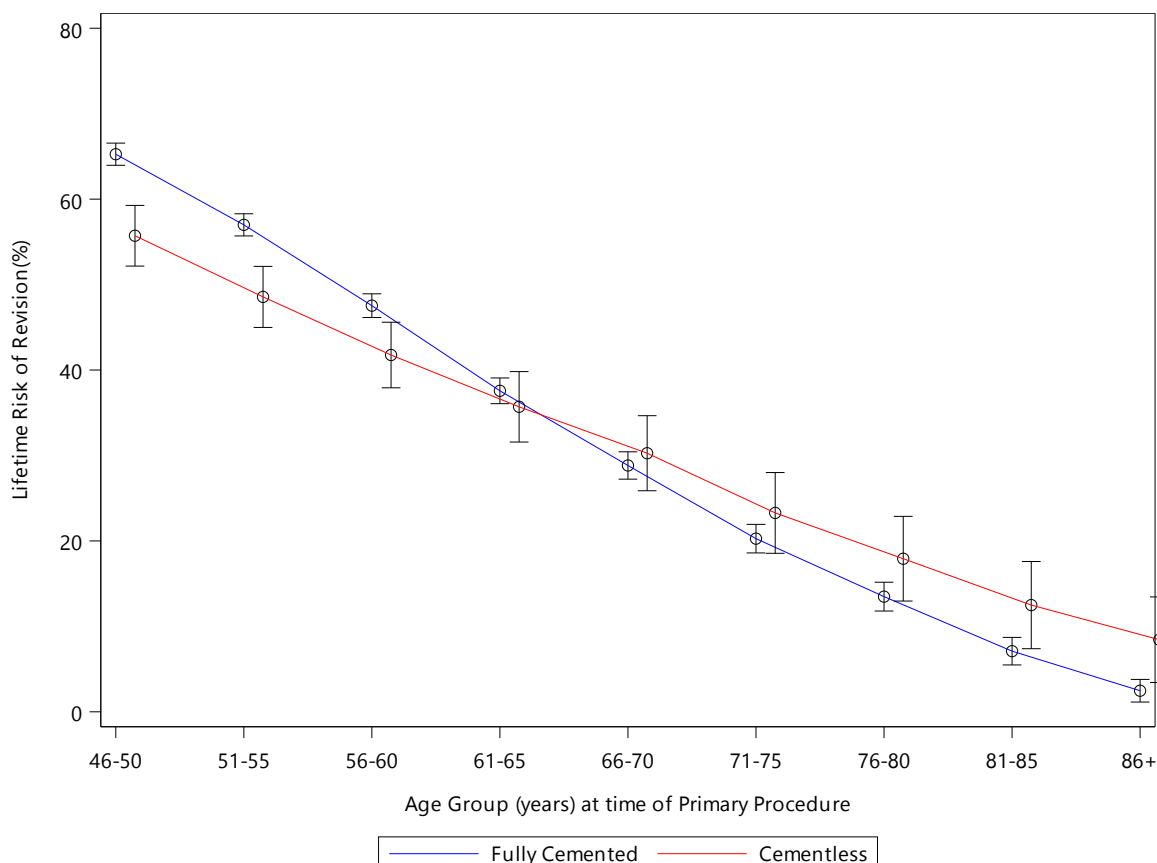
On average, UKR using cemented fixation has a higher lifetime risk of revision in age cohorts until 60 years, and in age cohorts over 65 years, cementless fixation has a higher lifetime risk of revision. Regardless of the type of fixation, the percentage lifetime risk of revision reduces with each age cohort.

Table N34 Percent Lifetime Risk of Revision (95% CI) after Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)

Age Group (years)	Cemented, % (95% CI)	Cementless, % (95% CI)
46-50	65.26 (63.96, 66.56)	55.72 (52.17, 59.27)
51-55	56.99 (55.69, 58.29)	48.56 (44.98, 52.13)
56-60	47.53 (46.15, 48.92)	41.76 (37.92, 45.59)
61-65	37.57 (36.06, 39.07)	35.69 (31.57, 39.82)
66-70	28.83 (27.23, 30.43)	30.26 (25.87, 34.66)
71-75	20.26 (18.59, 21.94)	23.28 (18.55, 28)
76-80	13.48 (11.8, 15.17)	17.92 (12.96, 22.87)
81-85	7.1 (5.49, 8.71)	12.49 (7.39, 17.59)
86+	2.47 (1.14, 3.79)	8.44 (3.43, 13.44)

Note: Restricted to modern prostheses

Figure N18 Percent Lifetime Risk (95% CI) of Revision after Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N35 **Number of Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)**

Age Group (years)	Cemented, N	Cementless, N
46-50	1900	392
51-55	4115	1054
56-60	6305	1768
61-65	7668	2305
66-70	7506	2316
71-75	6261	1880
76-80	4386	1148
81-85	2112	509
86+	705	147

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Modelling the Lifetime Revision Risk – Total Knee Replacement

Osteoarthritis is the most common diagnosis for knee replacement in Australia. Accordingly, the analysis of lifetime risk of requiring knee replacement is confined to those having their knee replacement for osteoarthritis.

In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 771,004 patients with an average age of 68.7 years, 55.3% of whom are female. The demographics of this study population are found in Table N36.

Table N36 Summary of Primary Total Knee Replacement Patients (Primary Diagnosis OA)

Variable		Total Knee (n=771,004)
Follow Up Years	Mean (SD)	6.5 (4.9)
	Median (IQR)	5.4 (2.4, 9.6)
	Minimum	0
	Maximum	26
Age	Mean (SD)	68.7 (8.8)
	Median (IQR)	69 (62, 75)
Age Group	<55	44,807 (5.8%)
	55-64	204,120 (26.5%)
	65-74	314,201 (40.8%)
	≥75	207,876 (27%)
Sex	Male	344,585 (44.7%)
	Female	426,419 (55.3%)
BMI ¹	Underweight (<18.50)	1,030 (0.2%)
	Normal (18.50-24.99)	59,590 (10.7%)
	Pre Obese (25.00-29.99)	175,301 (31.5%)
	Obese Class 1 (30.00-34.99)	172,087 (30.9%)
	Obese Class 2 (35.00-39.99)	93,612 (16.8%)
	Obese Class 3 (≥40.00)	55,572 (10%)
Obesity	Obese	321,271 (57.7%)
	Not Obese	235,921 (42.3%)
ASA Score ²	1	30,007 (4.8%)
	2	327,087 (52.7%)
	3	257,062 (41.4%)
	4	6,117 (1%)
	5	26 (0%)
Femoral Fixation	Cementless	269,018 (34.9%)
	Cemented	501,986 (65.1%)
Fixation	Cemented	498,536 (64.7%)
	Cementless	122,126 (15.8%)
	Hybrid (Tibial Cemented)	146,892 (19.1%)
	Hybrid (Tibial Cementless)	3,450 (0.4%)
Patella Usage	Patella Used	532,900 (69.1%)
	No Patella	238,104 (30.9%)
Bearing Surface	Non XLPE	290,737 (37.7%)
	XLPE	307,901 (39.9%)
	XLPE + Antioxidant	171,162 (22.2%)
	Unknown	1,204 (0.2%)

Modelling the Lifetime Risk of Revision

Table N36 – Cont.

Variable		Total Knee (n=771,004)
Stability	Fully Stabilised	3,517 (0.5%)
	Hinged	2,258 (0.3%)
	Medial Pivot Design	57,918 (7.5%)
	Minimally Stabilised	542,908 (70.4%)
	Posterior Stabilised	164,226 (21.3%)
	Unknown	177 (0%)

Abbreviations: SD - standard deviation, IQR - interquartile range, BMI - Body Mass Index (kg/m²), ASA - American Society of Anesthesiologists

¹Excludes 213,812 procedures with unknown BMI

²Excludes 150,705 procedures with unknown ASA Score

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE

The risk of requiring revision surgery post-knee replacement is related to the life expectancy of that particular patient. The numbers of patients having primary knee replacement for osteoarthritis in 5 year cohorts, together with the proportions of mortality and revision surgery during the study period, are shown in Table N37. The 10, 15 and 20 year revision-free survival estimates for each 5 year age cohort are shown in Table N38.

The proportion of patients less than 50 years of age requiring knee replacement surgery is low; however, their longer life expectancy places them at a higher lifetime risk of revision surgery of 30.64%. Conversely, while the proportion of patients over 85 years of age requiring knee replacement is also low, their shorter life expectancy means that in this group the risk of revision surgery is approximately 2%. The percentage lifetime risk of revision for patients undergoing primary total knee replacement for osteoarthritis is shown in Table N39 and in Figure N19.

Table N37 Characteristics of Primary Total Knee Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Total, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	14184	6.08 (2.76, 10.61)	378 (2.66%)	1072 (7.56%)
51-55	42153	6.06 (2.61, 10.54)	1547 (3.67%)	2424 (5.75%)
56-60	87054	6.18 (2.77, 10.55)	4450 (5.11%)	4270 (4.91%)
61-65	135781	5.91 (2.55, 10.33)	9708 (7.15%)	5261 (3.87%)
66-70	159667	5.76 (2.51, 9.87)	16898 (10.58%)	5200 (3.26%)
71-75	152568	5.22 (2.37, 9.22)	24797 (16.25%)	4024 (2.64%)
76-80	110424	4.92 (2.18, 8.76)	27790 (25.17%)	2447 (2.22%)
81-85	52917	4.85 (2.24, 8.14)	19338 (36.54%)	970 (1.83%)
86+	16256	4.41 (2.11, 7.09)	7833 (48.19%)	252 (1.55%)

Note: Restricted to modern prostheses

Table N38 Revision-Free Survival (95% CI) Estimates after Primary Total Knee Replacement by Revision-Free Years (Primary Diagnosis OA)

Age Group (years)	10 Years	15 Years	20 Years
46-50	90.8 (90.2, 91.4)	87.3 (86.3, 88.2)	82.2 (80.4, 83.9)
51-55	92.8 (92.5, 93.1)	89.9 (89.5, 90.4)	86.3 (85.5, 87.2)
56-60	93.8 (93.6, 94.0)	91.5 (91.1, 91.8)	88.7 (88.1, 89.3)
61-65	95.0 (94.9, 95.2)	93.0 (92.7, 93.2)	91.2 (90.7, 91.6)
66-70	95.6 (95.5, 95.7)	94.4 (94.2, 94.6)	93.4 (93.1, 93.7)
71-75	96.3 (96.2, 96.5)	95.6 (95.4, 95.7)	95.1 (94.8, 95.3)
76-80	96.9 (96.7, 97.0)	96.3 (96.1, 96.5)	95.9 (95.4, 96.4)
81-85	97.6 (97.4, 97.7)	97.2 (96.8, 97.4)	96.8 (96.1, 97.3)
86+	97.9 (97.5, 98.2)	96.6 (94.6, 97.9)	96.6 (94.6, 97.9)

Note: Restricted to modern prostheses

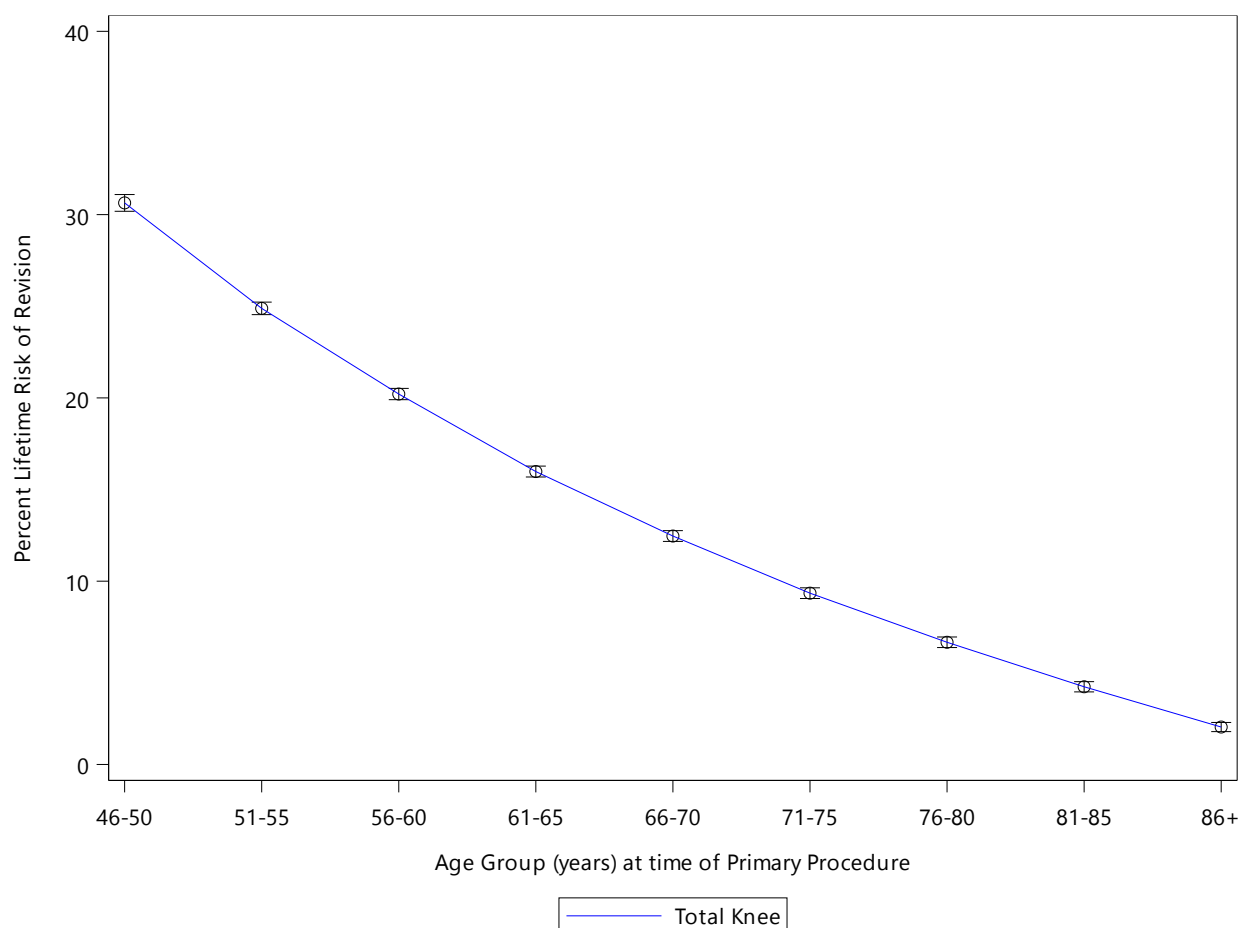
Modelling the Lifetime Risk of Revision

Table N39 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)
46-50	30.64 (30.18, 31.1)
51-55	24.88 (24.54, 25.23)
56-60	20.21 (19.9, 20.52)
61-65	15.98 (15.68, 16.28)
66-70	12.46 (12.17, 12.76)
71-75	9.35 (9.05, 9.64)
76-80	6.67 (6.38, 6.96)
81-85	4.24 (3.96, 4.52)
86+	2.04 (1.79, 2.29)

Note: Restricted to modern prostheses

Figure N19 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE AND SEX

The number of patients having primary total knee replacement for osteoarthritis in 5 yearly cohorts, together with the proportions of mortality and revision surgery during the study period for males and females, are shown in Table N40 and Table N41, respectively.

The percentage of lifetime risk of revision after primary total knee replacement for osteoarthritis in each 5 year age cohort for males and females is shown in Table N42. Until the age of 85, males have, on average, a higher lifetime risk of revision surgery than females. (Figure N20).

Table N40 Characteristics of Male Primary Total Knee Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Males, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	6076	6.05 (2.74, 10.65)	197 (3.24%)	497 (8.18%)
51-55	18567	5.86 (2.53, 10.26)	794 (4.28%)	1132 (6.1%)
56-60	41188	5.9 (2.65, 10.13)	2436 (5.91%)	2160 (5.24%)
61-65	65034	5.52 (2.45, 9.93)	5370 (8.26%)	2638 (4.06%)
66-70	73359	5.43 (2.4, 9.57)	8925 (12.17%)	2584 (3.52%)
71-75	66953	5.08 (2.31, 8.8)	12333 (18.42%)	1965 (2.93%)
76-80	45928	4.65 (2.11, 8.23)	12635 (27.51%)	1109 (2.41%)
81-85	21171	4.48 (2.08, 7.53)	8235 (38.9%)	434 (2.05%)
86+	6309	4.07 (1.93, 6.54)	3247 (51.47%)	113 (1.79%)

Note: Restricted to modern prostheses

Table N41 Characteristics of Female Primary Total Knee Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Females, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	8108	6.11 (2.77, 10.58)	181 (2.23%)	575 (7.09%)
51-55	23586	6.17 (2.66, 10.77)	753 (3.19%)	1292 (5.48%)
56-60	45866	6.44 (2.86, 10.91)	2014 (4.39%)	2110 (4.6%)
61-65	70747	6.23 (2.65, 10.67)	4338 (6.13%)	2623 (3.71%)
66-70	86308	5.98 (2.59, 10.15)	7973 (9.24%)	2616 (3.03%)
71-75	85615	5.38 (2.41, 9.56)	12464 (14.56%)	2059 (2.4%)
76-80	64496	5.16 (2.24, 9.14)	15155 (23.5%)	1338 (2.07%)
81-85	31746	5.15 (2.36, 8.55)	11103 (34.97%)	536 (1.69%)
86+	9947	4.66 (2.21, 7.41)	4586 (46.1%)	139 (1.4%)

Note: Restricted to modern prostheses

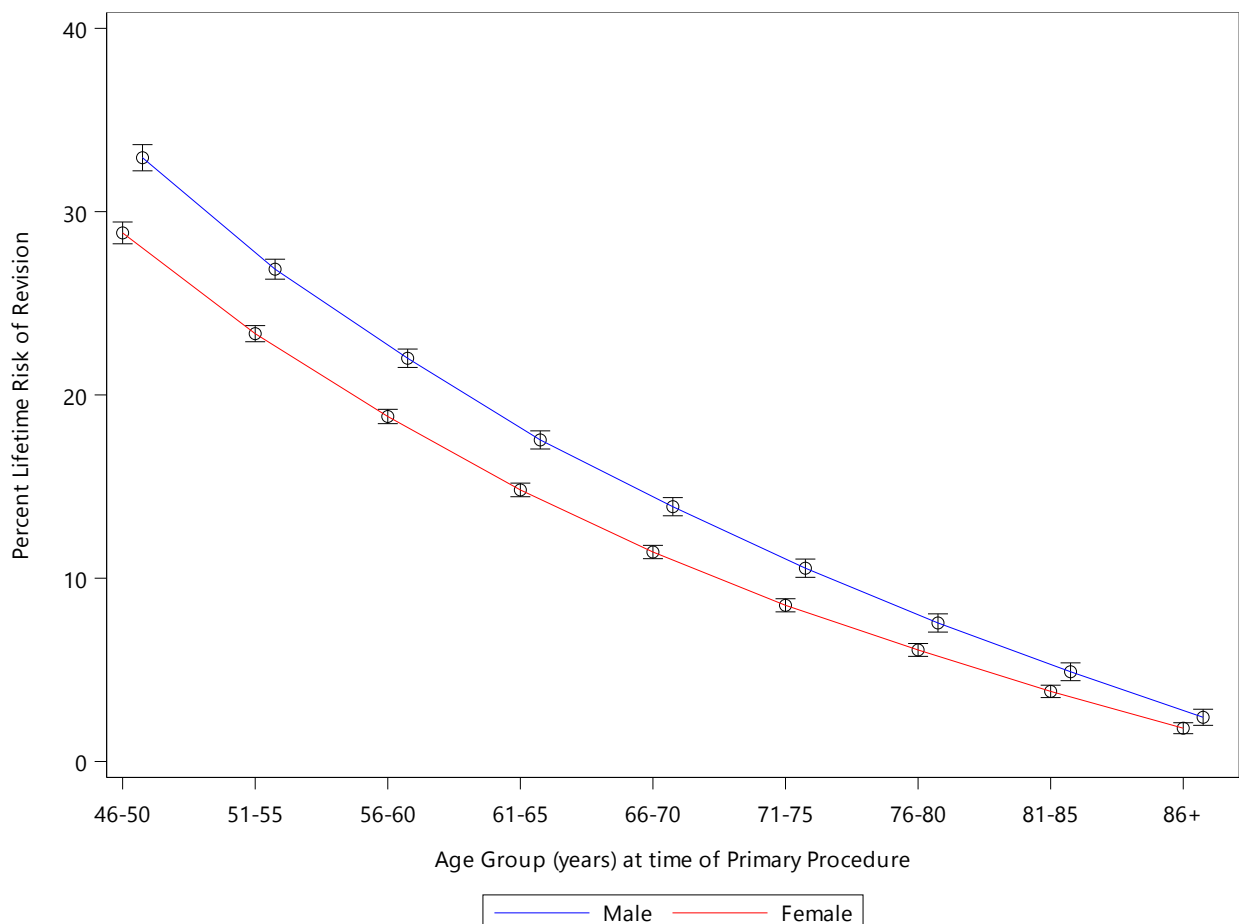
Modelling the Lifetime Risk of Revision

Table N42 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Arthroplasty by Sex (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)	Male, % (95% CI)	Female, % (95% CI)
46-50	30.64 (30.18, 31.1)	32.94 (32.23, 33.66)	28.84 (28.24, 29.44)
51-55	24.88 (24.54, 25.23)	26.86 (26.31, 27.4)	23.34 (22.9, 23.78)
56-60	20.21 (19.9, 20.52)	22 (21.5, 22.5)	18.82 (18.43, 19.21)
61-65	15.98 (15.68, 16.28)	17.54 (17.05, 18.04)	14.82 (14.45, 15.19)
66-70	12.46 (12.17, 12.76)	13.9 (13.41, 14.4)	11.43 (11.07, 11.79)
71-75	9.35 (9.05, 9.64)	10.55 (10.05, 11.04)	8.52 (8.16, 8.88)
76-80	6.67 (6.38, 6.96)	7.56 (7.06, 8.06)	6.09 (5.73, 6.44)
81-85	4.24 (3.96, 4.52)	4.9 (4.41, 5.38)	3.83 (3.49, 4.16)
86+	2.04 (1.79, 2.29)	2.41 (1.97, 2.85)	1.82 (1.52, 2.12)

Note: Restricted to modern prostheses

Figure N20 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO ASA SCORE

The AOANJRR has collected ASA score data for patients having joint replacement surgery since 2012, and therefore the lifetime risk of revision analysis according to ASA score is based on this cohort with a maximum 13 year follow-up. The percentage lifetime revision risk for patients in each 5 year cohort having their primary knee replacement according to ASA score is shown in Table N43 and Figure N21.

The number of patients in each ASA score for each 5 year age cohort is shown in Table N44.

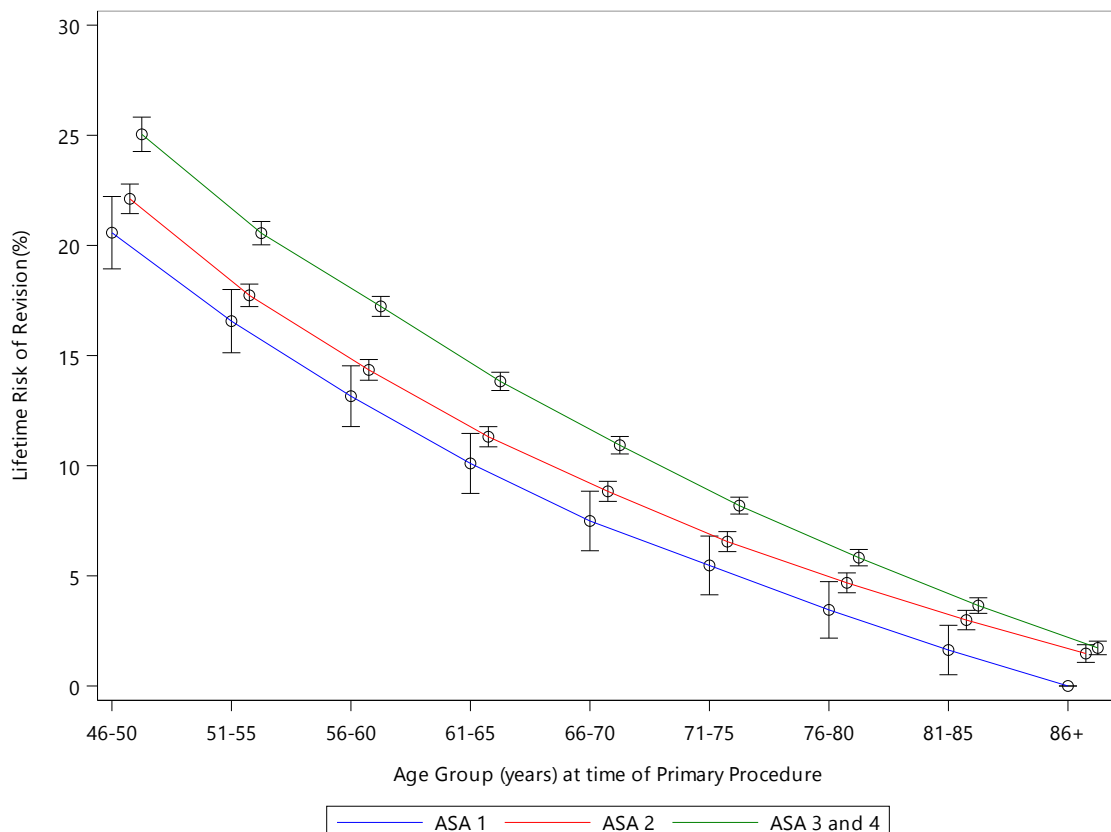
In each age cohort, patients having their primary joint replacement who have a higher ASA score have, on average, a higher lifetime risk of revision. Patients with an ASA score of 1 have the lowest lifetime risk of revision, while patients with an ASA score of 2 have a lower lifetime risk of revision until age 60 compared to those with ASA scores of 3 or 4.

Table N43 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)

Age Group (years)	ASA 1, % (95% CI)	ASA 2, % (95% CI)	ASA 3 and 4, % (95% CI)
46-50	20.58 (18.93, 22.22)	22.12 (21.44, 22.79)	25.04 (24.26, 25.82)
51-55	16.56 (15.13, 18)	17.73 (17.22, 18.25)	20.56 (20.03, 21.09)
56-60	13.16 (11.78, 14.53)	14.35 (13.88, 14.82)	17.23 (16.78, 17.68)
61-65	10.1 (8.74, 11.47)	11.32 (10.86, 11.77)	13.83 (13.41, 14.24)
66-70	7.49 (6.14, 8.84)	8.84 (8.38, 9.29)	10.93 (10.53, 11.33)
71-75	5.47 (4.14, 6.81)	6.55 (6.1, 7.01)	8.19 (7.81, 8.57)
76-80	3.45 (2.17, 4.74)	4.68 (4.23, 5.13)	5.83 (5.45, 6.2)
81-85	1.63 (0.51, 2.75)	2.99 (2.55, 3.43)	3.65 (3.3, 4)
86+	0 (0, 0)	1.47 (1.07, 1.87)	1.73 (1.42, 2.04)

Note: Restricted to modern prostheses

Figure N21 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by ASA Score



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N44 **Number of Primary Total Knee Replacement by Age and ASA Score**

Age Group, (years)	ASA 1, N	ASA 2, N	ASA 3 and 4, N
46-50	1399	5895	3635
51-55	3399	18136	11264
56-60	5685	38554	23482
61-65	6723	60389	39788
66-70	5670	70452	51780
71-75	3589	63096	55646
76-80	1560	39617	45376
81-85	512	15796	23762
86+	105	3604	8439

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO BMI

The AOANJRR has collected the BMI data for patients having joint replacement surgery since 2015; therefore, the lifetime risk of revision analysis according to BMI is based on this cohort with a maximum 10 year follow-up. The percentage lifetime revision risk for patients in each BMI category is shown in Table N45. The number of patients in each BMI category for each 5 year age cohort is shown in Table N46.

For patients in all BMI categories, the highest lifetime risk of revision occurs in those who have their primary total knee replacement at a younger age, with the risk gradually reducing over time.

For patients having their primary total knee replacement in the age cohorts less than 75, lifetime revision risk is highest for those in obese class 3, followed by those in the pre-obese group, class 2, and normal BMI groups, respectively.

The analysis of lifetime revision risk according to BMI may be simplified by dichotomising BMI into obese and not obese groups. This analysis is shown in Table N47 and Figure N22. In all age cohorts, those patients having their primary total knee replacement who are obese, on average, have a higher lifetime revision risk than those in the not obese group, though there were no significant differences.

Table N45 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by BMI Category

Age Group (years)	Underweight or Normal, % (95% CI)	Pre Obese, % (95% CI)	Obese Class 1, % (95% CI)	Obese Class 2, % (95% CI)	Obese Class 3, % (95% CI)
46-50	22.03 (20.06, 24)	21.37 (20.36, 22.38)	20.61 (19.73, 21.48)	21.73 (20.45, 23.01)	24.33 (22.06, 26.6)
51-55	16.46 (15.38, 17.55)	16.91 (16.27, 17.56)	17.09 (16.42, 17.75)	17.63 (16.53, 18.74)	20.5 (18.25, 22.75)
56-60	13.62 (12.79, 14.46)	14.02 (13.48, 14.56)	14.11 (13.51, 14.7)	14.23 (13.15, 15.31)	17.6 (15.3, 19.9)
61-65	10.97 (10.25, 11.69)	11.19 (10.7, 11.69)	11.16 (10.59, 11.73)	11.63 (10.55, 12.71)	14.62 (12.26, 16.98)
66-70	8.33 (7.68, 8.97)	8.92 (8.44, 9.4)	8.79 (8.22, 9.35)	9.43 (8.34, 10.51)	11.96 (9.54, 14.37)
71-75	6.28 (5.67, 6.89)	6.86 (6.4, 7.33)	6.59 (6.03, 7.15)	7.12 (6.03, 8.22)	9.35 (6.87, 11.82)
76-80	4.42 (3.84, 4.99)	4.95 (4.49, 5.4)	4.82 (4.27, 5.38)	5.04 (3.94, 6.14)	7.03 (4.51, 9.55)
81-85	2.93 (2.4, 3.47)	3.26 (2.82, 3.7)	2.91 (2.37, 3.44)	3.2 (2.11, 4.28)	4.29 (1.75, 6.82)
86+	1.51 (1.04, 1.97)	1.67 (1.28, 2.07)	1.21 (0.74, 1.69)	1.45 (0.45, 2.44)	1.71 (0, 4.06)

Note: Restricted to modern prostheses

Table N46 Number Primary Total Knee Replacement by Age and BMI Category (Primary Diagnosis OA)

Age Group (years)	Underweight (<18.5), N	Normal (18.5-24.9), N	Pre Obese (25.0-29.9), N	Obese Class 1 (30.0-34.9), N	Obese Class 2 (35.0-39.9), N	Obese Class 3 (≥40.0), N
46-50	10	581	2081	2956	2347	2070
51-55	35	1714	6509	9136	6891	5843
56-60	73	4163	15399	19493	13269	9651
61-65	121	7505	27147	30969	19159	12943
66-70	152	10890	35636	37722	20725	12045
71-75	207	12987	38315	35546	17593	8313
76-80	200	11539	30414	23961	9766	3672
81-85	149	7119	15038	9889	3203	891
86+	83	3087	4734	2384	641	137

Note: Restricted to modern prostheses

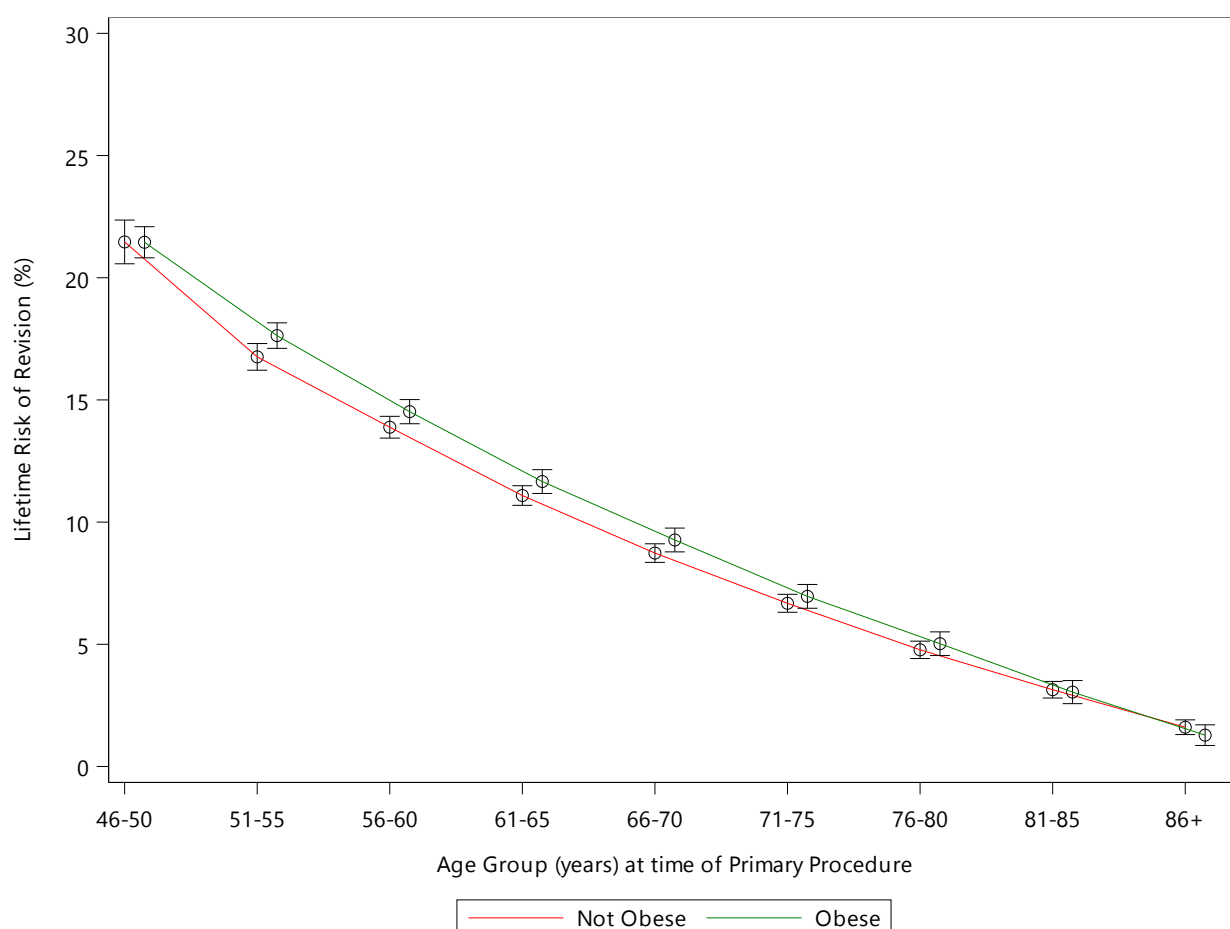
Modelling the Lifetime Risk of Revision

Table N47 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Obesity (Primary Diagnosis OA)

Age Group (years)	Not Obese, % (95% CI)	Obese, % (95% CI)
46-50	21.46 (20.57, 22.36)	21.45 (20.81, 22.09)
51-55	16.76 (16.22, 17.31)	17.63 (17.11, 18.15)
56-60	13.88 (13.44, 14.33)	14.52 (14.02, 15.01)
61-65	11.09 (10.69, 11.49)	11.66 (11.17, 12.15)
66-70	8.73 (8.35, 9.11)	9.27 (8.78, 9.76)
71-75	6.68 (6.31, 7.05)	6.96 (6.48, 7.45)
76-80	4.77 (4.42, 5.13)	5.02 (4.54, 5.51)
81-85	3.14 (2.8, 3.48)	3.04 (2.57, 3.52)
86+	1.61 (1.31, 1.91)	1.28 (0.86, 1.7)

Note: Restricted to modern prostheses

Figure N22 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Obesity (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC VERSUS SEPTIC

In 2025, the most common reason for revision after primary total knee replacement for osteoarthritis is infection. Therefore, this analysis considers lifetime revision risk for the diagnosis of infection (septic) versus aseptic diagnoses (Table N48 and Figure N23). The lifetime risk of revision for infection is highest in the younger cohorts.

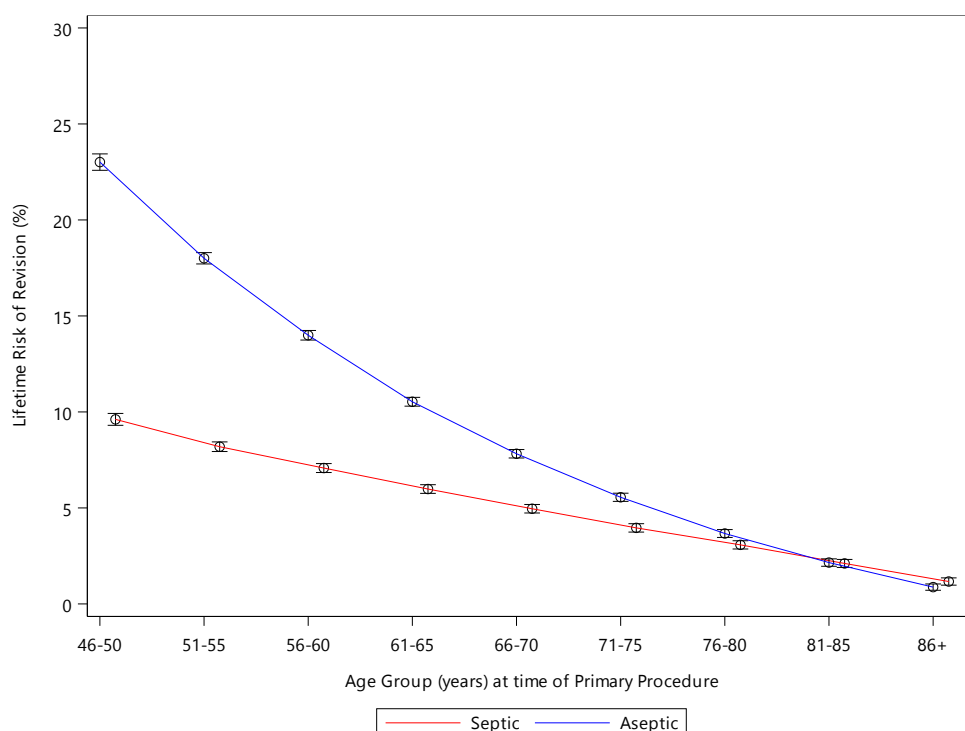
For patients aged 46-50 years, the risk for septic revision is 9.61%, and this risk decreases with each age cohort to be around 2% by age 81 years. Likewise, the lifetime risk of revision for aseptic reasons is highest in the younger cohorts, also reducing progressively through each age cohort. Until age 86 years, the risk of requiring revision surgery for aseptic reasons is higher than the risk of requiring revision surgery for infection. After age 86 years, there is a higher percentage lifetime risk of requiring revision for infection than for aseptic reasons.

Table N48 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	9.61 (9.3, 9.92)	23.01 (22.58, 23.44)
51-55	8.19 (7.94, 8.44)	18 (17.71, 18.3)
56-60	7.08 (6.84, 7.31)	13.99 (13.74, 14.24)
61-65	5.98 (5.76, 6.21)	10.53 (10.3, 10.76)
66-70	4.96 (4.74, 5.18)	7.82 (7.6, 8.04)
71-75	3.96 (3.74, 4.18)	5.55 (5.34, 5.77)
76-80	3.08 (2.86, 3.29)	3.67 (3.46, 3.87)
81-85	2.11 (1.9, 2.32)	2.15 (1.96, 2.35)
86+	1.17 (0.98, 1.36)	0.88 (0.71, 1.04)

Note: Restricted to modern prostheses

Figure N23 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO SEX AND DIAGNOSIS- ASEPTIC VERSUS SEPTIC

The lifetime risk of revision surgery following primary total knee replacement for osteoarthritis differs according to age, sex and whether the diagnosis for revision is infection (septic) or aseptic reasons. The lifetime risk of revision for males in each 5 year cohort, according to the revision diagnosis, is shown in Table N49 and Figure N24.

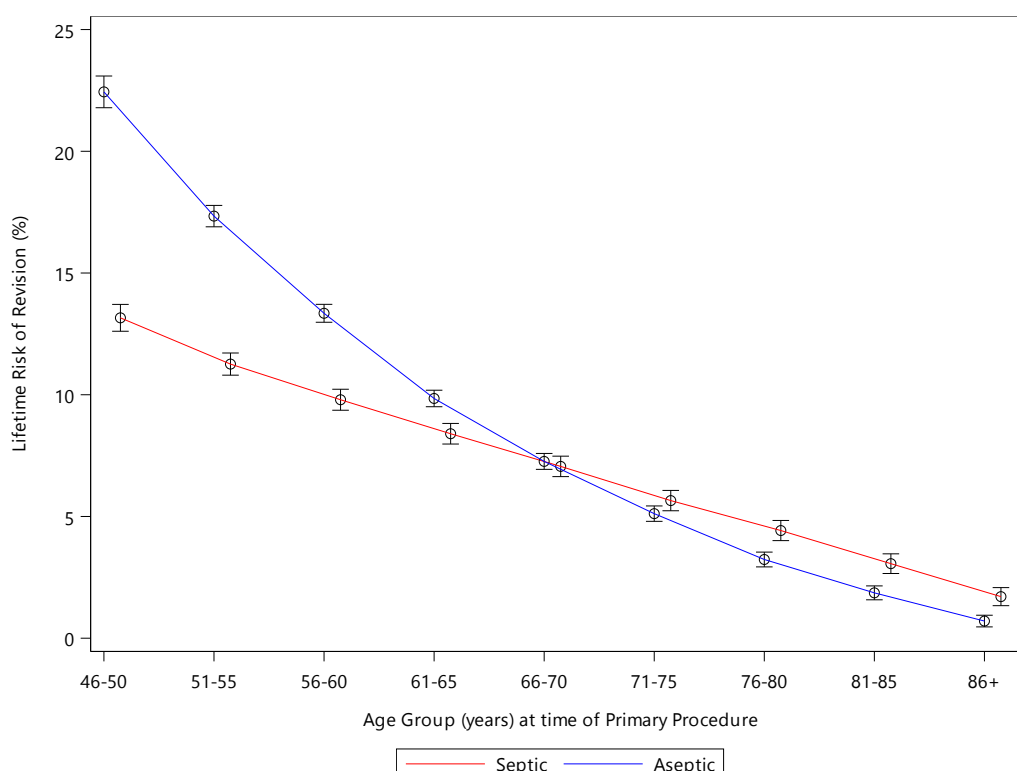
The lifetime risk of revision for females in each 5 year cohort, according to the revision diagnosis, is shown in Table N50 and Figure N25. In each age cohort, the risk of revision for infection in males is approximately twice that for females, with young males at the highest risk. The risk of revision for aseptic reasons for males and females in each age cohort, by contrast, is similar. In males, revision for aseptic reasons is most common until after age 65 years, after which revision for infection is more common. In females, aseptic revision is more common than revision for infection until after age 85 years.

Table N49 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	13.16 (12.61, 13.71)	22.44 (21.79, 23.09)
51-55	11.26 (10.8, 11.71)	17.34 (16.9, 17.78)
56-60	9.79 (9.36, 10.23)	13.35 (12.98, 13.71)
61-65	8.4 (7.98, 8.82)	9.85 (9.51, 10.19)
66-70	7.06 (6.64, 7.48)	7.26 (6.94, 7.59)
71-75	5.65 (5.23, 6.07)	5.12 (4.8, 5.43)
76-80	4.42 (4.01, 4.84)	3.23 (2.93, 3.54)
81-85	3.06 (2.66, 3.47)	1.86 (1.58, 2.15)
86+	1.71 (1.34, 2.08)	0.7 (0.46, 0.94)

Note: Restricted to modern prostheses

Figure N24 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



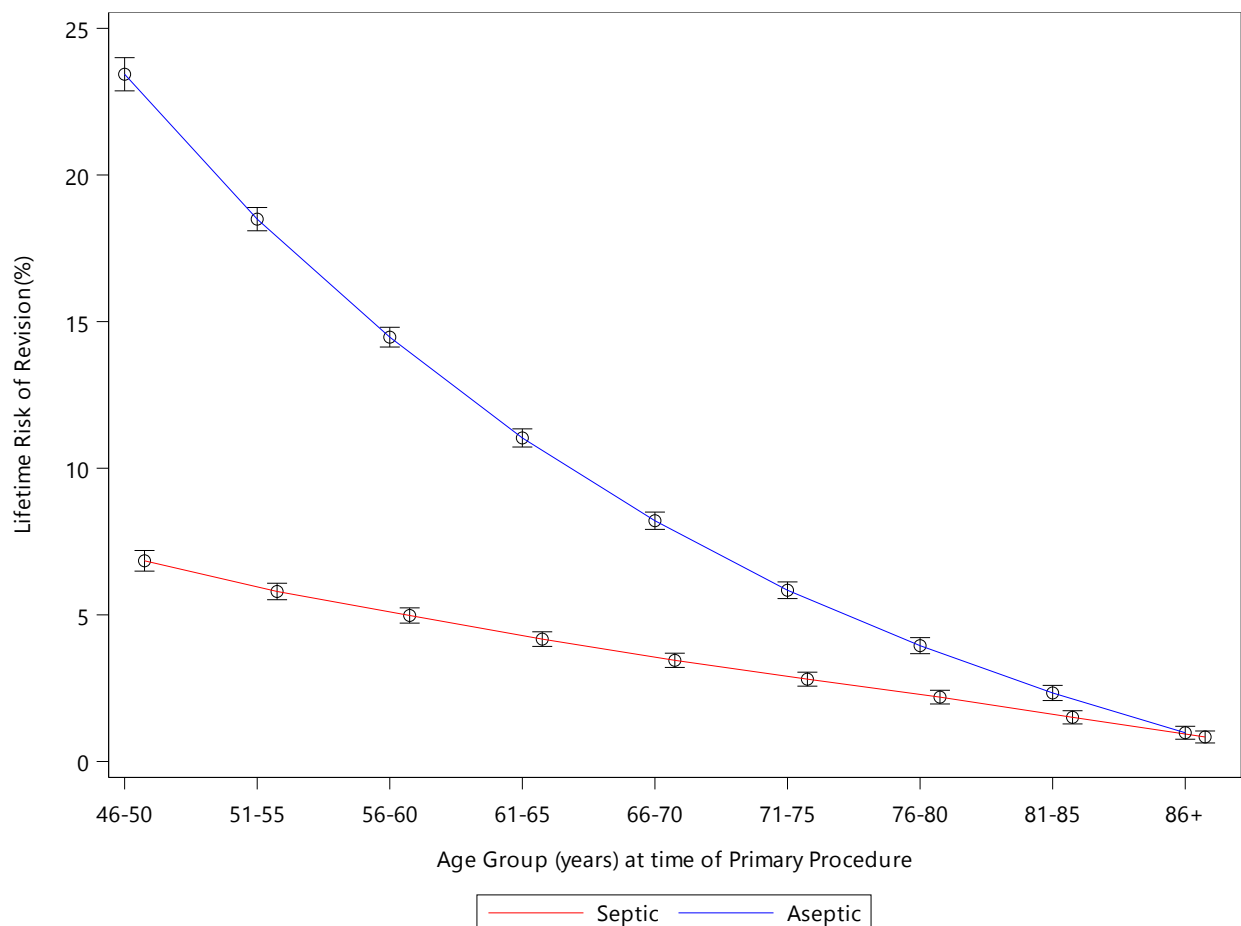
Modelling the Lifetime Risk of Revision

Table N50 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement in Female Patients, by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	6.84 (6.49, 7.2)	23.43 (22.87, 24)
51-55	5.8 (5.52, 6.08)	18.49 (18.1, 18.89)
56-60	4.98 (4.72, 5.24)	14.47 (14.13, 14.81)
61-65	4.17 (3.92, 4.42)	11.03 (10.72, 11.34)
66-70	3.45 (3.21, 3.69)	8.21 (7.91, 8.5)
71-75	2.81 (2.57, 3.05)	5.84 (5.56, 6.12)
76-80	2.19 (1.96, 2.43)	3.95 (3.68, 4.22)
81-85	1.51 (1.28, 1.73)	2.34 (2.08, 2.6)
86+	0.84 (0.63, 1.04)	0.98 (0.76, 1.2)

Note: Restricted to modern prostheses

Figure N25 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC REASONS

The three most common aseptic diagnoses for revision after primary total knee replacement for osteoarthritis are loosening, instability and patella related diagnoses (patella erosion and patellofemoral pain combined).

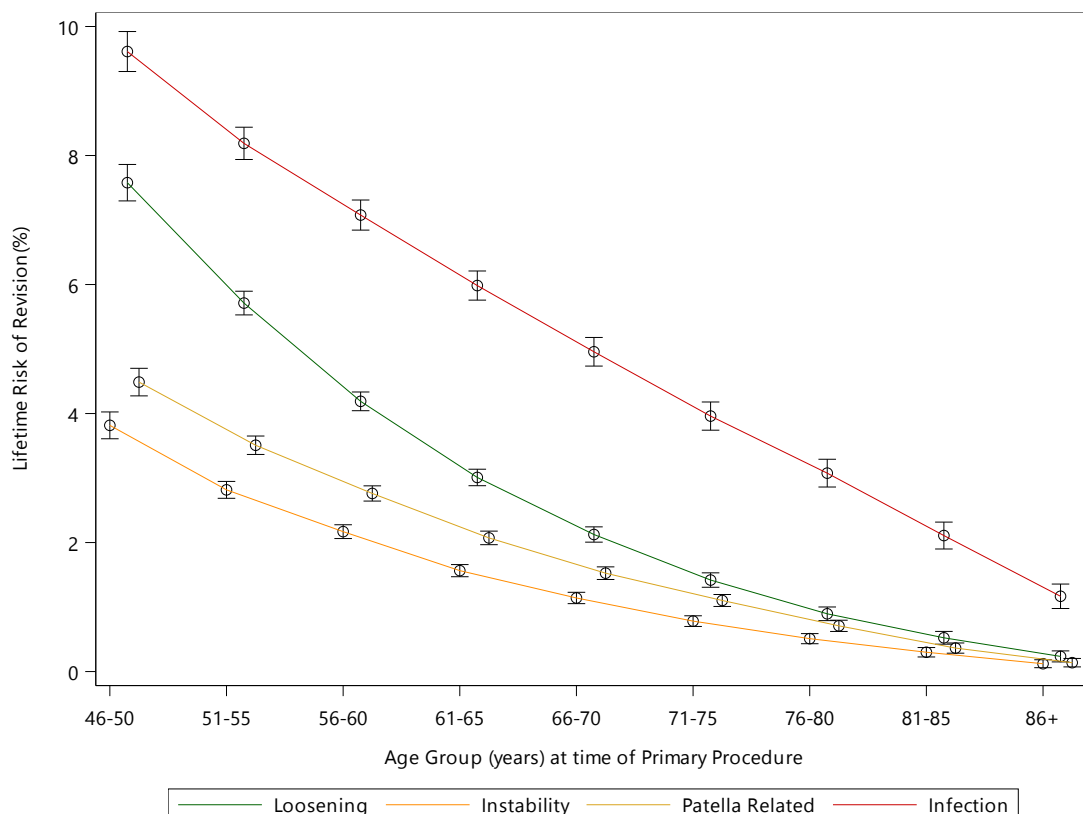
The percentage lifetime risks of revision surgery for each of these reasons after primary total knee replacement for osteoarthritis are shown in Table N51 and Figure N26. Revision for infection carries the highest risk in all age cohorts, followed by revision for loosening, patella related reasons and instability. For each of these diagnoses, the lifetime risk of revision surgery is highest for the youngest patients and decreases for each age cohort.

Table N51 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Loosening, % (95% CI)	Instability, % (95% CI)	Patella Related, % (95% CI)	Infection, % (95% CI)
46-50	7.58 (7.3, 7.86)	3.82 (3.61, 4.02)	4.49 (4.27, 4.7)	9.61 (9.3, 9.92)
51-55	5.71 (5.53, 5.9)	2.82 (2.69, 2.95)	3.51 (3.37, 3.65)	8.19 (7.94, 8.44)
56-60	4.19 (4.04, 4.33)	2.17 (2.06, 2.28)	2.76 (2.64, 2.88)	7.08 (6.84, 7.31)
61-65	3.01 (2.88, 3.14)	1.56 (1.47, 1.66)	2.07 (1.97, 2.18)	5.98 (5.76, 6.21)
66-70	2.12 (2.01, 2.24)	1.14 (1.05, 1.23)	1.53 (1.43, 1.62)	4.96 (4.74, 5.18)
71-75	1.42 (1.31, 1.53)	0.78 (0.7, 0.86)	1.1 (1.01, 1.19)	3.96 (3.74, 4.18)
76-80	0.9 (0.79, 1)	0.51 (0.43, 0.59)	0.71 (0.62, 0.8)	3.08 (2.86, 3.29)
81-85	0.52 (0.42, 0.62)	0.3 (0.23, 0.37)	0.36 (0.28, 0.44)	2.11 (1.9, 2.32)
86+	0.24 (0.15, 0.32)	0.12 (0.06, 0.18)	0.14 (0.07, 0.2)	1.17 (0.98, 1.36)

Note: Restricted to modern prostheses

Figure N26 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO POLYETHYLENE TYPE

One of the major advances in joint replacement technology has been the introduction of XLPE, a bearing material which has markedly reduced wear rates compared to polyethylene that is not highly cross linked. Landmark studies from the AOANJRR have previously demonstrated reduced revision risks with XLPE compared to non-XLPE. In 2015, De Steiger et al.⁹ reported AOANJRR data which showed improved survivorship of knee replacements performed using XLPE. The percentage lifetime risk of revision for patients having their primary knee replacement

in each 5 year cohort according to polyethylene type is shown in Table N52 and Figure N27. XLPE includes both XLPE and XLPE with antioxidant. The number at risk in each 5 year age cohort for each of these designs is shown in Table N53.

For all age cohorts, the lifetime risk of revision where XLPE is used as the bearing surface is much lower than when non-XLPE is used. This difference is most apparent in the youngest 46-50 year cohort, where knee replacements performed with non-XLPE have a 42.85% lifetime risk of revision versus 22.53% where XLPE is used. For both types of polyethylene, the lifetime risk of revision reduces progressively with older age at surgery.

Table N52 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

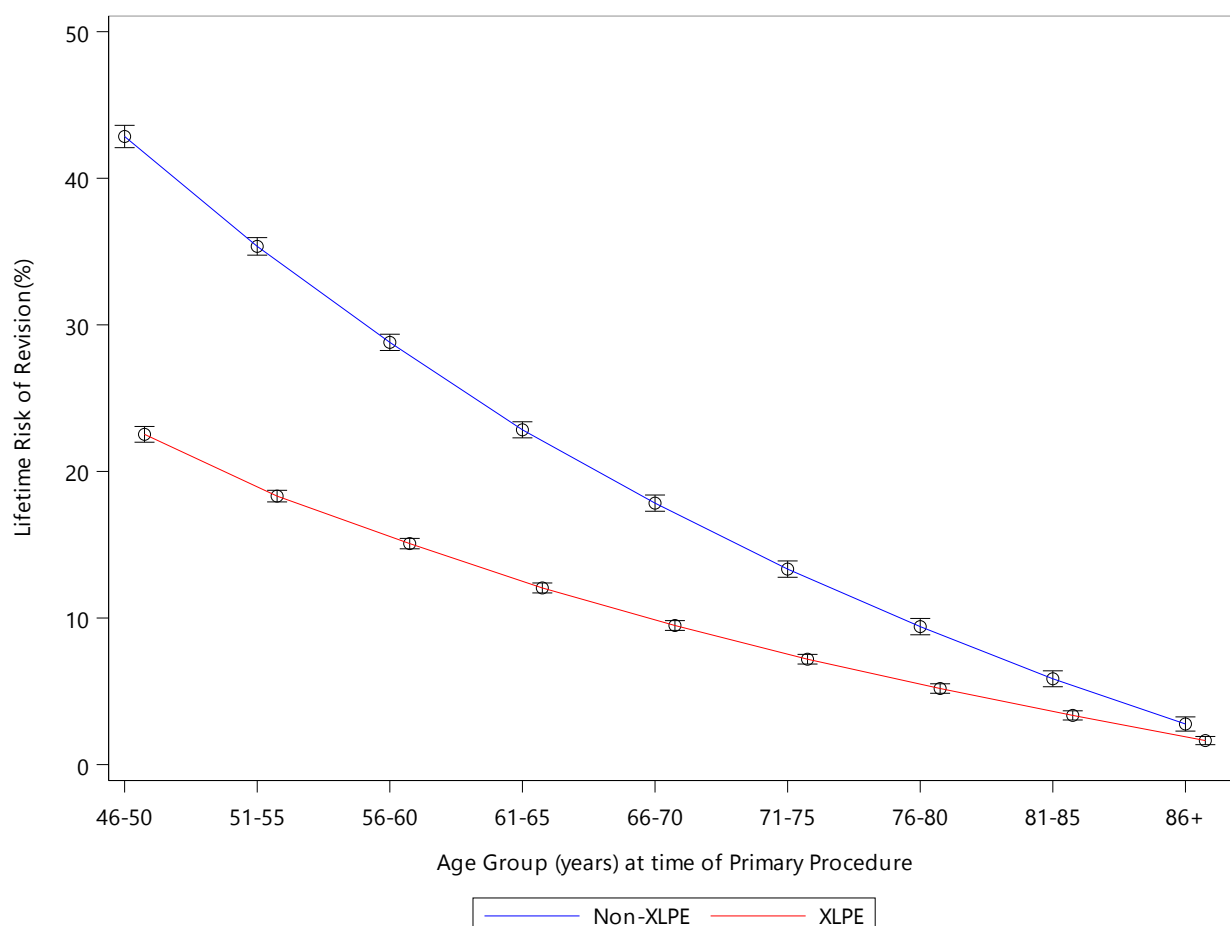
Age Group (years)	Non-XLPE, % (95% CI)	XLPE, % (95% CI)
46-50	42.85 (42.09, 43.61)	22.53 (21.99, 23.07)
51-55	35.35 (34.75, 35.95)	18.32 (17.92, 18.71)
56-60	28.81 (28.25, 29.36)	15.08 (14.72, 15.43)
61-65	22.84 (22.29, 23.39)	12.05 (11.71, 12.39)
66-70	17.84 (17.28, 18.39)	9.49 (9.16, 9.82)
71-75	13.34 (12.78, 13.89)	7.19 (6.86, 7.52)
76-80	9.41 (8.86, 9.97)	5.19 (4.87, 5.51)
81-85	5.86 (5.31, 6.4)	3.36 (3.04, 3.67)
86+	2.77 (2.29, 3.25)	1.64 (1.36, 1.92)

Note: Restricted to modern prostheses

⁹ [PMID: 26119884](#)

Modelling the Lifetime Risk of Revision

Figure N27 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table N53 Number Primary Total Knee Replacement by Age and Polyethylene Type

Age Group (years)	Non XLPE N	XLPE, N
46-50	5579	8580
51-55	16205	25863
56-60	33010	53893
61-65	51149	84416
66-70	59319	100087
71-75	56219	96112
76-80	41681	68579
81-85	20971	31888
86+	5900	9645

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO STABILITY

The three most common stability types in primary total knee replacement are minimally stabilised, posterior stabilised and medial pivot designs. The percentage lifetime risk of revision in each 5 year age cohort after primary total knee replacement according to each of these stability variants is shown in Table N54 and Figure N28.

The number in each 5 year age cohort for each of these three designs is shown in Table N55.

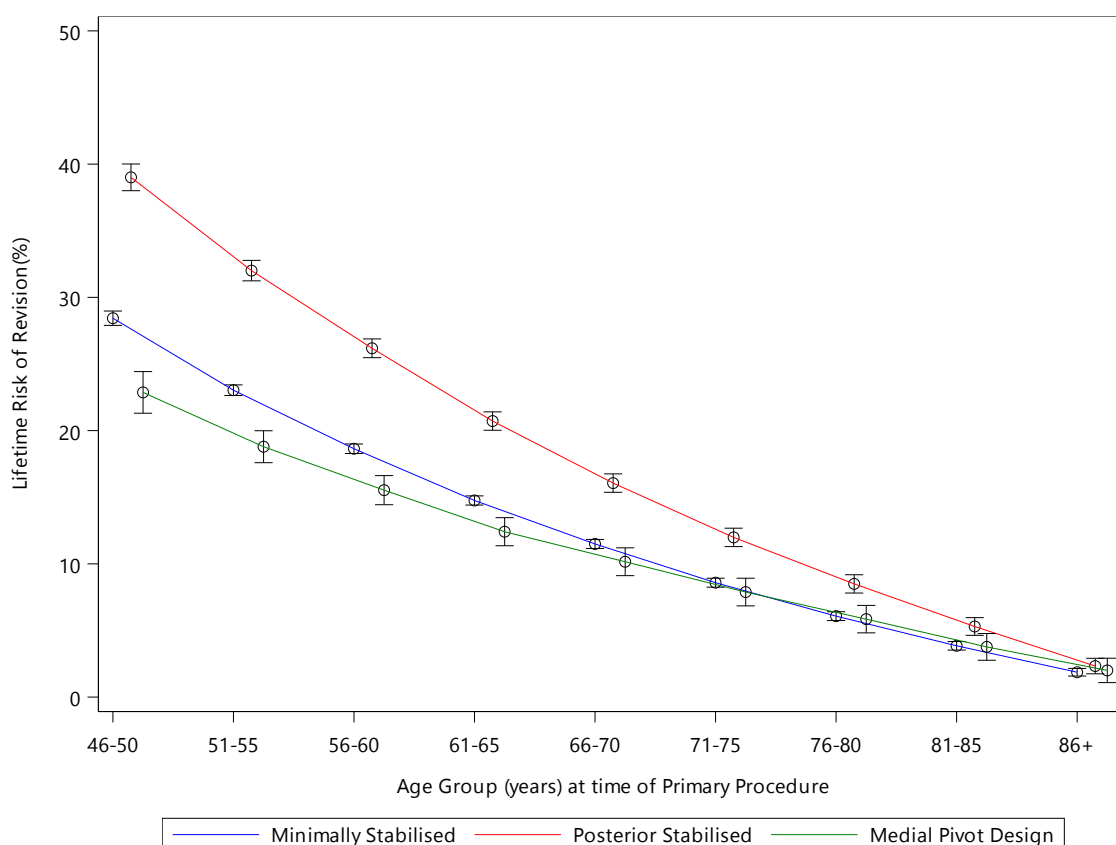
On average, medial pivot designs have the lowest lifetime risk of revision in all age cohorts. Posterior stabilised has the highest risk of revision in all age cohorts.

Table N54 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

Age Group (years)	Minimally Stabilised, % (95% CI)	Posterior Stabilised, % (95% CI)	Medial Pivot Design, % (95% CI)
46-50	28.43 (27.89, 28.97)	39.01 (38.01, 40.01)	22.87 (21.3, 24.43)
51-55	23.03 (22.63, 23.43)	32.01 (31.24, 32.77)	18.79 (17.59, 19.99)
56-60	18.64 (18.28, 19)	26.18 (25.47, 26.88)	15.53 (14.44, 16.62)
61-65	14.76 (14.41, 15.1)	20.72 (20.02, 21.41)	12.41 (11.36, 13.46)
66-70	11.49 (11.15, 11.83)	16.06 (15.37, 16.75)	10.16 (9.11, 11.2)
71-75	8.58 (8.25, 8.92)	11.98 (11.29, 12.68)	7.88 (6.84, 8.92)
76-80	6.07 (5.74, 6.41)	8.49 (7.81, 9.18)	5.85 (4.82, 6.88)
81-85	3.85 (3.53, 4.17)	5.3 (4.63, 5.96)	3.77 (2.76, 4.77)
86+	1.86 (1.58, 2.15)	2.33 (1.75, 2.91)	2 (1.09, 2.92)

Note: Restricted to modern prostheses

Figure N28 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N55 Number of Primary Total Knee Replacement by Age and Stability

Age Group (years)	Medial Pivot Design, N	Minimally Stabilised, N	Posterior Stabilised, N
46-50	1064	9791	3159
51-55	3073	29450	9280
56-60	6258	60889	19323
61-65	10320	95714	28909
66-70	12360	112798	33556
71-75	12030	108210	31300
76-80	8153	77908	23346
81-85	3604	37018	11669
86+	1056	11130	3684

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO PATELLA COMPONENT USAGE

Primary total knee replacement may be performed preserving the native patella surface or where the patella is resurfaced using a polyethylene component. The percentage lifetime risk of revision after primary total knee replacement for each 5 year age cohort according to

patellar component usage is shown in Table N56 and Figure N29. The numbers in each 5 year age cohort according to patellar component usage are shown in Table N57.

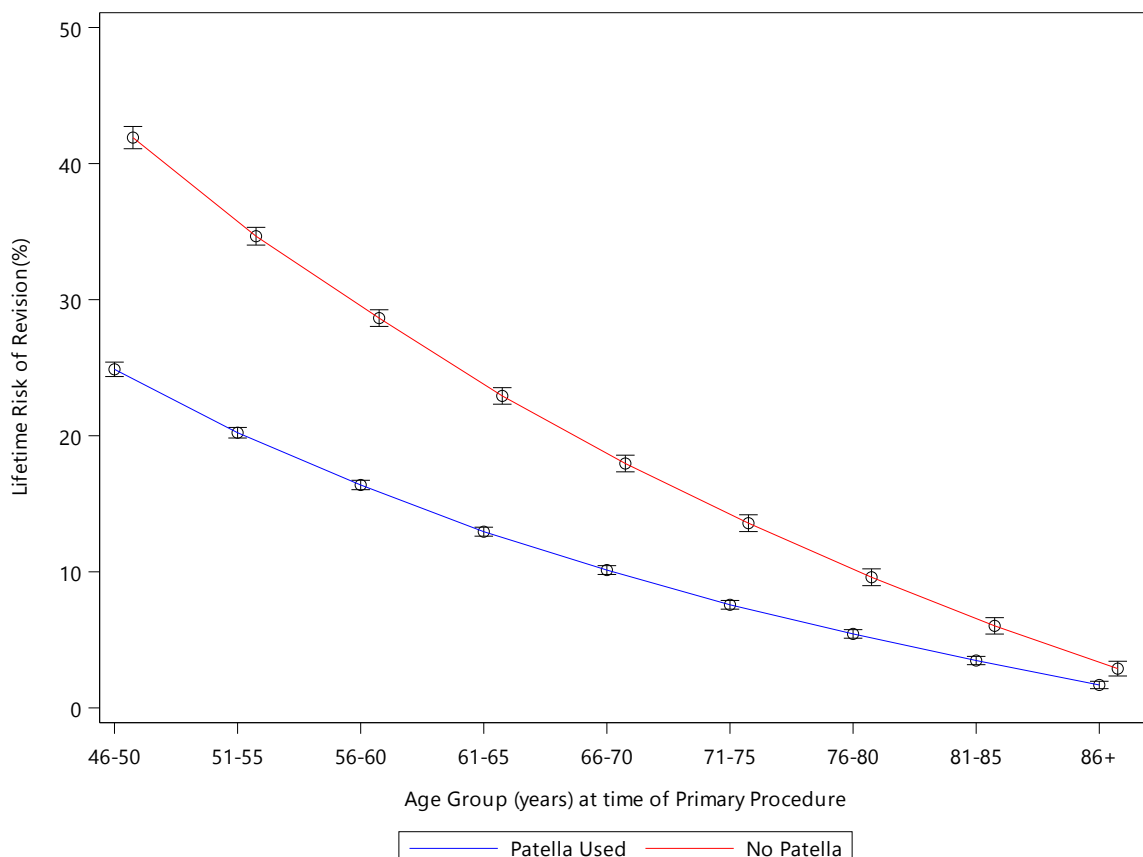
In all age cohorts, there is a lower lifetime risk of revision when the patella is resurfaced.

Table N56 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Patella Component Usage (Primary Diagnosis OA)

Age Group (years)	Patella Used, % (95% CI)	No Patella, % (95% CI)
46-50	24.88 (24.35, 25.41)	41.91 (41.09, 42.73)
51-55	20.22 (19.83, 20.61)	34.66 (34.01, 35.31)
56-60	16.38 (16.04, 16.73)	28.65 (28.03, 29.26)
61-65	12.95 (12.62, 13.28)	22.93 (22.32, 23.53)
66-70	10.13 (9.81, 10.45)	17.96 (17.35, 18.57)
71-75	7.58 (7.26, 7.9)	13.57 (12.96, 14.19)
76-80	5.44 (5.12, 5.75)	9.6 (8.98, 10.22)
81-85	3.48 (3.18, 3.79)	6.03 (5.43, 6.63)
86+	1.68 (1.41, 1.96)	2.89 (2.34, 3.43)

Note: Restricted to modern prostheses

Figure N29 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Patella Component Usage (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N57 Number Primary Total Knee Replacement by Age and Patella Component Usage

Age Group (years)	Patella Used, N	No Patella, N
46-50	9255	4929
51-55	28140	14013
56-60	59401	27653
61-65	93999	41782
66-70	111539	48128
71-75	107028	45540
76-80	76501	33923
81-85	36044	16873
86+	10993	5263

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO FIXATION

The fixation methods of primary total knee replacement may be cemented, cementless or hybrid (most commonly with the tibia cemented). The percentage lifetime risk of revision after primary total knee replacement for each 5 year cohort according to fixation is shown in Table N58 and Figure N30.

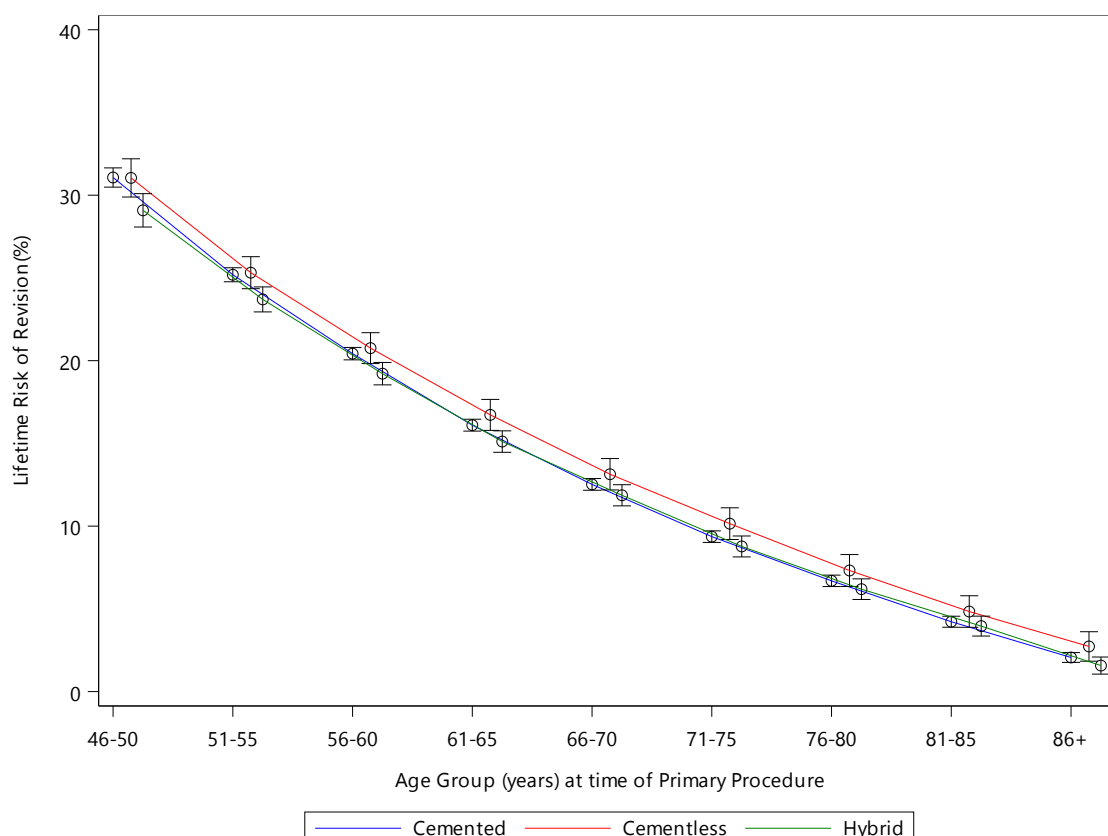
The numbers in each 5 year age cohort are shown in Table N59. In each age cohort, on average, hybrid fixation has the lowest lifetime risk of revision, though there were no significant differences. For each type of fixation, the lifetime risk of revision is highest for the youngest age groups and progressively reduces over time.

Table N58 Percent Lifetime Risk of Revision (95% CI) after Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Age Group (years)	Cemented, % (95% CI)	Cementless, % (95% CI)	Hybrid, % (95% CI)
46-50	31.07 (30.49, 31.65)	31.04 (29.89, 32.2)	29.09 (28.08, 30.09)
51-55	25.19 (24.77, 25.61)	25.32 (24.35, 26.28)	23.7 (22.95, 24.46)
56-60	20.42 (20.05, 20.8)	20.76 (19.82, 21.69)	19.21 (18.54, 19.89)
61-65	16.1 (15.74, 16.46)	16.72 (15.79, 17.66)	15.11 (14.46, 15.76)
66-70	12.52 (12.17, 12.87)	13.14 (12.19, 14.08)	11.86 (11.22, 12.5)
71-75	9.36 (9.02, 9.71)	10.15 (9.19, 11.11)	8.77 (8.14, 9.4)
76-80	6.69 (6.35, 7.04)	7.32 (6.35, 8.28)	6.19 (5.57, 6.81)
81-85	4.22 (3.89, 4.55)	4.84 (3.88, 5.79)	3.96 (3.36, 4.56)
86+	2.06 (1.76, 2.36)	2.73 (1.84, 3.62)	1.57 (1.06, 2.09)

Note: Restricted to modern prostheses

Figure N30 Percent Lifetime Risk (95% CI) of Revision after Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N59 Number Primary Total Knee Replacement by Age and Fixation

Age Group (years)	Cemented, N	Cementless, N	Hybrid, N
46-50	8506	2849	2829
51-55	25595	8250	8308
56-60	54011	16119	16924
61-65	85240	23784	26757
66-70	102578	25703	31386
71-75	99815	22904	29849
76-80	74349	14812	21263
81-85	36745	6080	10092
86+	11697	1625	2934

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Total Shoulder Replacement

Modelling the Lifetime Revision Risk – Shoulder Replacement

Osteoarthritis is the most common diagnosis for total anatomic shoulder replacement. This is equally true for total stemmed reverse shoulder replacement; however, rotator cuff arthropathy is also a frequently encountered diagnosis and will also be reported in the lifetime risk for total stemmed reverse replacement.

Registry shoulder data collection was commenced during 2004, with full national enrolment implemented in November 2007.

In this section, to reflect current practice, the analysis excludes prostheses that are no longer in use. The total cohort is 71,599 patients with an average age of 72.6 years, with 55.7% being female. The demographics of the shoulder replacement cohort are shown in Table N60.

Table N60 Summary of Primary Shoulder Replacement Patients by Class and Primary Diagnosis

Variable		Total Anatomic Shoulder Replacement (Primary Diagnosis OA) ⁴ (n=11,235)	Total Stemmed Reverse Shoulder Replacement (Primary Diagnosis OA) ⁵ (n=32,142)	Total Stemmed Reverse Shoulder Replacement (Primary Diagnosis RCA) ⁶ (n=28,222)	TOTAL (n=71,599)
Follow Up Years	Mean (SD)	5 (3.6)	4.6 (3.6)	4.4 (3.4)	4.6 (3.5)
	Median (IQR)	4.5 (2.1, 7.4)	3.9 (1.7, 6.9)	3.6 (1.5, 6.5)	3.8 (1.7, 6.8)
	Minimum	0	0	0	0
	Maximum	19.4	19.9	19.6	19.9
Age	Mean (SD)	67.5 (8.5)	73.5 (7.7)	73.5 (7.7)	72.6 (8.1)
	Median (IQR)	68 (62, 74)	74 (69, 79)	74 (69, 79)	73 (67, 78)
Age Group	<55	841 (7.5%)	441 (1.4%)	326 (1.2%)	1,608 (2.2%)
	55-64	3,137 (27.9%)	3,486 (10.8%)	3,196 (11.3%)	9,819 (13.7%)
	65-74	4,835 (43%)	12,849 (40%)	11,329 (40.1%)	29,013 (40.5%)
	≥75	2,422 (21.6%)	15,366 (47.8%)	13,371 (47.4%)	31,159 (43.5%)
Sex	Male	5,405 (48.1%)	12,845 (40%)	13,495 (47.8%)	31,745 (44.3%)
	Female	5,830 (51.9%)	19,297 (60%)	14,727 (52.2%)	39,854 (55.7%)
BMI ¹	Underweight (<18.50)	27 (0.3%)	133 (0.5%)	140 (0.6%)	300 (0.5%)
	Normal (18.50-24.99)	1,428 (14.3%)	4,135 (15.3%)	4,311 (17.5%)	9,874 (16%)
	Pre Obese (25.00-29.99)	3,345 (33.6%)	9,150 (33.8%)	8,734 (35.5%)	21,229 (34.4%)
	Obese Class 1 (30.00-34.99)	2,968 (29.8%)	7,515 (27.7%)	6,827 (27.8%)	17,310 (28.1%)
	Obese Class 2 (35.00-39.99)	1,453 (14.6%)	3,907 (14.4%)	3,029 (12.3%)	8,389 (13.6%)
	Obese Class 3 (≥40.00)	731 (7.3%)	2,258 (8.3%)	1,553 (6.3%)	4,542 (7.4%)
Obesity	Obese	5,152 (51.8%)	13,680 (50.5%)	11,409 (46.4%)	30,241 (49.1%)
	Not Obese	4,800 (48.2%)	13,418 (49.5%)	13,185 (53.6%)	31,403 (50.9%)
ASA Score ²	1	665 (6.3%)	775 (2.6%)	722 (2.7%)	2,162 (3.3%)
	2	5,448 (51.6%)	12,189 (41.4%)	10,805 (40.9%)	28,442 (42.8%)
	3	4,323 (41%)	15,695 (53.3%)	14,235 (53.9%)	34,253 (51.6%)
	4	112 (1.1%)	772 (2.6%)	667 (2.5%)	1,551 (2.3%)
	5	1 (0%)	2 (0%)	1 (0%)	4 (0%)
Class	Total Stemmed Anatomic	5,396 (48%)			5,396 (7.5%)
	Total Stemmed Reverse		32,142 (100%)	28,222 (100%)	60,364 (84.3%)
	Total Stemless Anatomic	5,839 (52%)			5,839 (8.2%)



Modelling the Lifetime Risk of Revision

Table N60 **Cont.**

Variable		Total Anatomic Shoulder Replacement (Primary Diagnosis OA) ⁴ (n=11,235)	Total Stemmed Reverse Shoulder Replacement (Primary Diagnosis OA) ⁵ (n=32,142)	Total Stemmed Reverse Shoulder Replacement (Primary Diagnosis RCA) ⁶ (n=28,222)	TOTAL (n=71,599)
Bearing Surface	Ceramic/Non XLPE	521 (4.6%)	5 (0%)	10 (0%)	536 (0.7%)
	Ceramic/XLPE	196 (1.7%)	3 (0%)	2 (0%)	201 (0.3%)
	Ceramic/XLPE + Antioxidant	2,993 (26.6%)	84 (0.3%)	75 (0.3%)	3,152 (4.4%)
	Metal/Non XLPE	5,364 (47.7%)	501 (1.6%)	467 (1.7%)	6,332 (8.8%)
	Metal/XLPE	2,128 (18.9%)	4,623 (14.4%)	3,938 (14%)	10,689 (14.9%)
	Metal/XLPE + Antioxidant	32 (0.3%)	249 (0.8%)	213 (0.8%)	494 (0.7%)
	Non XLPE/Metal		18,388 (57.2%)	16,305 (57.8%)	34,693 (48.5%)
	XLPE/Metal		1,990 (6.2%)	1,367 (4.8%)	3,357 (4.7%)
	XLPE + Antioxidant/Metal		6,246 (19.4%)	5,799 (20.5%)	12,045 (16.8%)
	Unknown	1 (0%)	53 (0.2%)	46 (0.2%)	100 (0.1%)
Polyethylene Use³	Non XLPE	5,885 (52.4%)	18,392 (57.3%)	16,311 (57.9%)	40,588 (56.7%)
	XLPE	5,349 (47.6%)	8,242 (25.7%)	7,173 (25.4%)	20,764 (29%)
	Other Bearing Surface		5,466 (17%)	4,706 (16.7%)	10,172 (14.2%)
Fixation	Cemented	469 (4.2%)	119 (0.4%)	36 (0.1%)	624 (0.9%)
	Cementless	1,161 (10.3%)	28,777 (89.5%)	25,907 (91.8%)	55,845 (78%)
	Hybrid (Glenoid Cemented)	9,605 (85.5%)	126 (0.4%)	140 (0.5%)	9,871 (13.8%)
	Hybrid (Glenoid Cementless)		3,120 (9.7%)	2,139 (7.6%)	5,259 (7.3%)

Abbreviations: SD - standard deviation, IQR - interquartile range, BMI - Body Mass Index (kg/m²), ASA - American Society of Anesthesiologists

¹Excludes 9,955 procedures with unknown BMI

²Excludes 5,187 procedures with unknown ASA Score

³Excludes 75 procedures with unknown Polyethylene Use

⁴1,121 bilaterals with a mean of 2.1 years apart

⁵2805 bilaterals with a mean of 2.3 years apart

⁶1790 bilaterals with a mean of 2.5 years apart



Modelling the Lifetime Risk of Revision

Modelling the Lifetime Risk of Revision - Total Anatomic Shoulder Replacement for Osteoarthritis

The most common diagnosis for patients undergoing total anatomic shoulder replacement is osteoarthritis. There are 11,235 patients in this group. The mean age is 67.5 years, with females predominating (51.9%).

LIFETIME REVISION RISK ACCORDING TO AGE

The risk of revision for total anatomic shoulder replacement is related to the life expectancy of the patient. The proportions of patients undergoing total shoulder replacement for osteoarthritis and 5 yearly cohorts, together with the

proportions of mortality and revision surgery during the study period, are shown in Table N61. The 10 and 15 year revision free survival estimates for each 5 year age cohort are shown in Table N62.

The number of patients under the age of 50 years requiring total anatomic shoulder replacement is low; however, their life expectancy places them at a higher lifetime risk for revision surgery. Conversely, the proportion of patients over the age of 85 is also low. Their shorter life expectancy means the risk of revision surgery over their lifetime is very low. The percentage lifetime risk of revision for patients undergoing total anatomic shoulder replacement for osteoarthritis is shown in Table N63 and Figure N31.

Table N61 Characteristics of Primary Total Anatomic Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Total, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	289	3.54 (1.41, 6.31)	9 (3.11%)	22 (7.61%)
51-55	743	3.66 (1.7, 6.86)	9 (1.21%)	46 (6.19%)
56-60	1299	4.11 (1.79, 6.96)	36 (2.77%)	74 (5.7%)
61-65	2112	4.63 (2.05, 7.43)	72 (3.41%)	105 (4.97%)
66-70	2512	4.67 (2.18, 7.45)	130 (5.18%)	115 (4.58%)
71-75	2256	4.71 (2.26, 7.61)	174 (7.71%)	79 (3.5%)
76-80	1369	4.53 (2.15, 7.63)	215 (15.7%)	47 (3.43%)
81-85	535	4.66 (2.37, 7.53)	138 (25.79%)	8 (1.5%)
86+	120	5.05 (2.47, 7.06)	60 (50%)	2 (1.67%)

Note: Restricted to modern prostheses

Table N62 Revision-Free Survival (95% CI) Estimates after Primary Total Anatomic Shoulder Replacement by Revision-Free Years (Primary Diagnosis OA)

Age Group (years)	10 Years	15 Years
46-50	87.8 (79.7, 92.8)	87.8 (79.7, 92.8)
51-55	89.5 (85.4, 92.6)	78.8 (63.2, 88.4)
56-60	89.2 (85.9, 91.8)	87.2 (81.4, 91.2)
61-65	90.8 (88.2, 92.8)	85.7 (79.0, 90.4)
66-70	91.8 (89.7, 93.5)	88.1 (84.1, 91.2)
71-75	95.2 (94.0, 96.2)	95.2 (94.0, 96.2)
76-80	95.0 (93.1, 96.3)	95.0 (93.1, 96.3)
81-85	98.2 (96.4, 99.1)	98.2 (96.4, 99.1)
86+	98.0 (92.3, 99.5)	98.0 (92.3, 99.5)

Note: Restricted to modern prostheses

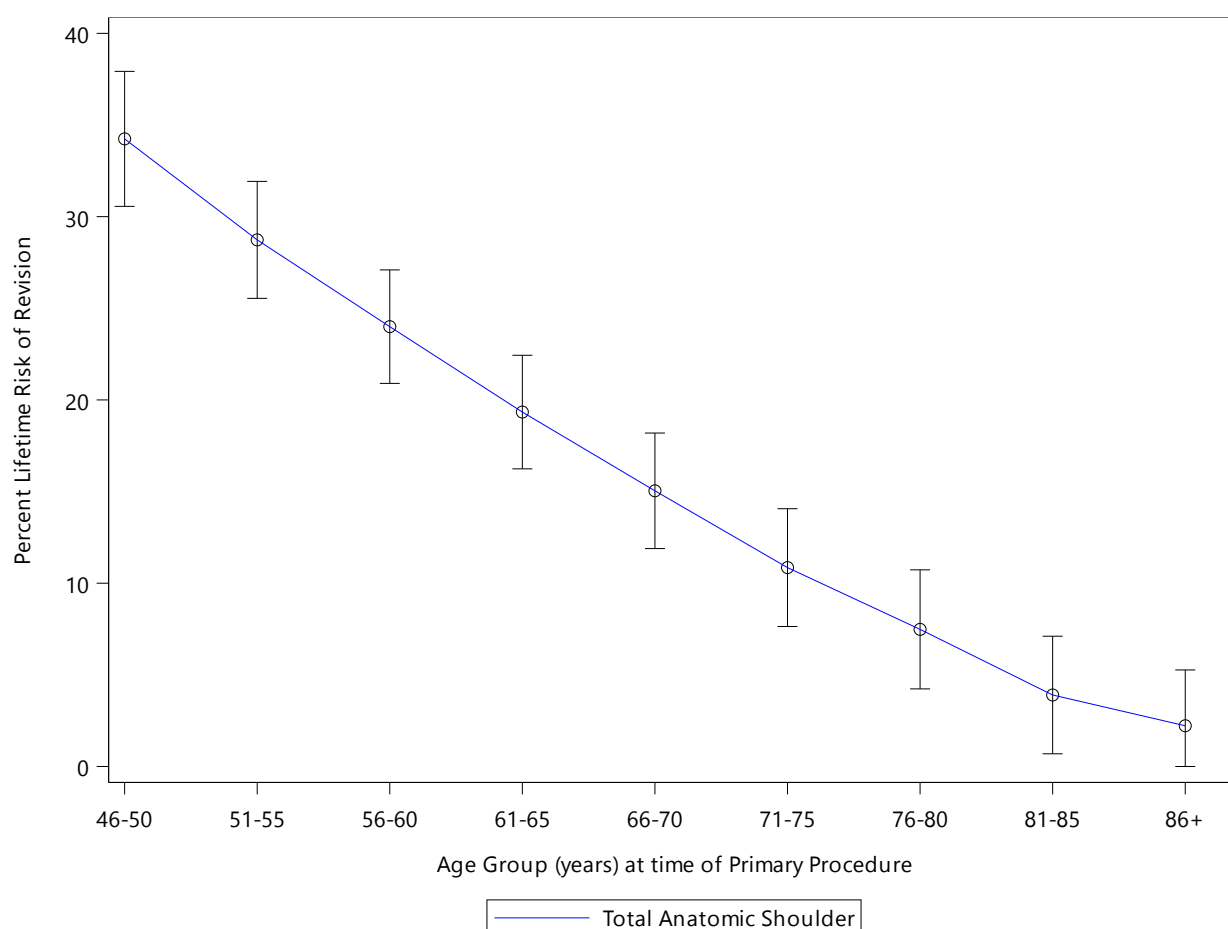
Modelling the Lifetime Risk of Revision

Table N63 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)
46-50	34.24 (30.56, 37.92)
51-55	28.73 (25.54, 31.92)
56-60	24 (20.9, 27.09)
61-65	19.34 (16.24, 22.44)
66-70	15.04 (11.89, 18.19)
71-75	10.85 (7.64, 14.06)
76-80	7.48 (4.23, 10.73)
81-85	3.9 (0.69, 7.11)
86+	2.22 (0, 5.27)

Note: Restricted to modern prostheses

Figure N31 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE AND SEX

The numbers of patients undergoing primary total anatomic shoulder replacement for osteoarthritis in 5 yearly cohorts, together with the proportions of mortality and revision surgery over the study period for both males and females, are shown in Table N64 and Table N65.

The percentage lifetime risk of revision surgery after total anatomic shoulder replacement for osteoarthritis in 5 yearly cohorts for both males and females is shown in Table N66 and Figure N32. On average, females younger than 71 have a higher lifetime risk of revision surgery than males. After 71 years of age, on average, males have a higher risk of revision.

Table N64 Characteristics of Male Primary Total Anatomic Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Males, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	220	3.75 (1.57, 6.46)	7 (3.18%)	13 (5.91%)
51-55	505	3.55 (1.71, 6.29)	8 (1.58%)	20 (3.96%)
56-60	776	3.84 (1.79, 6.77)	16 (2.06%)	34 (4.38%)
61-65	1175	4.47 (2.05, 7.08)	48 (4.09%)	51 (4.34%)
66-70	1162	4.6 (2.15, 7.29)	73 (6.28%)	39 (3.36%)
71-75	913	4.61 (2.1, 7.18)	76 (8.32%)	26 (2.85%)
76-80	469	4.11 (1.92, 7.46)	85 (18.12%)	10 (2.13%)
81-85	161	4.22 (2.25, 7.01)	42 (26.09%)	2 (1.24%)
86+	24	4.79 (3.31, 6.47)	14 (58.33%)	1 (4.17%)

Note: Restricted to modern prostheses

Table N65 Characteristics of Female Primary Total Anatomic Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Females, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	69	3.1 (1.05, 5.84)	2 (2.9%)	9 (13.04%)
51-55	238	4.09 (1.69, 7.55)	1 (0.42%)	26 (10.92%)
56-60	523	4.43 (1.79, 7.15)	20 (3.82%)	40 (7.65%)
61-65	937	4.85 (2.09, 7.89)	24 (2.56%)	54 (5.76%)
66-70	1350	4.7 (2.19, 7.63)	57 (4.22%)	76 (5.63%)
71-75	1343	4.86 (2.34, 7.82)	98 (7.3%)	53 (3.95%)
76-80	900	4.74 (2.3, 7.76)	130 (14.44%)	37 (4.11%)
81-85	374	4.86 (2.43, 7.7)	96 (25.67%)	6 (1.6%)
86+	96	5.06 (2.43, 7.24)	46 (47.92%)	1 (1.04%)

Note: Restricted to modern prostheses

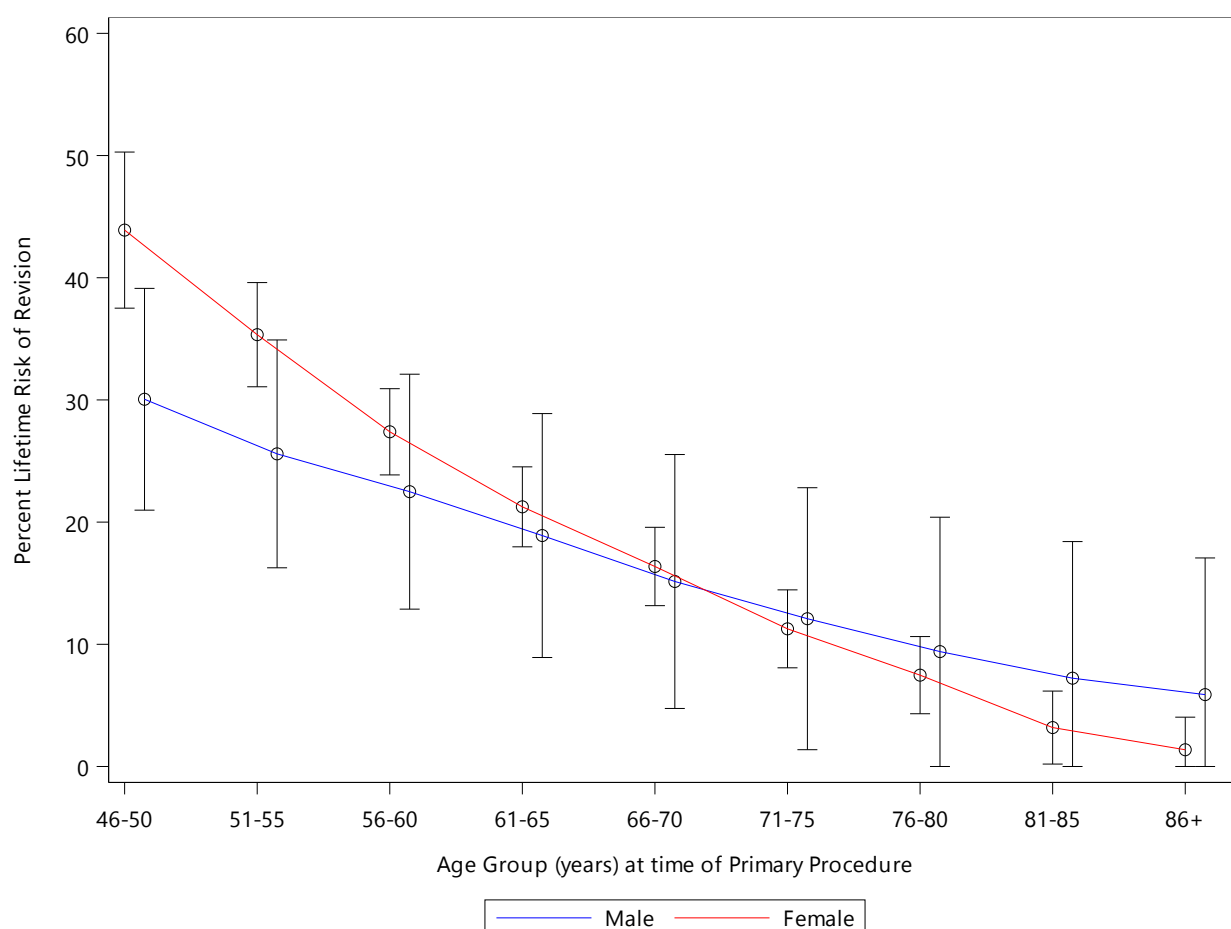
Modelling the Lifetime Risk of Revision

Table N66 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Arthroplasty by Sex (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)	Male, % (95% CI)	Female, % (95% CI)
46-50	34.24 (30.56, 37.92)	30.05 (20.98, 39.13)	43.9 (37.51, 50.29)
51-55	28.73 (25.54, 31.92)	25.58 (16.26, 34.91)	35.34 (31.08, 39.6)
56-60	24 (20.9, 27.09)	22.49 (12.88, 32.1)	27.39 (23.86, 30.92)
61-65	19.34 (16.24, 22.44)	18.9 (8.92, 28.88)	21.25 (17.98, 24.52)
66-70	15.04 (11.89, 18.19)	15.14 (4.75, 25.53)	16.37 (13.16, 19.57)
71-75	10.85 (7.64, 14.06)	12.09 (1.37, 22.81)	11.26 (8.08, 14.45)
76-80	7.48 (4.23, 10.73)	9.4 (0, 20.4)	7.48 (4.32, 10.63)
81-85	3.9 (0.69, 7.11)	7.23 (0, 18.41)	3.19 (0.2, 6.17)
86+	2.22 (0, 5.27)	5.88 (0, 17.07)	1.37 (0, 4.04)

Note: Restricted to modern prostheses

Figure N32 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO BMI

The AOANJRR has collected the body mass index data for patients having joint replacement surgery since 2015, and therefore, the lifetime risk of revision analysis according to BMI is based on this cohort with a maximum 10 year follow-up. The analysis according to BMI may be simplified by dichotomising BMI into obese and not obese groups. The percentage revision risk for patients in the not obese and obese categories is shown in Table N67 and Figure N33.

The numbers of patients in each obesity category for each 5 year age cohort are shown in Table N68.

For both obesity categories, the highest lifetime risk of revision occurs for those who have their primary total anatomic shoulder replacement at a younger age, with risk decreasing with increasing age group. In all age groups, those patients having their primary total anatomic shoulder replacement who are obese have a lifetime revision risk greater than a no obese patient of the same age.

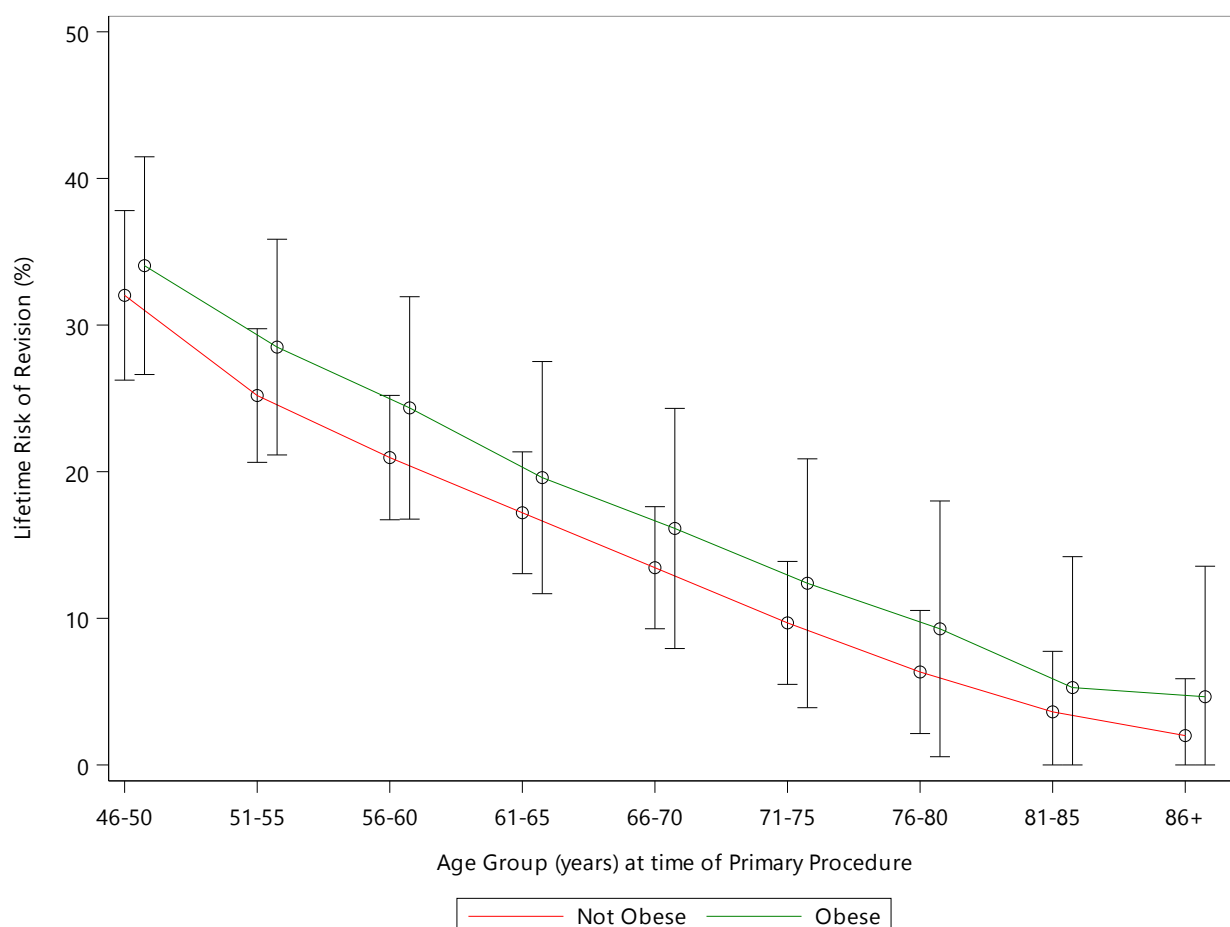
Table N67 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Obesity (Primary Diagnosis OA)

Age Group (years)	Not Obese, % (95% CI)	Obese, % (95% CI)
46-50	32.02 (26.24, 37.81)	34.05 (26.63, 41.48)
51-55	25.19 (20.64, 29.75)	28.5 (21.14, 35.85)
56-60	20.96 (16.72, 25.2)	24.35 (16.76, 31.93)
61-65	17.2 (13.04, 21.35)	19.6 (11.68, 27.51)
66-70	13.45 (9.29, 17.61)	16.13 (7.94, 24.32)
71-75	9.69 (5.49, 13.88)	12.39 (3.9, 20.88)
76-80	6.34 (2.14, 10.54)	9.28 (0.56, 18)
81-85	3.62 (0, 7.75)	5.28 (0, 14.2)
86+	2 (0, 5.88)	4.65 (0, 13.55)

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

Figure N33 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Obesity (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table N68 Number of Primary Total Anatomic Shoulder Replacements by Age and Obesity (Primary Diagnosis OA)

Age Group (years)	Not Obese, N	Obese, N
46-50	111	157
51-55	263	422
56-60	510	684
61-65	861	1032
66-70	1070	1172
71-75	999	989
76-80	665	501
81-85	260	168
86+	61	25

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC VERSUS SEPTIC

While the risk of revision for infection in total anatomic shoulder replacement is low, it is an important risk to consider. This analysis considers lifetime revision risk for the diagnosis of infection versus aseptic diagnosis (Table N69 and Figure N34).

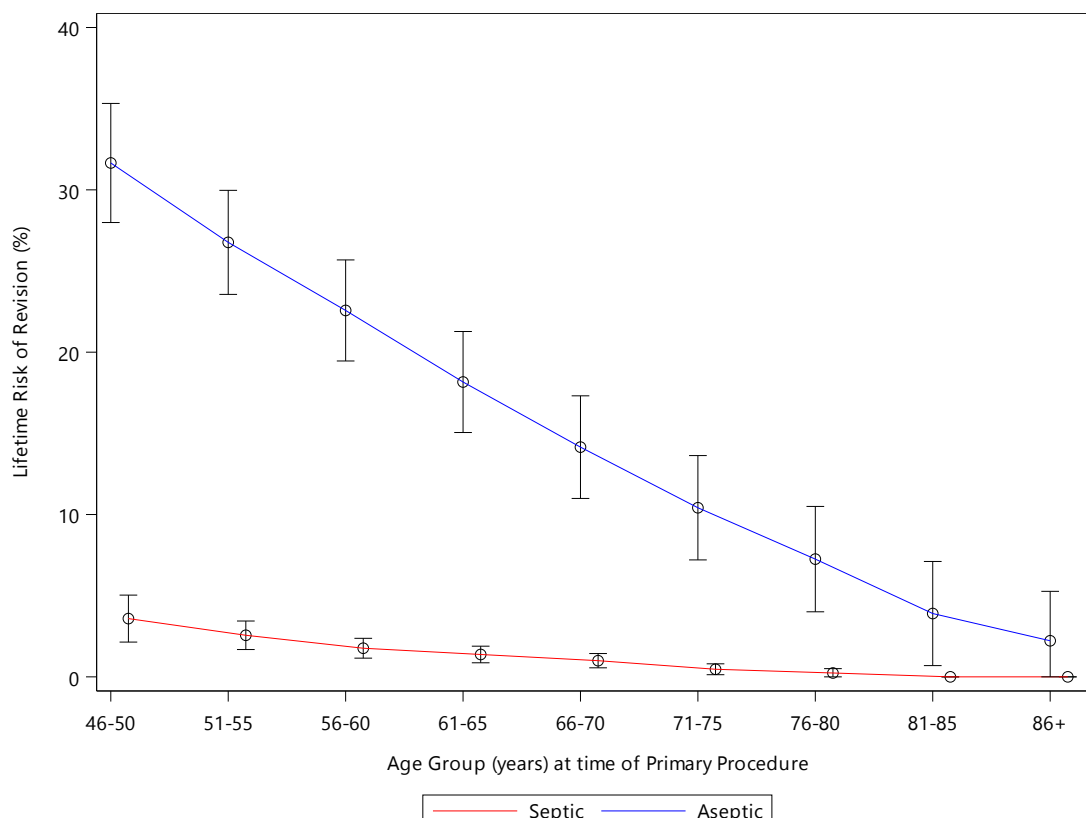
The lifetime risk for revision for infection is highest in younger patients. For those patients 46–50 years of age, the risk is 3.59%, reducing to 0.24% for the age cohort 76–80 years of age. Equally, the lifetime risk of revision for aseptic cause is highest at a younger age, reducing progressively with increasing age. At all age groups, the risk of requiring revision for aseptic causes is higher than the risk for revision surgery for infection.

Table N69 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	3.59 (2.14, 5.04)	31.66 (27.99, 35.32)
51-55	2.56 (1.68, 3.44)	26.76 (23.56, 29.97)
56-60	1.76 (1.15, 2.37)	22.57 (19.46, 25.68)
61-65	1.38 (0.87, 1.89)	18.16 (15.05, 21.27)
66-70	1 (0.56, 1.44)	14.15 (10.99, 17.31)
71-75	0.47 (0.13, 0.8)	10.42 (7.2, 13.63)
76-80	0.24 (0, 0.51)	7.25 (4.01, 10.5)
81-85	0 (0, 0)	3.9 (0.69, 7.11)
86+	0 (0, 0)	2.22 (0, 5.27)

Note: Restricted to modern prostheses

Figure N34 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO SEX AND DIAGNOSIS – ASEPTIC VERSUS SEPTIC

The lifetime risk of revision surgery following total anatomic shoulder replacement for osteoarthritis differs according to age, sex, and whether the diagnosis for revision is infection or aseptic diagnoses. The lifetime revision risk for males in each 5 year cohort according to the underlying diagnosis is shown in Table N70 and Figure N35.

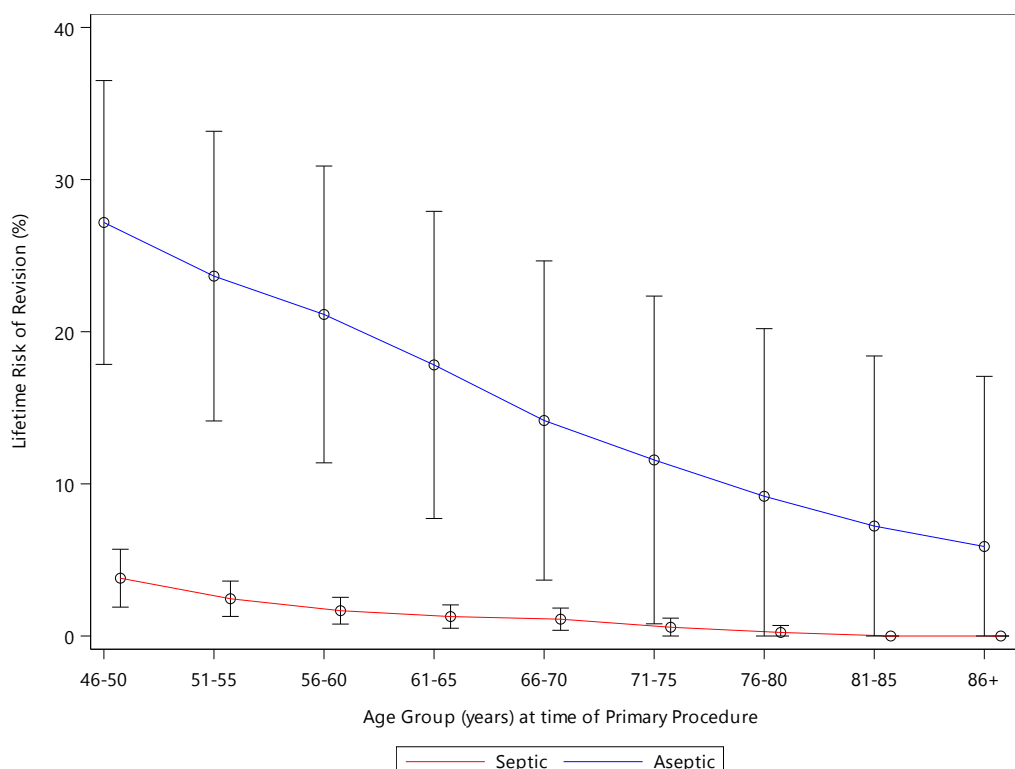
The lifetime risk of revision for females in each 5 year cohort according to the underlying diagnosis is shown in Table N71 and Figure N36. In each age cohort, the risk of revision for infection in males is higher than for females, with young males at the highest risk. The risk of revision for aseptic reasons for females in each age cohort, by contrast, is approximately twice that for males.

Table N70 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	3.8 (1.9, 5.7)	27.18 (17.85, 36.51)
51-55	2.45 (1.29, 3.61)	23.65 (14.13, 33.17)
56-60	1.66 (0.78, 2.54)	21.14 (11.38, 30.89)
61-65	1.28 (0.51, 2.05)	17.82 (7.72, 27.91)
66-70	1.11 (0.38, 1.84)	14.16 (3.67, 24.66)
71-75	0.58 (0, 1.18)	11.57 (0.8, 22.34)
76-80	0.23 (0, 0.69)	9.18 (0, 20.2)
81-85	0 (0, 0)	7.23 (0, 18.41)
86+	0 (0, 0)	5.88 (0, 17.07)

Note: Restricted to modern prostheses

Figure N35 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



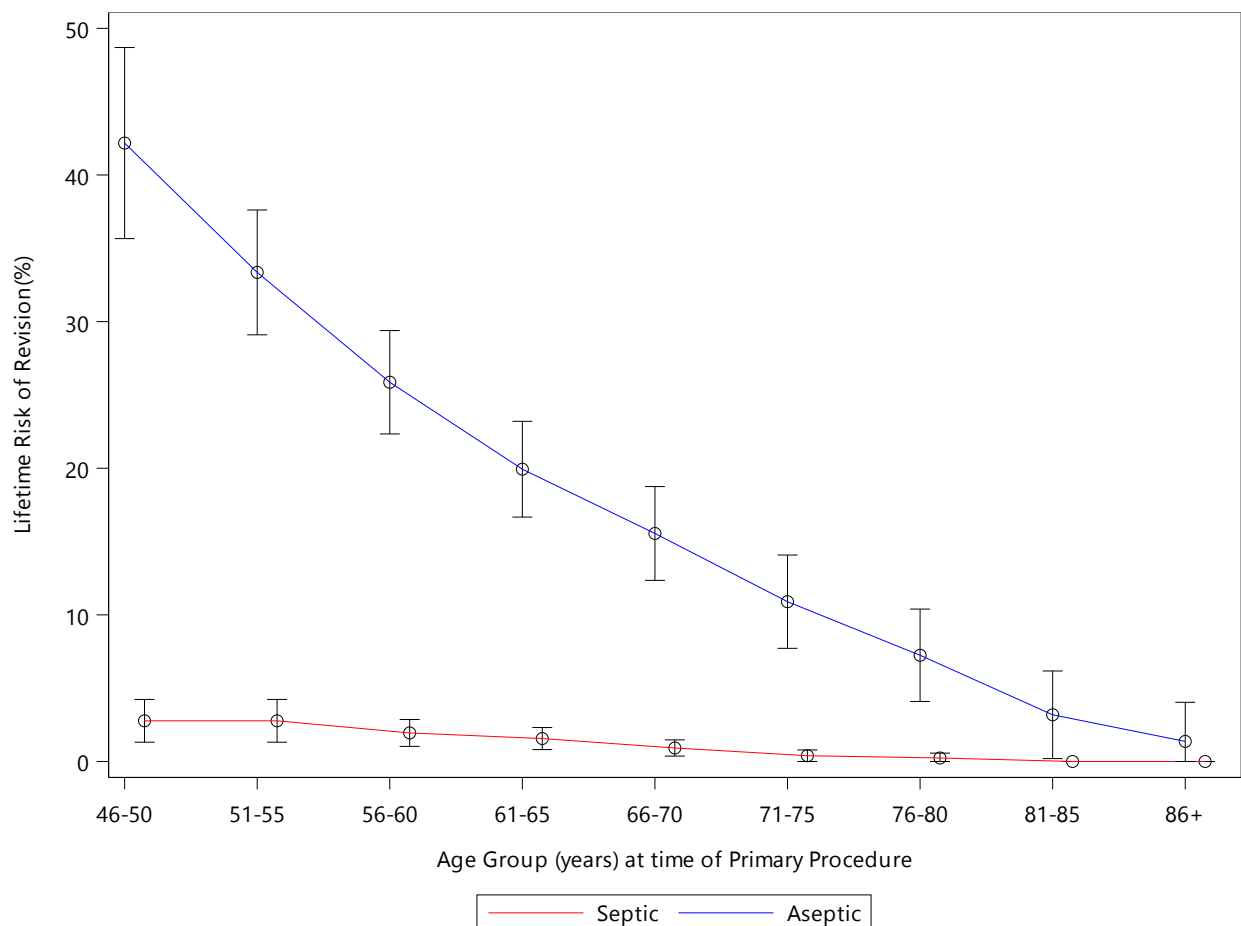
Modelling the Lifetime Risk of Revision

Table N71 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement in Female Patients, by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	2.77 (1.32, 4.23)	42.18 (35.66, 48.69)
51-55	2.77 (1.32, 4.23)	33.36 (29.1, 37.61)
56-60	1.95 (1.03, 2.87)	25.86 (22.34, 29.39)
61-65	1.56 (0.81, 2.32)	19.93 (16.67, 23.2)
66-70	0.92 (0.37, 1.47)	15.55 (12.35, 18.75)
71-75	0.39 (0, 0.79)	10.9 (7.72, 14.08)
76-80	0.24 (0, 0.57)	7.24 (4.09, 10.39)
81-85	0 (0, 0)	3.19 (0.2, 6.17)
86+	0 (0, 0)	1.37 (0, 4.04)

Note: Restricted to modern prostheses

Figure N36 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC REASONS

The three most common reasons for revision of primary total anatomic shoulder replacement in osteoarthritis are loosening, instability/dislocation and rotator cuff insufficiency. The percentage lifetime risks of revision surgery for each of these reasons, including infection after primary total anatomic

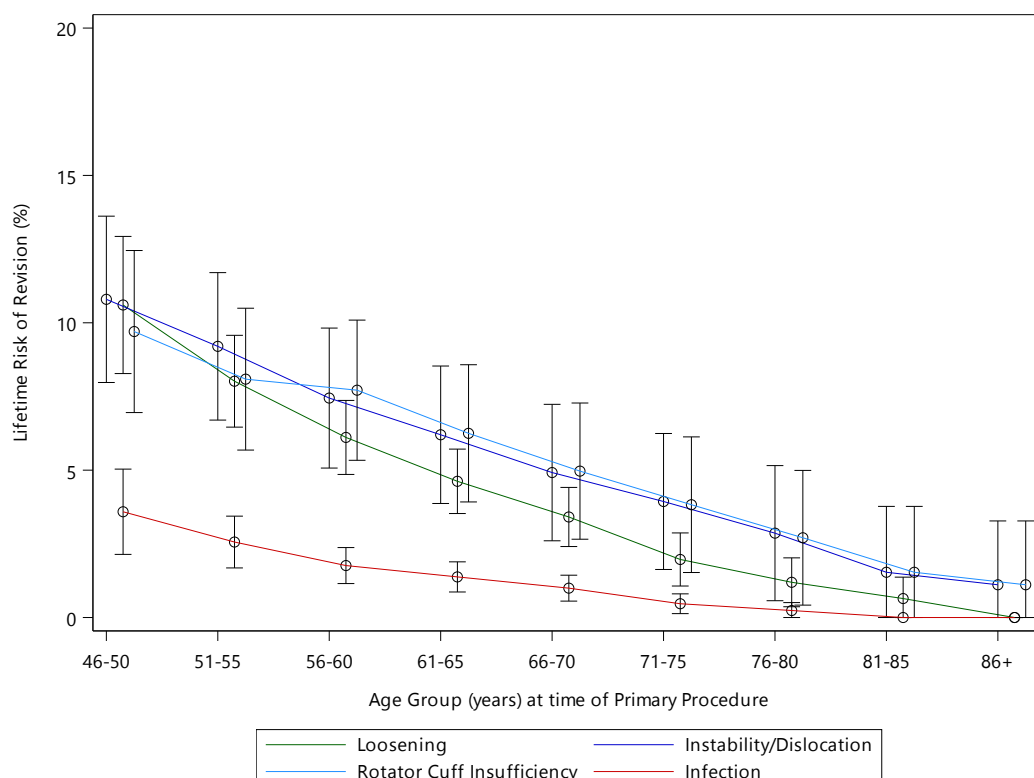
shoulder replacement for osteoarthritis, are shown in Table N72 and Figure N37. For each of these diagnoses, the lifetime risk of revision surgery is highest for the youngest patient and decreases with each age cohort and remains similar throughout.

Table N72 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Loosening, % (95% CI)	Instability/Dislocation, % (95% CI)	Rotator Cuff Insufficiency, % (95% CI)	Infection, % (95% CI)
46-50	10.6 (8.28, 12.93)	10.8 (7.97, 13.62)	9.7 (6.95, 12.45)	3.59 (2.14, 5.04)
51-55	8.02 (6.46, 9.58)	9.2 (6.7, 11.7)	8.09 (5.68, 10.49)	2.56 (1.68, 3.44)
56-60	6.11 (4.85, 7.37)	7.45 (5.07, 9.82)	7.71 (5.33, 10.09)	1.76 (1.15, 2.37)
61-65	4.62 (3.53, 5.71)	6.2 (3.87, 8.53)	6.25 (3.92, 8.58)	1.38 (0.87, 1.89)
66-70	3.41 (2.41, 4.41)	4.92 (2.6, 7.23)	4.97 (2.66, 7.28)	1 (0.56, 1.44)
71-75	1.97 (1.07, 2.87)	3.94 (1.63, 6.24)	3.83 (1.53, 6.13)	0.47 (0.13, 0.8)
76-80	1.2 (0.37, 2.02)	2.86 (0.57, 5.15)	2.71 (0.42, 4.99)	0.24 (0, 0.51)
81-85	0.64 (0, 1.37)	1.54 (0, 3.77)	1.54 (0, 3.77)	0 (0, 0)
86+	0 (0, 0)	1.11 (0, 3.28)	1.11 (0, 3.28)	0 (0, 0)

Note: Restricted to modern prostheses

Figure N37 Percent Lifetime Risk of Revision (95% CI) after Primary Total Anatomic Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Modelling the Lifetime Risk of Revision – Total Stemmed Reverse Shoulder Replacement for Osteoarthritis

The most common diagnosis leading to the need for total stemmed reverse replacement surgery in Australia is osteoarthritis. In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 32,142 patients with a mean age of 73.5 years, with most patients being female (60%). The demographics of this study population are to be found in Table N60.

LIFETIME REVISION RISK ACCORDING TO AGE

The risk of revision surgery after total stemmed reverse replacement is related to the life expectancy of the patient. The number of patients having primary total stemmed reverse replacements for osteoarthritis in 5 yearly cohorts, together with the proportions of mortality and revision surgery during the study period, are shown in Table N73. The 10 and 15 year revision free survival estimates for each 5 year cohort of age are shown in Table N74. The number of patients aged <50 years requiring total stemmed reverse replacement is low. However, their longer life expectancy places them at a higher lifetime risk of revision surgery at 31.87%. Whilst the proportion of patients >85 years of age requiring primary total stemmed reverse replacement is also low, their shorter life expectancy means that in this group the risk of revision surgery is <4%. The percentage lifetime risk of revision surgery for patients undergoing primary total stemmed reverse replacement for osteoarthritis is shown in Table N75 and Figure N38.

Table N73 Characteristics of Primary Total Reverse Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Total, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	130	3.6 (1.46, 6.06)	5 (3.85%)	9 (6.92%)
51-55	425	3.55 (1.4, 6.19)	25 (5.88%)	17 (4%)
56-60	1171	3.58 (1.55, 6.36)	61 (5.21%)	72 (6.15%)
61-65	3020	3.62 (1.53, 6.65)	161 (5.33%)	139 (4.6%)
66-70	5723	4.08 (1.72, 7.13)	482 (8.42%)	229 (4%)
71-75	8140	4.05 (1.77, 6.94)	970 (11.92%)	243 (2.99%)
76-80	7757	3.99 (1.65, 7.02)	1375 (17.73%)	194 (2.5%)
81-85	4262	3.92 (1.75, 6.78)	1194 (28.02%)	94 (2.21%)
86+	1514	3.64 (1.63, 6.27)	618 (40.82%)	31 (2.05%)

Note: Restricted to modern prostheses

Table N74 Revision-Free Survival (95% CI) Estimates after Primary Total Reverse Shoulder Replacement by Revision free Years (Primary Diagnosis OA)

Age Group (years)	10 Years	15 Years
46-50	89.8 (80.4, 94.9)	89.8 (80.4, 94.9)
51-55	93.1 (87.5, 96.3)	90.0 (79.8, 95.2)
56-60	91.5 (88.9, 93.6)	90.1 (85.8, 93.1)
61-65	92.3 (90.3, 93.8)	89.0 (84.1, 92.5)
66-70	93.8 (92.7, 94.7)	90.1 (86.2, 92.9)
71-75	95.5 (94.8, 96.1)	94.6 (93.5, 95.6)
76-80	96.1 (95.4, 96.7)	95.7 (94.8, 96.5)
81-85	97.2 (96.5, 97.7)	97.2 (96.5, 97.7)
86+	97.3 (96.1, 98.2)	97.3 (96.1, 98.2)

Note: Restricted to modern prostheses

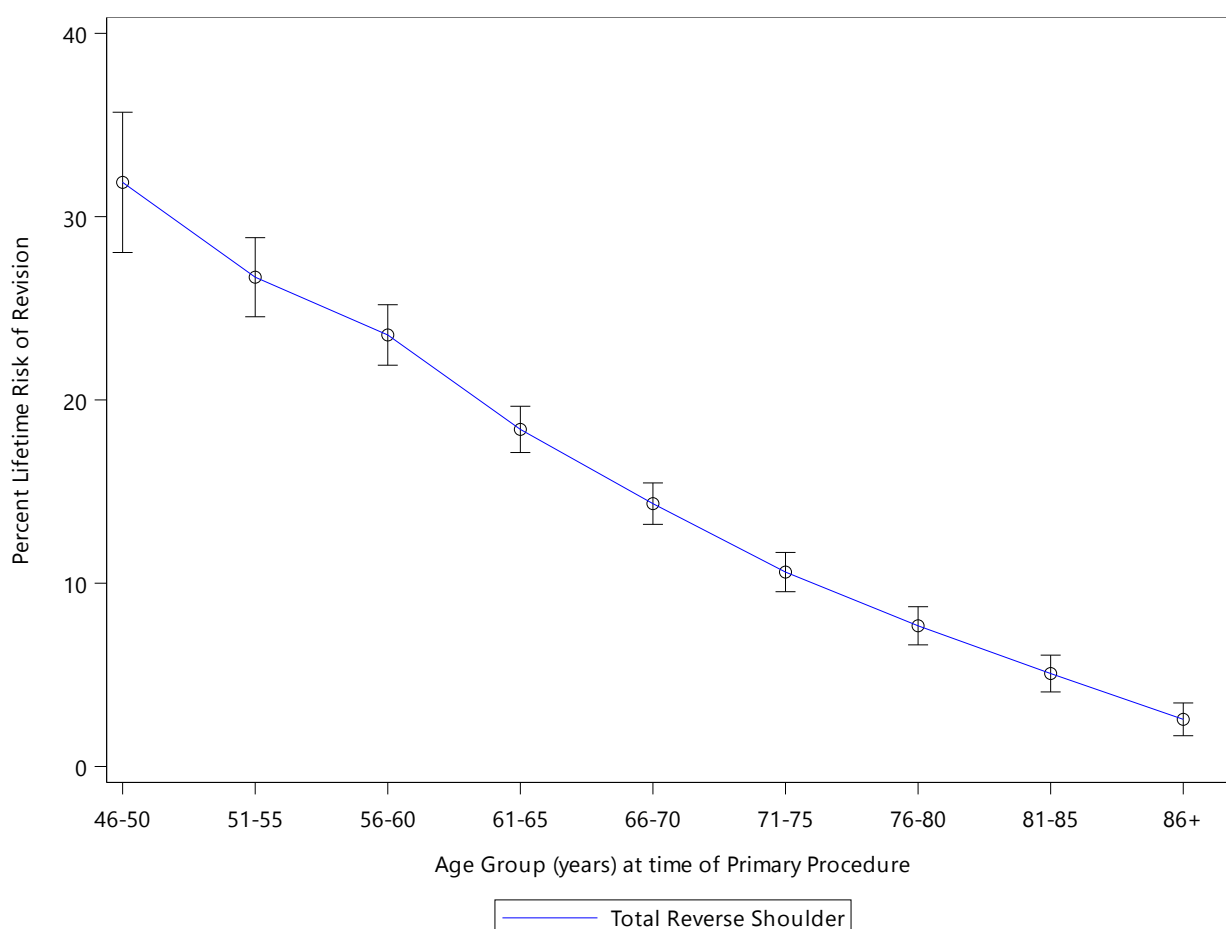
Modelling the Lifetime Risk of Revision

Table N75 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)
46-50	31.87 (28.04, 35.7)
51-55	26.69 (24.54, 28.85)
56-60	23.54 (21.89, 25.19)
61-65	18.39 (17.13, 19.65)
66-70	14.34 (13.21, 15.47)
71-75	10.61 (9.54, 11.68)
76-80	7.68 (6.64, 8.72)
81-85	5.07 (4.07, 6.08)
86+	2.57 (1.68, 3.47)

Note: Restricted to modern prostheses

Figure N38 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE AND SEX

The number of patients having primary total stemmed reverse shoulder replacement for osteoarthritis in 5 yearly cohorts, together with the proportions of mortality and revision surgery during the study period for males and females, are

shown in Table N76 and Table N77, respectively. The percentage of lifetime risk of revision after primary total stemmed reverse replacement for osteoarthritis in each 5 year age cohort for males and females is shown in Table N78 and Figure N39. Until age 85 years, males have a higher lifetime risk of revision surgery than females.

Table N76 Characteristics of Male Primary Total Reverse Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Males, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	91	3.6 (1.45, 5.34)	3 (3.3%)	9 (9.89%)
51-55	260	2.74 (1.16, 5.93)	16 (6.15%)	12 (4.62%)
56-60	696	3.37 (1.53, 6.15)	33 (4.74%)	49 (7.04%)
61-65	1622	3.52 (1.49, 6.48)	96 (5.92%)	95 (5.86%)
66-70	2573	4.06 (1.72, 7.11)	218 (8.47%)	130 (5.05%)
71-75	3236	3.8 (1.73, 6.65)	453 (14%)	143 (4.42%)
76-80	2689	3.56 (1.55, 6.53)	532 (19.78%)	97 (3.61%)
81-85	1294	3.56 (1.56, 6.22)	381 (29.44%)	42 (3.25%)
86+	384	3.5 (1.55, 6.12)	161 (41.93%)	13 (3.39%)

Note: Restricted to modern prostheses

Table N77 Characteristics of Female Primary Total Reverse Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis OA)

Age Group (years)	Females, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	39	3.77 (1.55, 8.05)	2 (5.13%)	0 (0%)
51-55	165	4.53 (1.93, 7.1)	9 (5.45%)	5 (3.03%)
56-60	475	4.1 (1.59, 6.92)	28 (5.89%)	23 (4.84%)
61-65	1398	3.74 (1.61, 6.84)	65 (4.65%)	44 (3.15%)
66-70	3150	4.1 (1.72, 7.15)	264 (8.38%)	99 (3.14%)
71-75	4904	4.14 (1.79, 7.15)	517 (10.54%)	100 (2.04%)
76-80	5068	4.23 (1.71, 7.29)	843 (16.63%)	97 (1.91%)
81-85	2968	4.16 (1.82, 7.09)	813 (27.39%)	52 (1.75%)
86+	1130	3.69 (1.65, 6.3)	457 (40.44%)	18 (1.59%)

Note: Restricted to modern prostheses

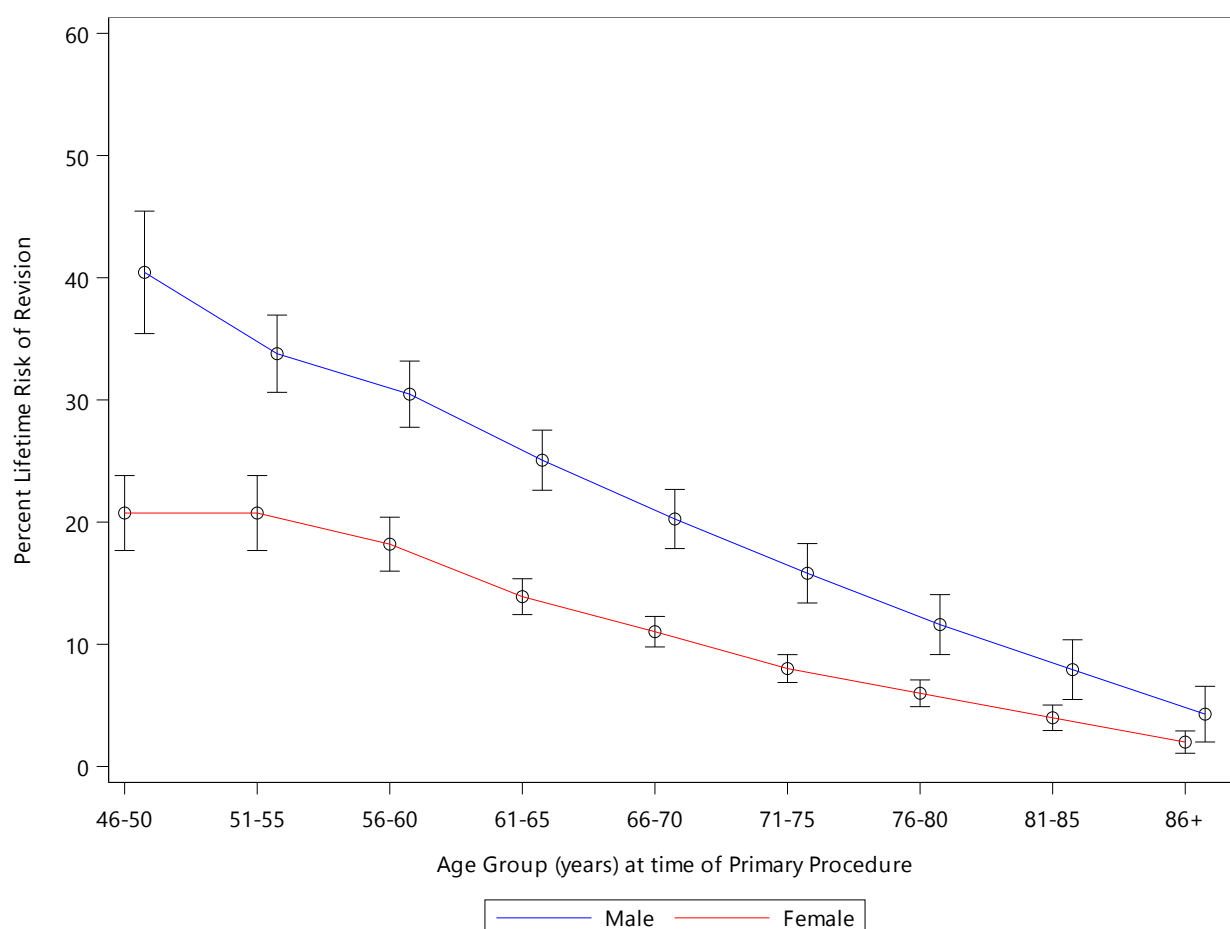
Modelling the Lifetime Risk of Revision

Table N78 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Arthroplasty by Sex (Primary Diagnosis OA)

Age Group (years)	Total, % (95% CI)	Male, % (95% CI)	Female, % (95% CI)
46-50	31.87 (28.04, 35.7)	40.44 (35.43, 45.45)	20.74 (17.68, 23.81)
51-55	26.69 (24.54, 28.85)	33.78 (30.62, 36.94)	20.74 (17.68, 23.81)
56-60	23.54 (21.89, 25.19)	30.47 (27.76, 33.18)	18.19 (15.99, 20.4)
61-65	18.39 (17.13, 19.65)	25.07 (22.61, 27.53)	13.9 (12.43, 15.37)
66-70	14.34 (13.21, 15.47)	20.25 (17.83, 22.67)	11.03 (9.78, 12.28)
71-75	10.61 (9.54, 11.68)	15.81 (13.38, 18.24)	8.01 (6.87, 9.15)
76-80	7.68 (6.64, 8.72)	11.61 (9.16, 14.07)	5.99 (4.9, 7.08)
81-85	5.07 (4.07, 6.08)	7.93 (5.48, 10.37)	3.99 (2.94, 5.03)
86+	2.57 (1.68, 3.47)	4.28 (2.01, 6.56)	2 (1.08, 2.91)

Note: Restricted to modern prostheses

Figure N39 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO BMI

The Australian Orthopaedic Association National Joint Replacement Registry has collected the body mass index data for patients undergoing joint replacement surgery since 2015, and therefore, the lifetime risk of revision analysis according to BMI is based on this cohort with maximum 10 year follow-up. The analysis of lifetime revision risk according to BMI may

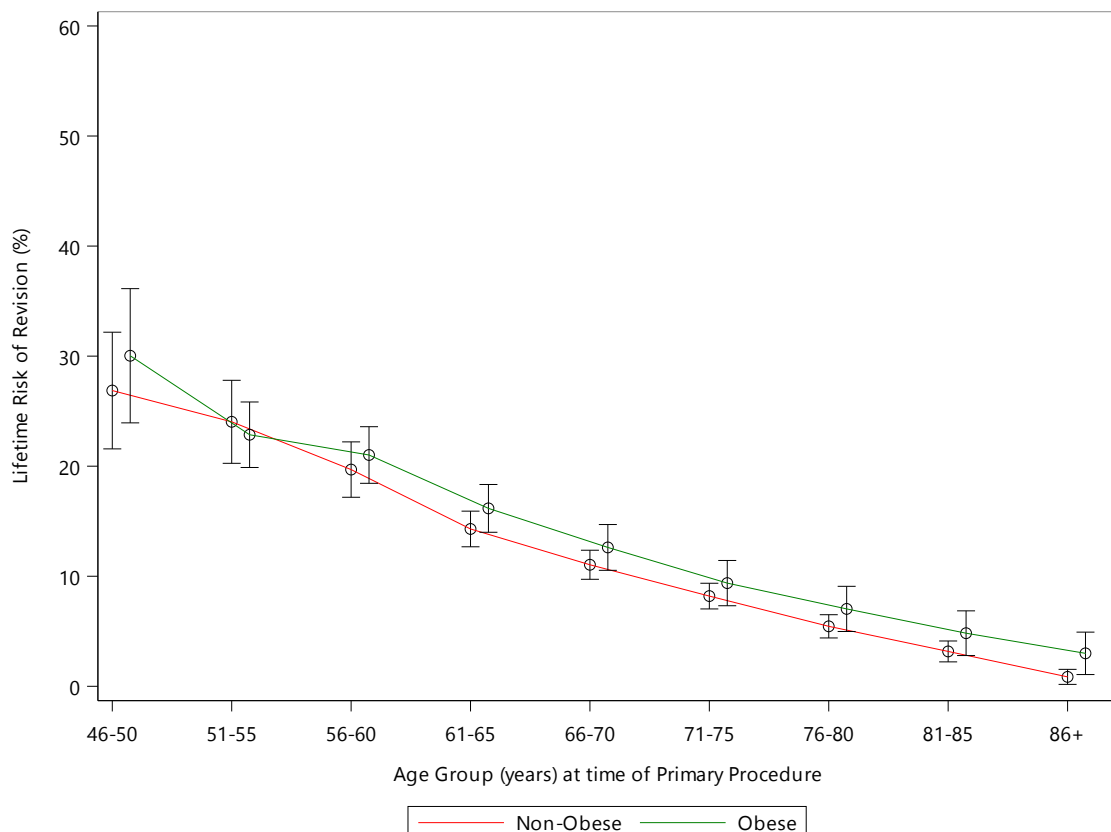
be simplified by dichotomising BMI into obese and not obese groups. This analysis is shown in Table N79 and Figure N40. The numbers of patients in each obesity category for each 5 year age cohort are shown in Table N80. On average, all cohorts, except 51-55, those patients having their primary total stemmed reverse replacement for osteoarthritis who are obese have a lifetime revision risk that is higher than that of a no obese patient in the same age cohort.

Table N79 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Obesity (Primary Diagnosis OA)

Age Group (years)	Not Obese, % (95% CI)	Obese, % (95% CI)
46-50	26.87 (21.57, 32.17)	30.03 (23.94, 36.13)
51-55	24.03 (20.26, 27.8)	22.86 (19.88, 25.83)
56-60	19.69 (17.18, 22.21)	21.02 (18.44, 23.59)
61-65	14.3 (12.68, 15.92)	16.17 (14, 18.34)
66-70	11.04 (9.72, 12.36)	12.62 (10.54, 14.7)
71-75	8.2 (7.03, 9.36)	9.38 (7.32, 11.43)
76-80	5.45 (4.39, 6.51)	7.03 (4.98, 9.08)
81-85	3.17 (2.22, 4.12)	4.83 (2.79, 6.86)
86+	0.86 (0.17, 1.54)	3 (1.07, 4.92)

Note: Restricted to modern prostheses

Figure N40 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Obesity (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

Table N80 Number of Primary Total Reverse Shoulder Replacements by Age and Obesity (Primary Diagnosis OA)

Age Group (years)	Not Obese, N	Obese, N
46-50	54	65
51-55	151	218
56-60	423	612
61-65	1087	1598
66-70	2156	2781
71-75	3251	3692
76-80	3396	3045
81-85	2063	1325
86+	829	340

Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC VERSUS SEPTIC

While other reasons for revision are more common, the risk for primary total stemmed reverse replacement to be revised for infection occurs more often for primary total stemmed reverse than for primary total anatomic shoulder replacement. The analysis below considers the lifetime revision risk for the

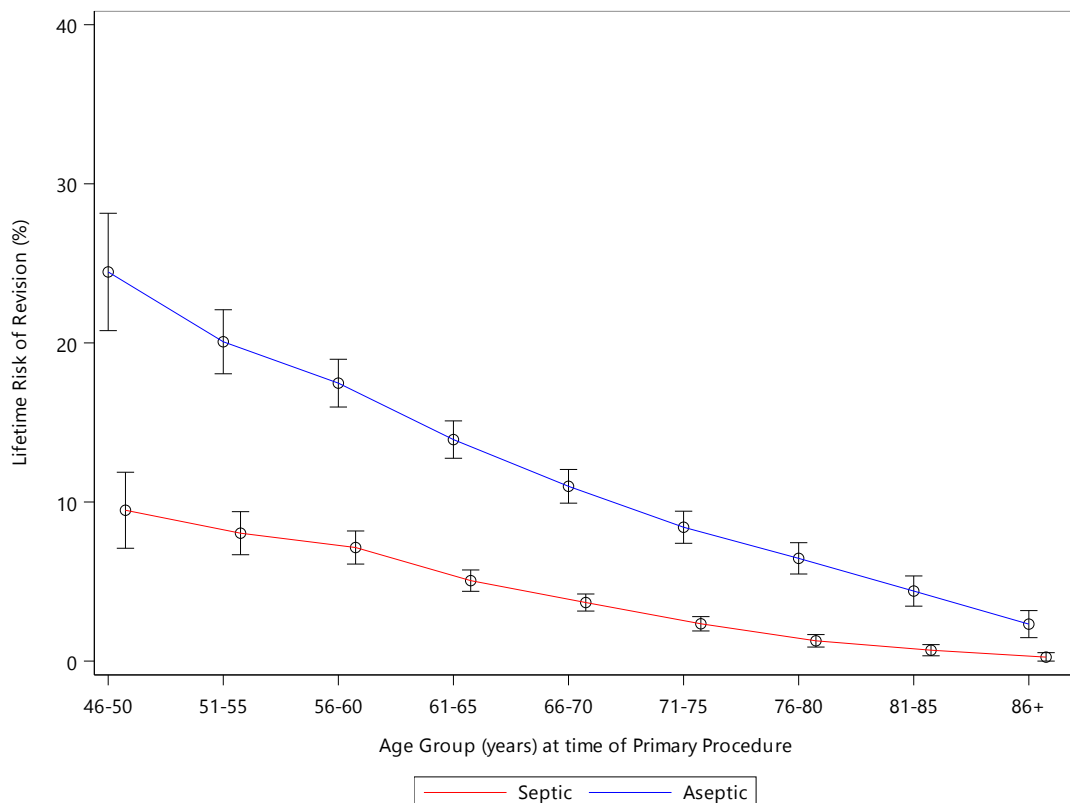
diagnosis of infection (septic) versus aseptic diagnosis (Table N81 and Figure N41). The lifetime risk of revision for infection is higher in the younger cohort. Whilst in the youngest age group the lifetime risk for revision for infection is 9.48%, the risk reduces as age increases to reach a risk of 1.27% or less above 75 years of age.

Table N81 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	9.48 (7.09, 11.87)	24.46 (20.77, 28.15)
51-55	8.04 (6.69, 9.39)	20.07 (18.06, 22.08)
56-60	7.14 (6.1, 8.18)	17.47 (15.97, 18.97)
61-65	5.06 (4.39, 5.73)	13.92 (12.75, 15.1)
66-70	3.68 (3.14, 4.22)	10.99 (9.93, 12.04)
71-75	2.34 (1.89, 2.8)	8.41 (7.4, 9.42)
76-80	1.27 (0.88, 1.67)	6.46 (5.47, 7.44)
81-85	0.68 (0.33, 1.04)	4.4 (3.45, 5.35)
86+	0.25 (0, 0.53)	2.32 (1.47, 3.17)

Note: Restricted to modern prostheses

Figure N41 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO SEX AND DIAGNOSIS – ASEPTIC VERSUS SEPTIC

The lifetime risk of revision surgery for primary total stemmed reverse replacement for osteoarthritis differs according to age, sex and whether the diagnosis for revision is infection or aseptic reasons. The lifetime risk for revision for males in each 5 year cohort, according to the underlying diagnosis, is shown

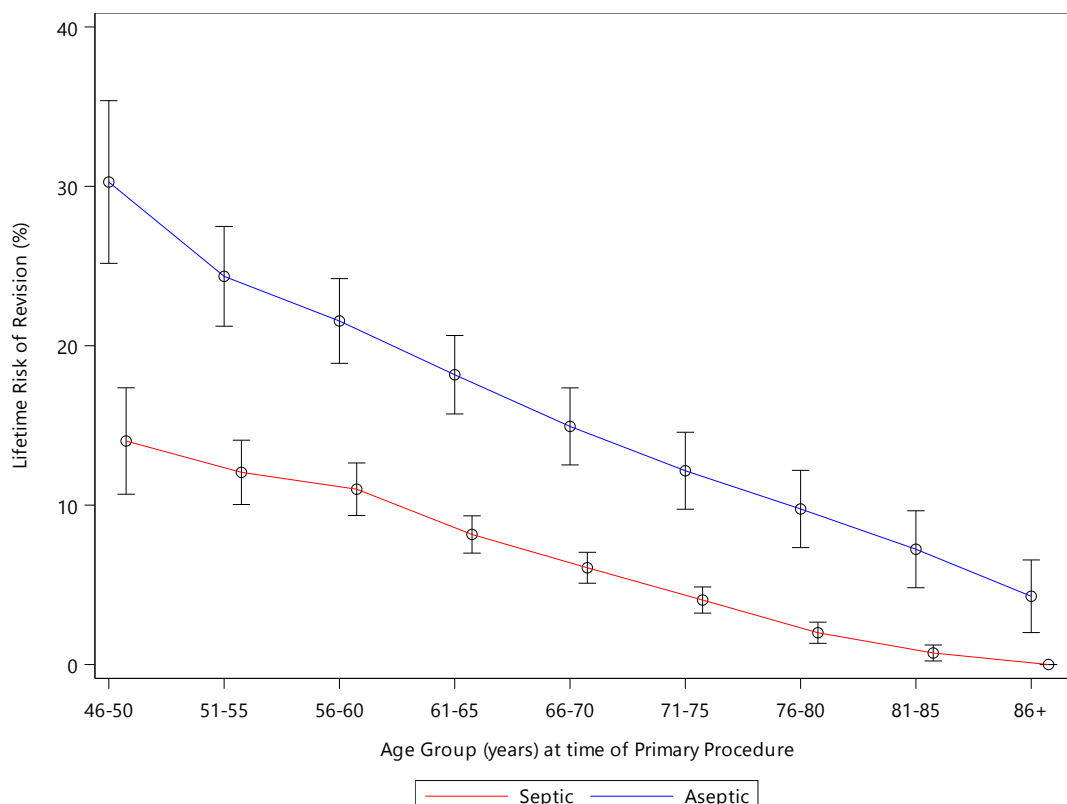
in Table N82 and Figure N42. The lifetime risk for revision of females in each 5 year cohort, according to their underlying diagnosis, is shown in Table N83 and Figure N43. In each age cohort, the revision risk for infection in males is approximately three times that for females, with younger males at the highest risk. The revision risk for aseptic reasons is also higher in males than females across all age cohorts.

Table N82 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	14.02 (10.69, 17.36)	30.27 (25.17, 35.37)
51-55	12.06 (10.04, 14.08)	24.35 (21.22, 27.48)
56-60	11 (9.35, 12.65)	21.55 (18.9, 24.21)
61-65	8.16 (6.99, 9.33)	18.18 (15.72, 20.64)
66-70	6.07 (5.1, 7.04)	14.94 (12.52, 17.36)
71-75	4.05 (3.23, 4.87)	12.16 (9.74, 14.57)
76-80	2 (1.33, 2.66)	9.76 (7.34, 12.18)
81-85	0.72 (0.22, 1.23)	7.23 (4.82, 9.65)
86+	0 (0, 0)	4.28 (2.01, 6.56)

Note: Restricted to modern prostheses

Figure N42 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses



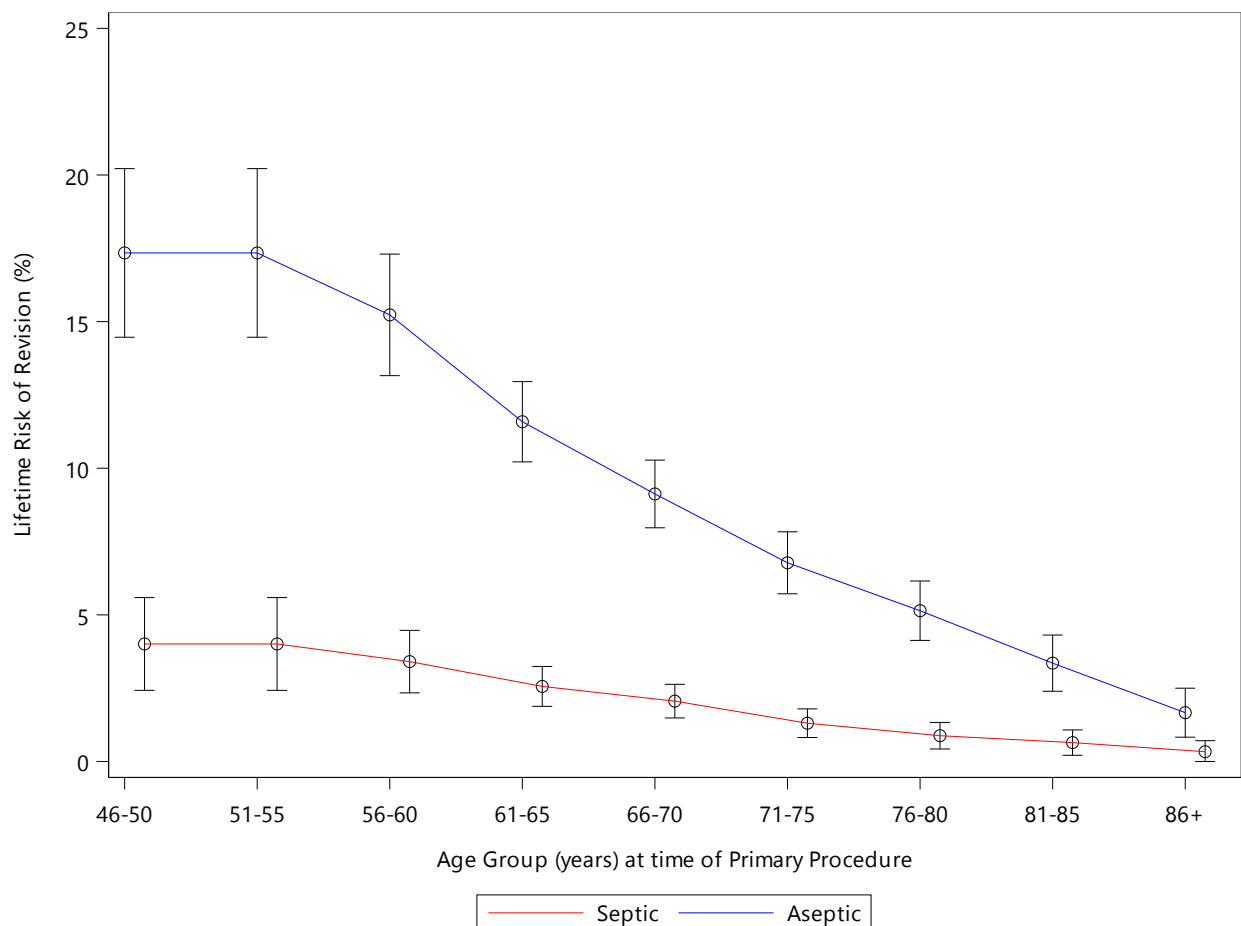
Modelling the Lifetime Risk of Revision

Table N83 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Female Patients, Stratified by Revision Diagnosis

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	4.01 (2.43, 5.59)	17.34 (14.47, 20.22)
51-55	4.01 (2.43, 5.59)	17.34 (14.47, 20.22)
56-60	3.41 (2.34, 4.47)	15.23 (13.16, 17.3)
61-65	2.56 (1.88, 3.24)	11.59 (10.22, 12.95)
66-70	2.06 (1.49, 2.63)	9.12 (7.97, 10.28)
71-75	1.31 (0.82, 1.79)	6.78 (5.72, 7.83)
76-80	0.88 (0.43, 1.33)	5.14 (4.13, 6.15)
81-85	0.64 (0.21, 1.08)	3.35 (2.39, 4.31)
86+	0.33 (0, 0.71)	1.66 (0.83, 2.5)

Note: Restricted to modern prostheses

Figure N43 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC REASONS

The three most common aseptic diagnoses for revision after primary total stemmed reverse replacement for osteoarthritis are loosening, instability/dislocation, and fracture. The percentage lifetime risks of revision surgery for each of these reasons for revision, including infection, after primary total

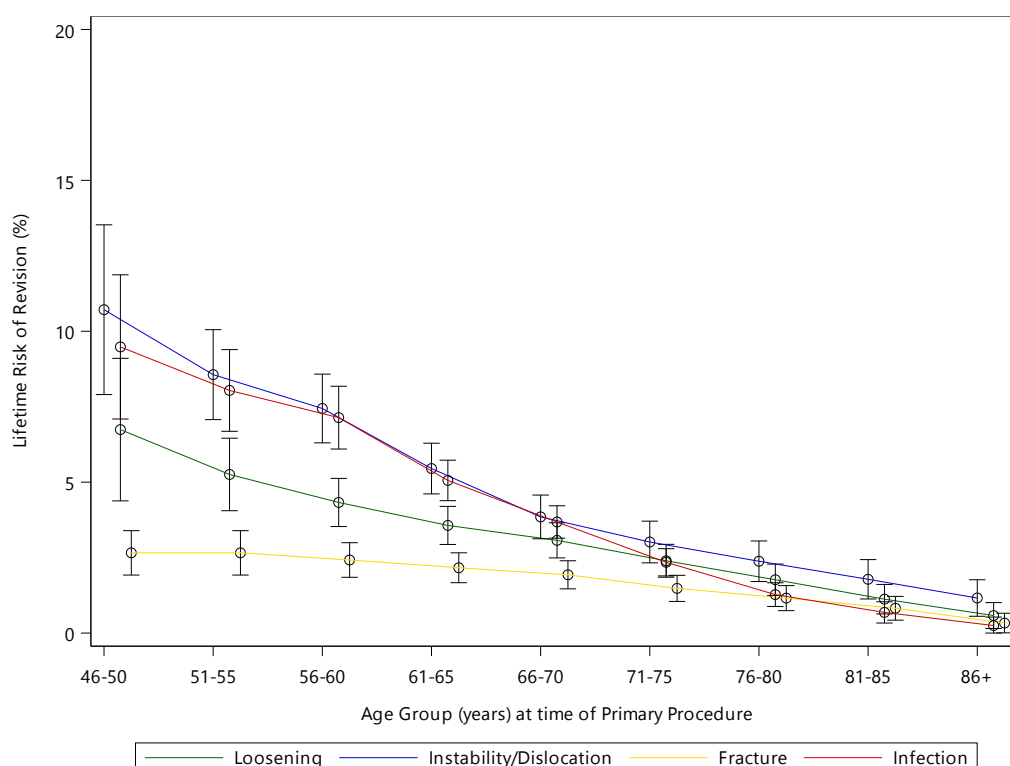
stemmed reverse replacement for osteoarthritis are shown in Table N84 and Figure N44. Revision for instability/dislocation carries the highest risk, followed by infection until the age cohort of 71–75, where loosening is the second most common reason for revision. For each of these diagnoses, the lifetime risk of revision surgery is highest for the youngest patient and decreases with increasing age.

Table N84 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)

Age Group (years)	Loosening, % (95% CI)	Instability/Dislocation, % (95% CI)	Fracture, % (95% CI)	Infection, % (95% CI)
46-50	6.74 (4.38, 9.1)	10.71 (7.9, 13.53)	2.66 (1.92, 3.39)	9.48 (7.09, 11.87)
51-55	5.26 (4.05, 6.46)	8.56 (7.07, 10.05)	2.66 (1.92, 3.39)	8.04 (6.69, 9.39)
56-60	4.33 (3.53, 5.13)	7.44 (6.3, 8.58)	2.42 (1.85, 2.99)	7.14 (6.1, 8.18)
61-65	3.57 (2.94, 4.2)	5.45 (4.61, 6.29)	2.16 (1.67, 2.66)	5.06 (4.39, 5.73)
66-70	3.07 (2.49, 3.65)	3.85 (3.12, 4.57)	1.93 (1.47, 2.4)	3.68 (3.14, 4.22)
71-75	2.4 (1.85, 2.94)	3.02 (2.33, 3.71)	1.48 (1.05, 1.91)	2.34 (1.89, 2.8)
76-80	1.77 (1.25, 2.29)	2.38 (1.71, 3.05)	1.16 (0.74, 1.57)	1.27 (0.88, 1.67)
81-85	1.12 (0.64, 1.61)	1.78 (1.13, 2.43)	0.82 (0.43, 1.22)	0.68 (0.33, 1.04)
86+	0.58 (0.15, 1.01)	1.16 (0.56, 1.77)	0.33 (0.01, 0.66)	0.25 (0, 0.53)

Note: Restricted to modern prostheses

Figure N44 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

Modelling the Lifetime risk of revision – total stemmed reverse replacement for Rotator Cuff Arthropathy

Rotator cuff arthropathy is the second most common diagnosis for total stemmed reverse replacement surgery in Australia. Accordingly, this analysis of lifetime risk of revision requiring total stemmed reverse replacement is limited to those total stemmed reverse replacements undertaken for rotator cuff arthropathy. In order to reflect current surgical practice, the analysis excludes prostheses that are no longer in use. The cohort for this analysis consists of 28,222 patients with an average age of 73.5 years, with 52.2% female. The demographics of the study population are found in Table N60.

LIFETIME REVISION RISK ACCORDING TO AGE

The risk of revision surgery after total stemmed reverse replacement for rotator cuff arthropathy is related to the life expectancy of the patient. The proportions of patients having primary total stemmed reverse replacement for rotator cuff arthropathy in 5 year cohorts, together with the proportions of mortality and revision surgery during the study period, are shown in Table N85. The 10 and 15 year revision free survival estimates for each 5 year age cohort are shown in Table N86. The proportion of patients aged <50 years requiring total stemmed reverse replacement surgery is low. However, their longer life expectancy places them at a higher lifetime risk of revision surgery. Conversely, whilst the proportion of patients aged >85 years requiring total stemmed reverse replacement is also low, their shorter life expectancy means that in this group the risk of revision surgery is very low. The percentage lifetime risk of revision for patients undergoing total stemmed reverse replacement for rotator cuff arthropathy is shown in Table N87 and Figure N45.

Table N85 Characteristics of Primary Total Reverse Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Total, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	90	2.7 (0.91, 6.05)	3 (3.33%)	3 (3.33%)
51-55	345	2.65 (1.34, 5.51)	10 (2.9%)	18 (5.22%)
56-60	1050	3.19 (1.37, 5.8)	41 (3.9%)	73 (6.95%)
61-65	2772	3.08 (1.33, 6.06)	105 (3.79%)	131 (4.73%)
66-70	5037	3.74 (1.52, 6.64)	365 (7.25%)	195 (3.87%)
71-75	7055	3.8 (1.61, 6.74)	762 (10.8%)	268 (3.8%)
76-80	6699	3.6 (1.61, 6.56)	1097 (16.38%)	199 (2.97%)
81-85	3813	3.72 (1.67, 6.56)	999 (26.2%)	117 (3.07%)
86+	1361	3.64 (1.71, 6.04)	555 (40.78%)	41 (3.01%)

Note: Restricted to modern prostheses

Table N86 Revision-Free Survival (95% CI) Estimates after Primary Total Reverse Shoulder Replacement by Revision free Years (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	10 Years	15 Years
46-50	89.9 (64.0, 97.5)	-
51-55	92.7 (88.1, 95.5)	92.7 (88.1, 95.5)
56-60	88.1 (82.5, 92.0)	84.1 (75.5, 89.9)
61-65	93.3 (91.8, 94.4)	91.5 (88.2, 93.9)
66-70	93.9 (92.7, 94.9)	92.7 (90.6, 94.3)
71-75	94.4 (93.5, 95.1)	93.9 (92.8, 94.9)
76-80	95.8 (95.0, 96.4)	95.8 (95.0, 96.4)
81-85	95.7 (94.5, 96.6)	95.7 (94.5, 96.6)
86+	96.0 (94.3, 97.2)	-

Note: Restricted to modern prostheses

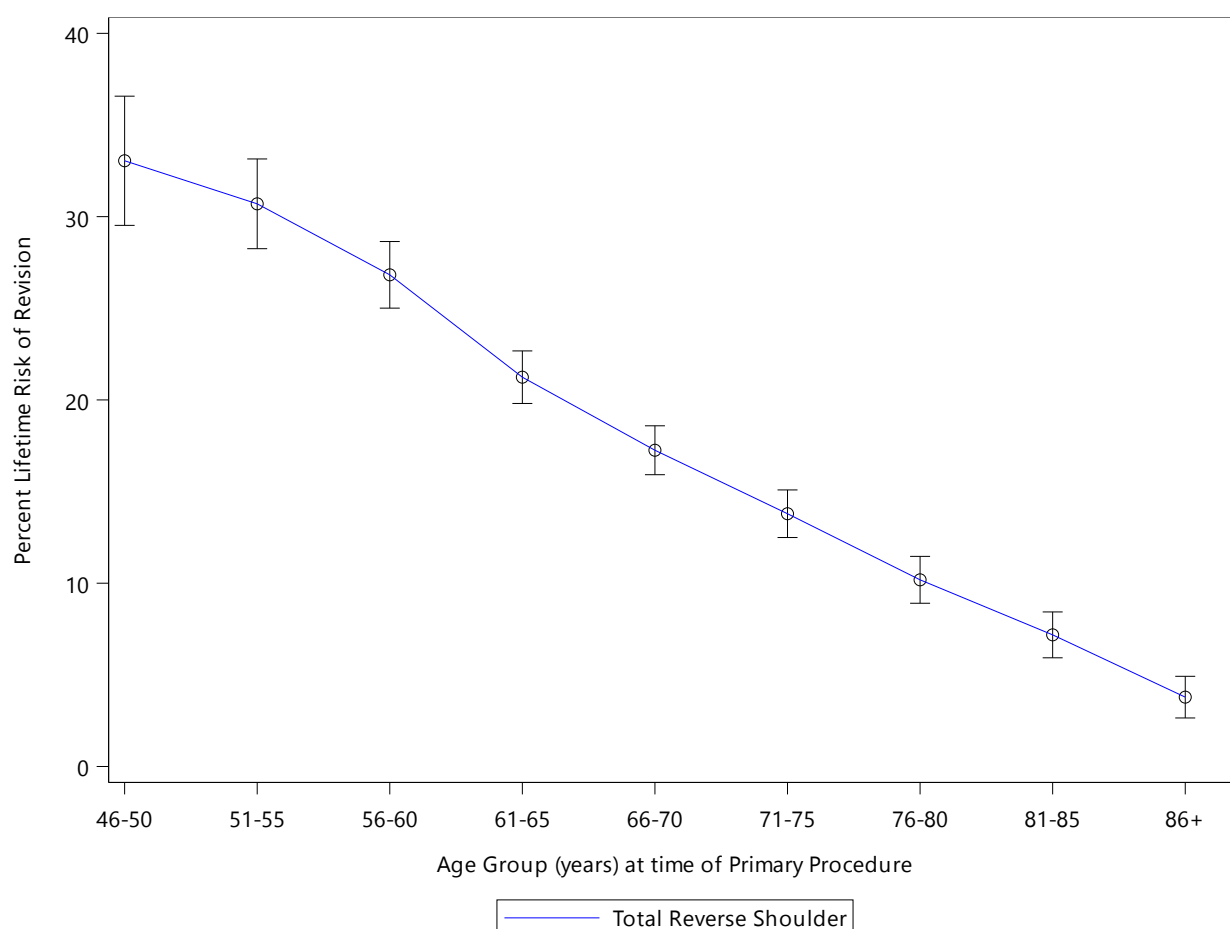
Modelling the Lifetime Risk of Revision

Table N87 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Total, % (95% CI)
46-50	33.05 (29.52, 36.57)
51-55	30.7 (28.25, 33.15)
56-60	26.82 (25.01, 28.64)
61-65	21.24 (19.81, 22.67)
66-70	17.25 (15.92, 18.59)
71-75	13.79 (12.49, 15.09)
76-80	10.18 (8.91, 11.46)
81-85	7.18 (5.93, 8.43)
86+	3.78 (2.65, 4.92)

Note: Restricted to modern prostheses

Figure N45 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO AGE AND SEX

The number of patients having primary total stemmed reverse replacement for rotator cuff arthropathy in 5 yearly cohorts, together with the proportions of mortality and revision surgery during the study period for males and females, are shown in Table N88 and Table N89, respectively. The

percentage of lifetime risk of revision after total stemmed reverse replacement for rotator cuff arthropathy in each 5 year cohort for males and females is shown in Table N90. In all age groups, males have a higher lifetime risk of revision surgery than females, with a significant difference up until 81 years of age (Figure N46).

Table N88 Characteristics of Male Primary Total Reverse Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Males, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	58	2.91 (1.1, 6.31)	3 (5.17%)	2 (3.45%)
51-55	236	2.65 (1.31, 5.49)	9 (3.81%)	15 (6.36%)
56-60	706	2.88 (1.27, 5.25)	31 (4.39%)	56 (7.93%)
61-65	1693	2.88 (1.21, 5.81)	64 (3.78%)	103 (6.08%)
66-70	2623	3.53 (1.42, 6.41)	200 (7.62%)	129 (4.92%)
71-75	3325	3.58 (1.44, 6.41)	404 (12.15%)	163 (4.9%)
76-80	2966	3.32 (1.42, 6.06)	525 (17.7%)	116 (3.91%)
81-85	1428	3.32 (1.41, 5.91)	386 (27.03%)	55 (3.85%)
86+	460	3.3 (1.49, 5.34)	189 (41.09%)	16 (3.48%)

Note: Restricted to modern prostheses

Table N89 Characteristics of Female Primary Total Reverse Shoulder Replacement Patients at the Time of the Primary Procedure (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Females, n	Median follow-up, years (IQR)	Mortality during follow-up, n (%)	Revision during follow-up, n (%)
46-50	32	2.14 (0.61, 5.03)	0 (0%)	1 (3.13%)
51-55	109	2.77 (1.4, 5.63)	1 (0.92%)	3 (2.75%)
56-60	344	3.44 (1.64, 6.59)	10 (2.91%)	17 (4.94%)
61-65	1079	3.23 (1.49, 6.36)	41 (3.8%)	28 (2.59%)
66-70	2414	3.98 (1.64, 6.93)	165 (6.84%)	66 (2.73%)
71-75	3730	4.07 (1.75, 7.08)	358 (9.6%)	105 (2.82%)
76-80	3733	3.85 (1.74, 6.92)	572 (15.32%)	83 (2.22%)
81-85	2385	4.08 (1.82, 6.92)	613 (25.7%)	62 (2.6%)
86+	901	3.81 (1.8, 6.34)	366 (40.62%)	25 (2.77%)

Note: Restricted to modern prostheses

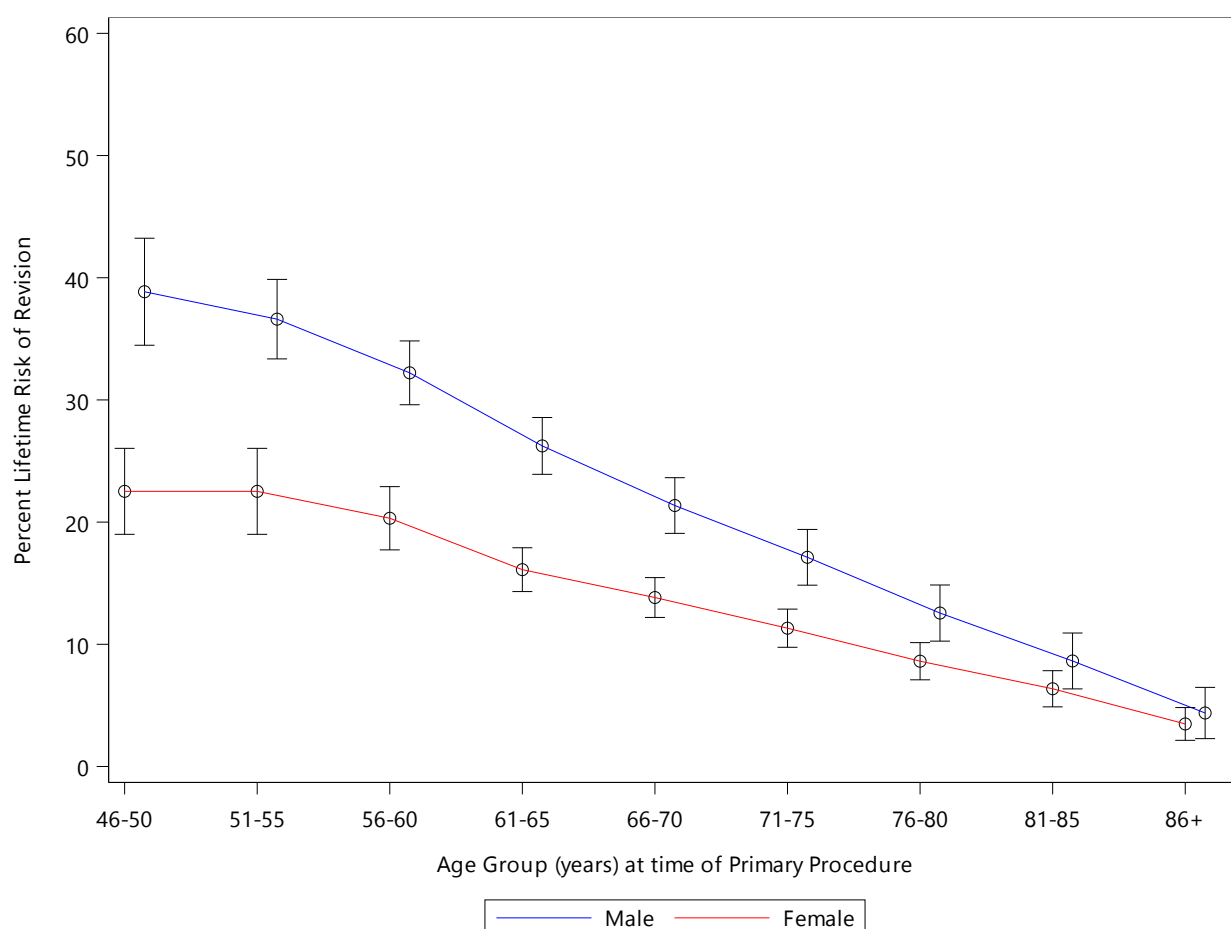
Modelling the Lifetime Risk of Revision

Table N90 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder by Sex (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Total, % (95% CI)	Male, % (95% CI)	Female, % (95% CI)
46-50	33.05 (29.52, 36.57)	38.85 (34.47, 43.23)	22.52 (19, 26.04)
51-55	30.7 (28.25, 33.15)	36.61 (33.36, 39.86)	22.52 (19, 26.04)
56-60	26.82 (25.01, 28.64)	32.22 (29.61, 34.83)	20.31 (17.73, 22.9)
61-65	21.24 (19.81, 22.67)	26.23 (23.91, 28.56)	16.11 (14.31, 17.9)
66-70	17.25 (15.92, 18.59)	21.36 (19.08, 23.64)	13.83 (12.2, 15.46)
71-75	13.79 (12.49, 15.09)	17.12 (14.84, 19.4)	11.32 (9.76, 12.88)
76-80	10.18 (8.91, 11.46)	12.56 (10.26, 14.85)	8.62 (7.09, 10.14)
81-85	7.18 (5.93, 8.43)	8.64 (6.35, 10.92)	6.36 (4.88, 7.84)
86+	3.78 (2.65, 4.92)	4.38 (2.28, 6.48)	3.48 (2.14, 4.82)

Note: Restricted to modern prostheses

Figure N46 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Sex (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prostheses



Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO BMI

The AOANJRR has collected body mass index data for patients undergoing joint replacement surgery since 2015, and therefore, lifetime risk of revision analysis according to BMI is based on this cohort with a maximum 10 year follow-up. The analysis of lifetime revision risk according to BMI may

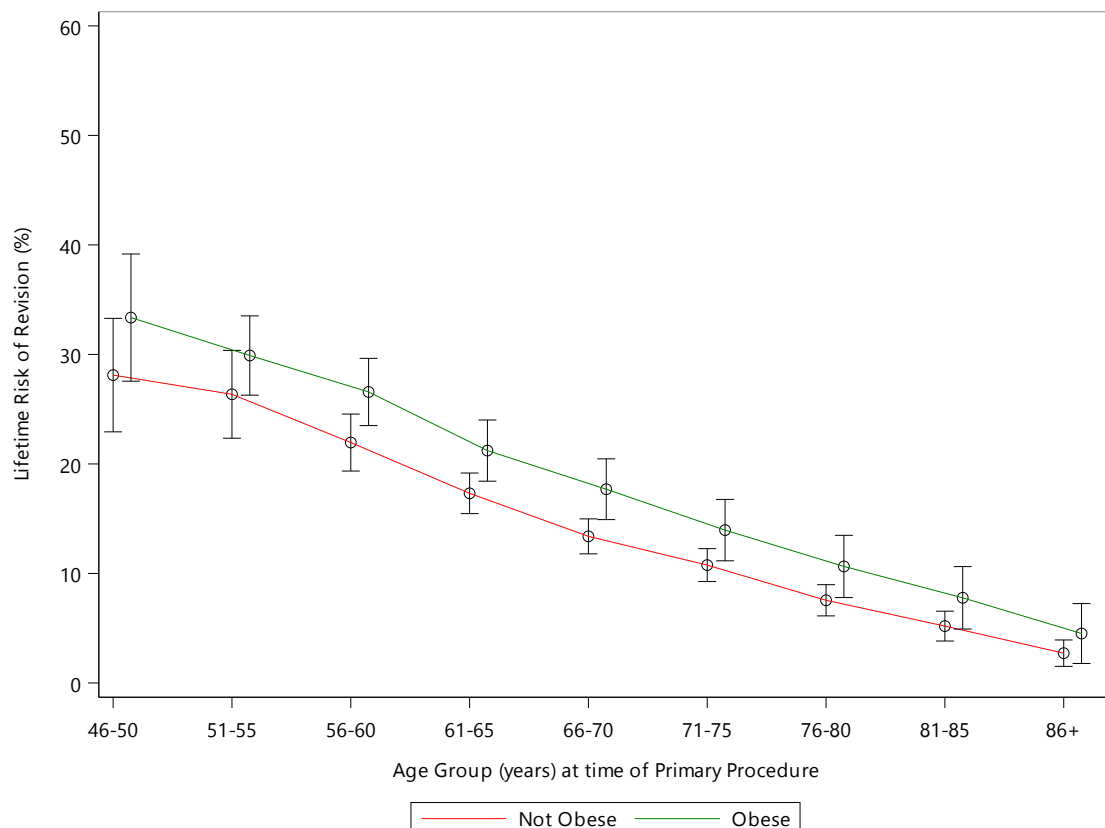
be simplified by dichotomising BMI into obese and not obese groups. This analysis is shown in Table N91 and Figure N47. The numbers of patients in each BMI category for each 5 year age cohort are shown in Table N92. In all age cohorts, on average, those patients having their primary joint replacement who are obese have a lifetime revision risk that is higher than those who are not obese.

Table N91 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Obesity (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Not Obese, % (95% CI)	Obese, % (95% CI)
46-50	28.11 (22.93, 33.29)	33.36 (27.56, 39.17)
51-55	26.36 (22.35, 30.37)	29.9 (26.28, 33.52)
56-60	21.95 (19.35, 24.56)	26.57 (23.5, 29.64)
61-65	17.32 (15.46, 19.17)	21.22 (18.42, 24.01)
66-70	13.39 (11.79, 14.98)	17.69 (14.92, 20.46)
71-75	10.76 (9.26, 12.26)	13.96 (11.15, 16.76)
76-80	7.55 (6.12, 8.97)	10.64 (7.8, 13.48)
81-85	5.19 (3.83, 6.56)	7.78 (4.92, 10.63)
86+	2.72 (1.51, 3.93)	4.51 (1.78, 7.25)

Note: Restricted to modern prostheses

Figure N47 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Obesity (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

Table N92 **Number of Primary Total Reverse Shoulder Replacements by Age and Obesity**

Age Group (years)	Not Obese, N	Obese, N
46-50	43	41
51-55	125	201
56-60	381	581
61-65	1141	1418
66-70	2095	2384
71-75	3155	3042
76-80	3344	2399
81-85	2074	1084
86+	824	259

Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS—ASEPTIC VERSUS SEPTIC

This analysis considers the lifetime revision risk for infection after total stemmed reverse replacement for rotator cuff arthropathy versus aseptic diagnoses (Table N93 and Figure N48). The lifetime risk of revision for infection is highest in the youngest cohort.

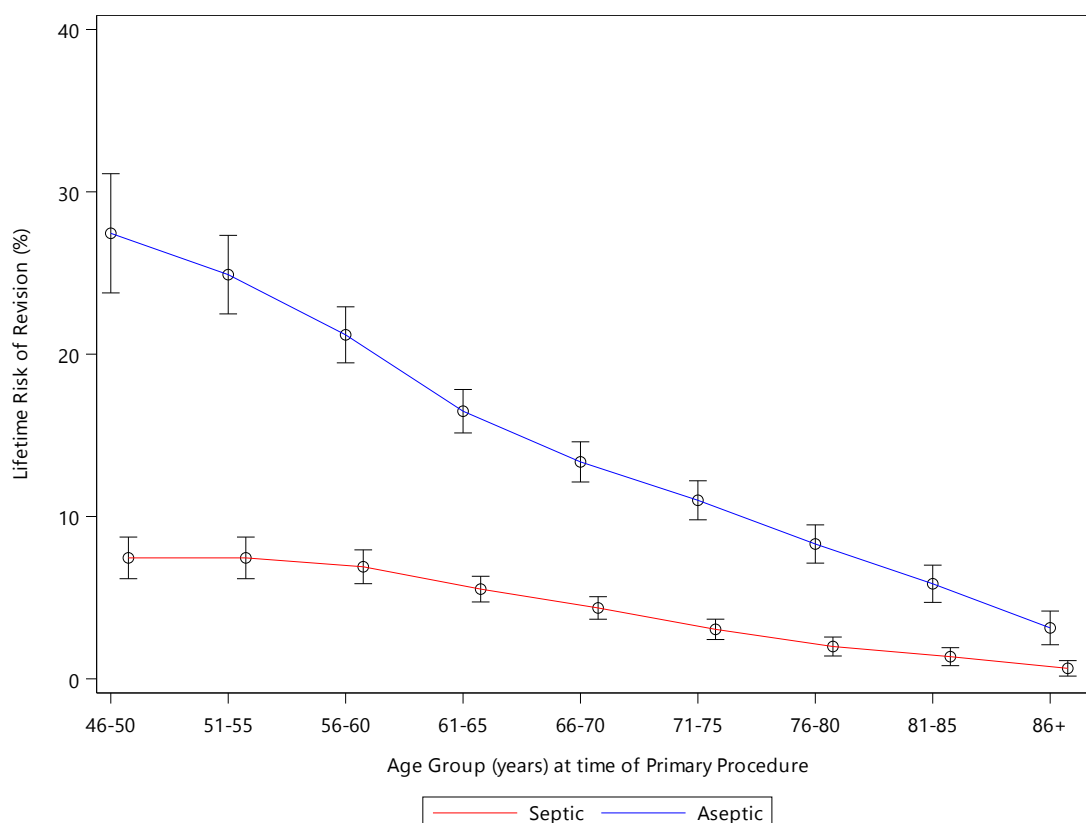
For patients 46–50 years, the risk is 7.52%, and this risk decreases with each age cohort to be under 1% by the 86+ year cohort. Likewise, the lifetime risk of revision for septic reasons is highest in the younger cohort, also reducing progressively with each age cohort. For all age cohorts, the risk of requiring revision surgery for infection is lower than the risk for aseptic reasons.

Table N93 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	7.45 (6.17, 8.73)	27.45 (23.77, 31.12)
51-55	7.45 (6.17, 8.73)	24.9 (22.48, 27.32)
56-60	6.9 (5.86, 7.95)	21.19 (19.46, 22.92)
61-65	5.53 (4.74, 6.32)	16.49 (15.15, 17.82)
66-70	4.37 (3.67, 5.06)	13.36 (12.13, 14.6)
71-75	3.05 (2.42, 3.68)	11 (9.8, 12.2)
76-80	1.99 (1.41, 2.58)	8.31 (7.13, 9.48)
81-85	1.37 (0.81, 1.92)	5.86 (4.71, 7)
86+	0.65 (0.17, 1.12)	3.14 (2.1, 4.18)

Note: Restricted to modern prostheses

Figure N48 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO SEX AND DIAGNOSIS – ASEPTIC VERSUS SEPTIC

The lifetime risk of revision surgery following primary total stemmed reverse replacement for rotator cuff arthropathy differs according to age, sex, and whether the revision diagnosis is infection or aseptic reasons. The lifetime risk of revision for males in each 5 year cohort according to the revision diagnosis is shown in Table N94 and Figure N49.

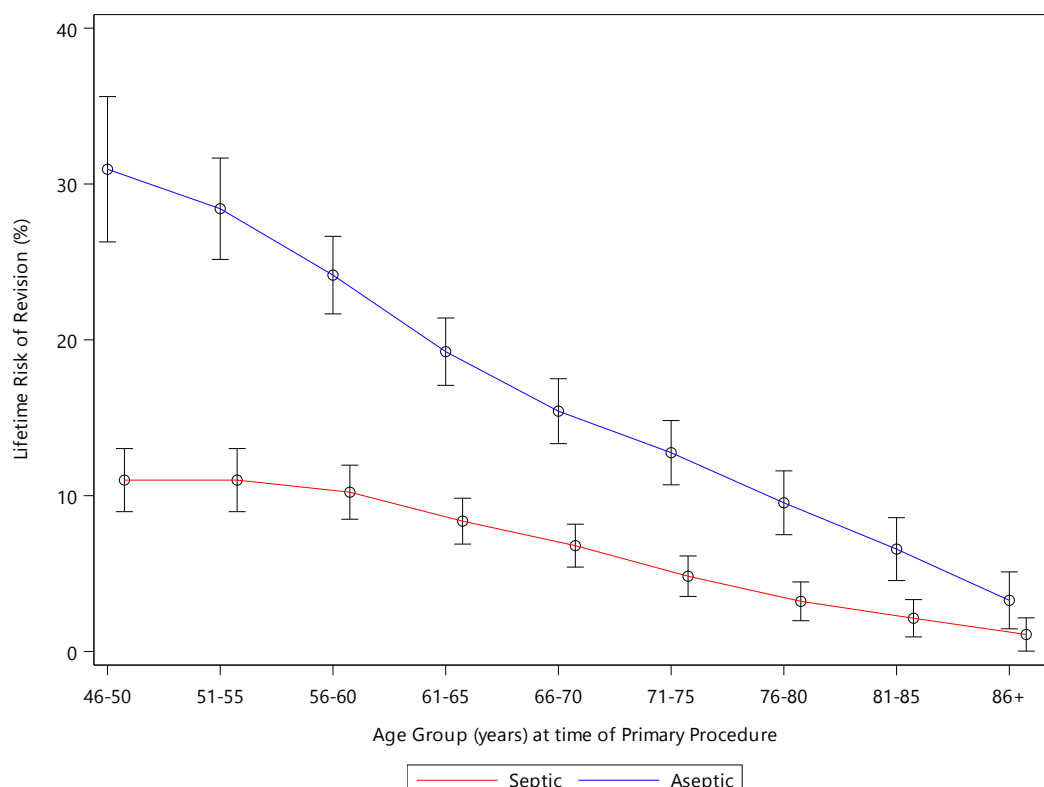
The lifetime risk of revision for females in each 5 year cohort according to the revision diagnosis is shown in Table N95 and Figure N50. In each age cohort, the risk of revision for infection in males is approximately three times that for females, with young males at the highest risk. The risk of revision for aseptic reasons for males is, on average, higher than for females.

Table N94 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	11 (8.97, 13.02)	30.95 (26.28, 35.61)
51-55	11 (8.97, 13.02)	28.41 (25.16, 31.66)
56-60	10.22 (8.49, 11.96)	24.15 (21.67, 26.64)
61-65	8.37 (6.89, 9.84)	19.24 (17.08, 21.4)
66-70	6.79 (5.42, 8.17)	15.42 (13.34, 17.5)
71-75	4.83 (3.53, 6.13)	12.76 (10.7, 14.82)
76-80	3.22 (1.98, 4.47)	9.54 (7.5, 11.59)
81-85	2.14 (0.94, 3.33)	6.57 (4.55, 8.59)
86+	1.09 (0.03, 2.16)	3.28 (1.46, 5.11)

Note: Restricted to modern prostheses

Figure N49 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Male Patients by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prostheses



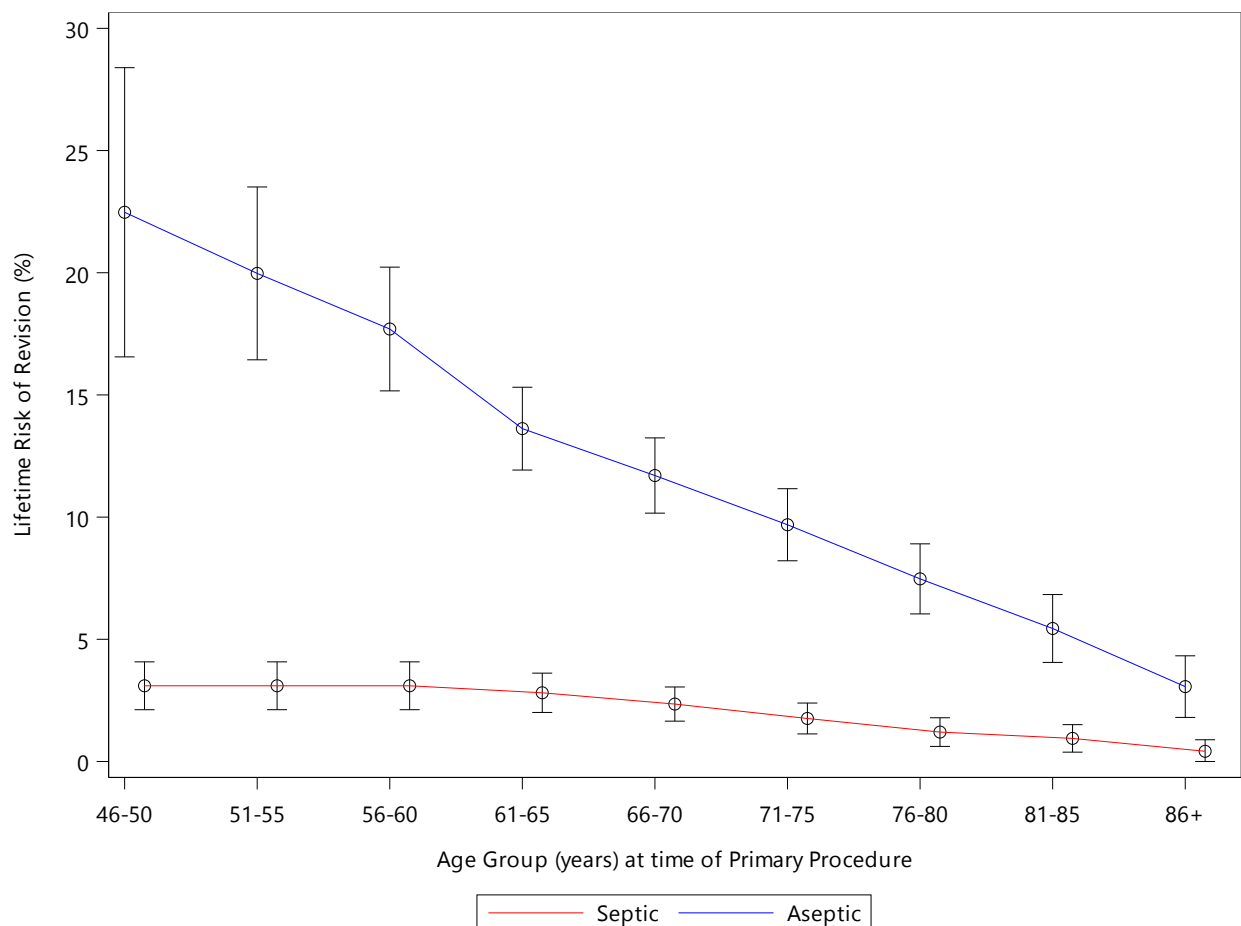
Modelling the Lifetime Risk of Revision

Table N95 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Female Patients, Stratified by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Septic, % (95% CI)	Aseptic, % (95% CI)
46-50	3.1 (2.12, 4.08)	22.47 (16.56, 28.39)
51-55	3.1 (2.12, 4.08)	19.97 (16.44, 23.51)
56-60	3.1 (2.12, 4.08)	17.7 (15.17, 20.23)
61-65	2.81 (2.01, 3.62)	13.62 (11.93, 15.31)
66-70	2.35 (1.65, 3.05)	11.7 (10.16, 13.24)
71-75	1.76 (1.13, 2.39)	9.69 (8.21, 11.16)
76-80	1.2 (0.62, 1.79)	7.47 (6.04, 8.91)
81-85	0.94 (0.38, 1.51)	5.44 (4.05, 6.83)
86+	0.42 (0, 0.89)	3.06 (1.8, 4.32)

Note: Restricted to modern prostheses

Figure N50 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement in Female Patients by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prostheses

Modelling the Lifetime Risk of Revision

LIFETIME REVISION RISK ACCORDING TO DIAGNOSIS – ASEPTIC REASONS

The three most common aseptic diagnoses for revision following primary total stemmed reverse replacement for rotator cuff arthropathy are loosening, instability/dislocation, and fracture.

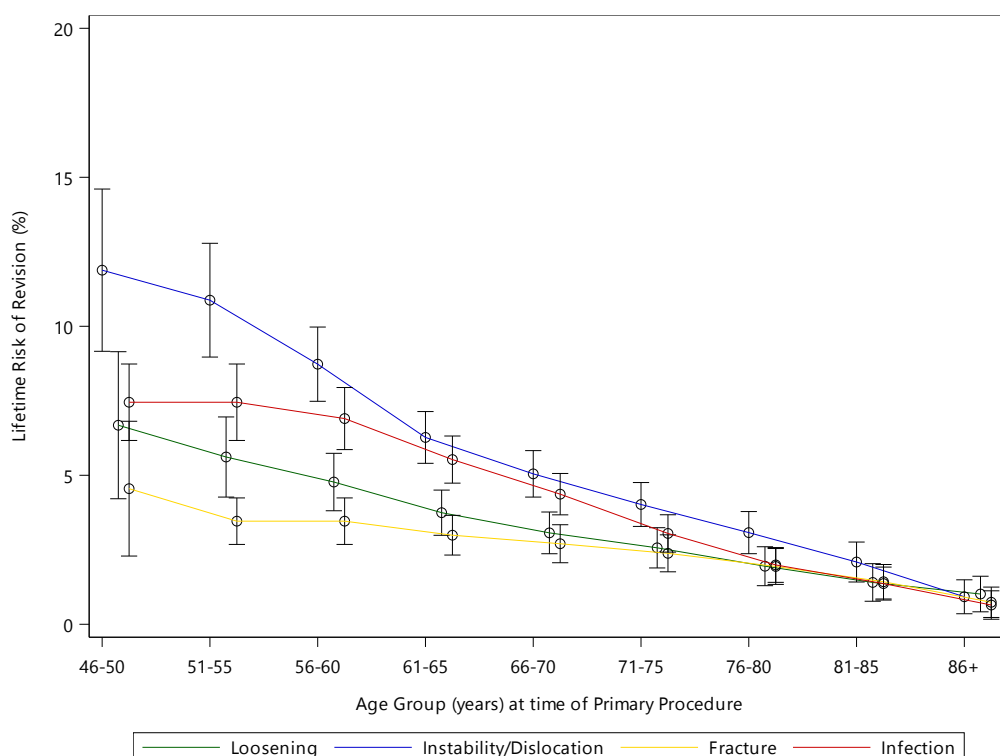
The percentage lifetime risks of revision surgery for each of these reasons, including infection, post primary total stemmed reverse replacement for rotator cuff arthropathy, are shown in Table N96 and Figure N51. Revision for instability/dislocation on average carries the highest risk in each age cohort until the age of 76–80 years, after which the four reasons are approximately equal in risk.

Table N96 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)

Age Group (years)	Loosening, % (95% CI)	Instability/Dislocation, % (95% CI)	Fracture, % (95% CI)	Infection, % (95% CI)
46-50	6.68 (4.21, 9.15)	11.88 (9.16, 14.61)	4.55 (2.29, 6.81)	7.45 (6.17, 8.73)
51-55	5.61 (4.27, 6.96)	10.88 (8.97, 12.78)	3.46 (2.68, 4.24)	7.45 (6.17, 8.73)
56-60	4.77 (3.81, 5.74)	8.73 (7.48, 9.97)	3.46 (2.68, 4.24)	6.9 (5.86, 7.95)
61-65	3.74 (2.99, 4.5)	6.27 (5.4, 7.14)	2.99 (2.32, 3.65)	5.53 (4.74, 6.32)
66-70	3.07 (2.37, 3.77)	5.05 (4.27, 5.83)	2.7 (2.07, 3.34)	4.37 (3.67, 5.06)
71-75	2.57 (1.89, 3.24)	4.02 (3.28, 4.76)	2.38 (1.76, 3)	3.05 (2.42, 3.68)
76-80	1.95 (1.3, 2.6)	3.08 (2.37, 3.78)	1.94 (1.34, 2.54)	1.99 (1.41, 2.58)
81-85	1.4 (0.77, 2.03)	2.09 (1.42, 2.76)	1.43 (0.85, 2.01)	1.37 (0.81, 1.92)
86+	1.02 (0.42, 1.61)	0.92 (0.35, 1.49)	0.74 (0.23, 1.25)	0.65 (0.17, 1.12)

Note: Restricted to modern prostheses

Figure N51 Percent Lifetime Risk of Revision (95% CI) after Primary Total Reverse Shoulder Replacement by Revision Diagnosis (Primary Diagnosis Rotator Cuff Arthropathy)



Note: Restricted to modern prosthese



Hip Replacement

Hip Replacement

As with previous year's Annual Reports, to ensure that the relevance and currency of AOANJRR data are maintained, almost all analyses (unless specifically stated) have been confined to hip, knee and shoulder prostheses that were still being used in 2025. Again, historic data are still available in previous Annual Reports on the AOANJRR website.

In addition to the main report, the Registry continues to publish Supplementary Reports. The Supplementary Reports are listed in the introductory chapter and will be available on the AOANJRR website <https://registry.aoa.org.au/annual-reports-2026> from November 2026. They include a Lay Summary of the main report and 13 additional reports on arthroplasty topics, as well as detailed analyses of all prostheses identified as having a higher than anticipated rate of revision.

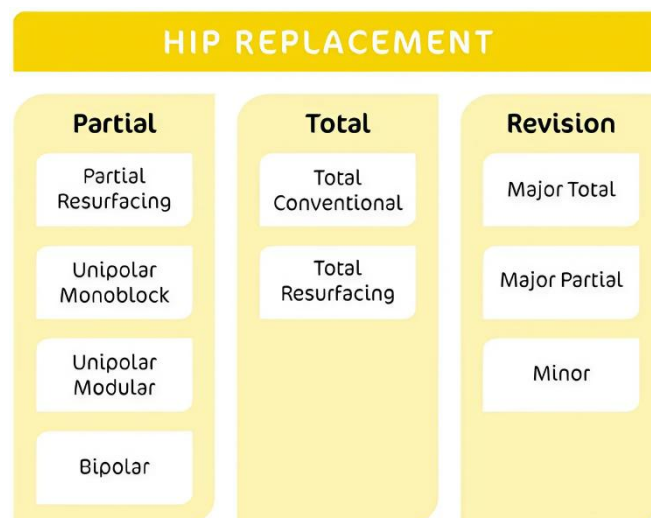
Categories of Hip Replacement

Hip replacement is grouped into three broad categories: primary partial, primary total and revision hip replacement.

A primary replacement is an initial replacement procedure undertaken on a joint and involves replacing either part (partial) or all (total) of the articular surface.

Primary partial and primary total hip replacement are further subcategorised into classes depending on the type of prostheses used. Partial hip classes include partial resurfacing, unipolar monoblock, unipolar modular, and bipolar. Total hip classes include total conventional and total resurfacing. Definitions for each of these classes are detailed in the subsequent sections.

Revision hip replacements are re-operations of previous hip replacements where one or more of the prosthetic components are replaced, removed, or one or more components are added. Revisions include re-operations of primary partial, primary total, or previous revision procedures. Hip revisions are subcategorised into three classes: major total, major partial, or minor revisions.



Detailed information on demographics of each category of hip replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>



Hip Replacement

Executive Summary Reference Tables

An index of the analyses presented in this chapter is provided in Table H1, Table H2 and Table H3. Variables are listed, and

where there is a significant finding for a comparison, a red diamond is shown in the table. Hyperlinks to the relevant tables and figures are included.

Table H1 Indexing Significant Characteristic Comparisons: Partial Hip Replacements

Characteristic	Variable	Partial Hip Fractured NoF		Unipolar Monoblock Fractured NoF		Unipolar Modular Fractured NoF		Bipolar Fractured NoF	
		Significant HR	Figure	Significant HR	Figure	Significant HR	Figure	Significant HR	Figure
	Mortality	♦	Figure HP3	NT		NT		NT	
	Class	♦	Figure HP4	NT		NT		NT	
	Class and Age	♦	Figure HP5	NT		NT		NT	
Patient									
	Age	NT		♦	Figure HP9	♦	Figure HP14	♦	Figure HP21
	Sex	NT			Figure HP10	♦	Figure HP15	♦	Figure HP22
Prosthesis									
	Fixation	NT		NT		♦	Figure HP16	♦	Figure HP23

♦ Significant Hazard Ratio difference between categories where $p < 0.05$

NT Not tested; Insufficient numbers to make statistical comparisons

*New analysis for this year's Annual Report

Table H2 Indexing Significant Characteristic Comparisons: Total Hip Replacements

Characteristic	Variable	Total Conventional Hip Osteoarthritis		Total Conventional Hip All Diagnoses		Total Conventional Hip Fractured NoF		Hip Fractured NoF	
		Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure
	Primary Diagnosis	NT		♦	Figure HT4	NT		NT	
	Class	NT		NT		♦		♦	Figure HT123
	Class and Age <70	NT		NT		NT		♦	Figure HT124
	Class and Age ≥70	NT		NT		NT		♦	Figure HT125
	Class and Sex	NT		NT		NT		NT	
Patient									
	Age	♦	Figure HT7	NT		♦	Figure HT103	NT	
	Sex	♦	Figure HT8	NT		♦	Figure HT104	NT	
	Sex by Age	♦	Figure HT9 Figure HT10	NT		♦	Figure HT105 Figure HT106	NT	
	ASA Score	♦	Figure HT14	NT		♦	Figure HT110	NT	
	ASA and Sex	♦	Figure HT16			NT		NT	
	ASA and Age	♦	Figure HT17			NT		NT	
	BMI	♦	Figure HT19	NT		♦	Figure HT113	NT	
	BMI and Sex	♦	Figure HT21			NT		NT	
	BMI and Age	♦	Figure HT22			NT		NT	
Prosthesis									



Hip Replacement

Characteristic	Variable	Total Conventional Hip Osteoarthritis		Total Conventional Hip All Diagnoses		Total Conventional Hip Fractured NoF		Hip Fractured NoF	
		Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure
	Fixation	♦	Figure HT25	NT		♦	Figure HT115	NT	
	Fixation and age <55	♦	Figure HT26	NT		NT		NT	
	Fixation and age 55-64	♦	Figure HT27	NT		NT		NT	
	Fixation and age 65-74	♦	Figure HT28	NT		NT		NT	
	Fixation and age ≥75	♦	Figure HT29	NT		NT		NT	
	Fixation and age <70	NT		NT		♦	Figure HT116	NT	
	Fixation and age ≥70	NT		NT		♦	Figure HT117	NT	
	Stem Collar	♦	Figure HT30	NT		NT		NT	
	Surgical Approach and Stem Collar Use	♦	Figure HT32 Figure HT33 Figure HT34	NT		NT		NT	
	Prosthesis Combinations and Stem Collar Use*	♦	Table HT33	NT		NT		NT	
	Mini Stems	♦	Figure HT35	NT		NT		NT	
	Mini Stems and Age	♦	Figure HT36			NT		NT	
	Mini Stems and BMI	♦	Figure HT37			NT		NT	
	Mini Stems Revision for Loosening	♦	Figure HT39	NT		NT		NT	
	Mini Stems Revision for Fracture	♦	Figure HT40	NT		NT		NT	
	Bearing Surface	♦	Figure HT45 Figure HT46	NT		NT		NT	
	Head Size	NT		NT		♦	Figure HT118	NT	
	Head Size and Revision for Prosthesis Dislocation/Instability	NT		NT		♦	Figure HT119	NT	
	XLPE Polyethylene Type and Head Size	♦	Figure HT51	NT		NT		NT	
	Polyethylene Type*	♦	Figure HT52						
	XLPE by Antioxidant Usage and Head Material*	♦	Figure HT54						
	Mixed Ceramic Bearings by Head Size	♦	Figure HT57	NT		NT		NT	
	Mixed Ceramic Bearings by Modularity*	♦	Figure HT59						
	Acetabular Size <52cm	♦	Figure HT60			NT		NT	
	Acetabular Size 52cm	♦	Figure HT61			NT		NT	
	Acetabular Size >52cm	♦	Figure HT62			NT		NT	
	Acetabular Type	NT		♦	Figure HT63		Figure HT120	NT	
	Constrained Acetabular Components	♦	Table HT56	NT		NT		NT	
	Dual Mobility*	♦	Figure HT67	♦	Figure HT66	♦	Figure HT121	NT	
	Dual Mobility and Reason for Revision	♦	Figure HT68	NT		♦	Figure HT122	NT	



Hip Replacement

Characteristic	Variable	Total Conventional Hip Osteoarthritis		Total Conventional Hip All Diagnoses		Total Conventional Hip Fractured NoF		Hip Fractured NoF	
		Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure	Significant HR	Table/ Figure
	Dual Mobility and Sex	♦	Figure HT69	NT		NT		NT	
	Dual Mobility and Age		Figure HT70	NT		NT		NT	
	Dual Mobility and Fixation	♦	Figure HT71	NT		NT		NT	
	Dual Mobility and Polyethylene Type		Figure HT74						
	Dual Mobility and Modularity		Figure HT75						
	Dual Mobility and Surgical Approach*		Figure HT76 Figure HT77 Figure HT78	NT		NT		NT	
Surgeon Assistive Tools (SAT)									
	Computer Navigation		Figure HT80	NT		NT		NT	
	Computer Navigation and Age		Figure HT82	NT		NT		NT	
	IDI	♦	Figure HT83	NT		NT		NT	
	IDI and Age	♦	Figure HT85	NT		NT		NT	
	Robotic Assistance	♦	Figure HT86	NT		NT		NT	
	Robotic Assistance and Age		Figure HT88	NT		NT		NT	
	XLPE by SAT	♦	Figure HT89	NT		NT		NT	
	Accolade II/Trident (Shell) Combination with XLPE by SAT		Figure HT90	NT		NT		NT	
	Exeter V40/Trident (Shell) Combination with XLPE by SAT		Figure HT91	NT		NT		NT	
Surgical Approach									
	Surgical Approach for osteoarthritis	♦	Figure HT93	NT		NT		NT	
	Surgical Approach Major Revision	♦	Figure HT94	NT		NT		NT	
	Surgical Approach Revision for Loosening	♦	Figure HT96	NT		NT		NT	
	Surgical Approach Revision for Fracture	♦	Figure HT97	NT		NT		NT	
	Surgical Approach Revision for Infection	♦	Figure HT98	NT		NT		NT	
	Surgical Approach Revision for Dislocation/Instability	♦	Figure HT99	NT		NT		NT	

♦ Significant Hazard Ratio difference between categories where $p < 0.05$

N T Not tested: Insufficient numbers to make statistical comparisons.

*New analysis for this year's Annual Report



Hip Replacement

Table H3 Indexing Significant Characteristic Comparisons: Total Hip Replacements

Characteristic	Variable	Total Resurfacing Hip All Diagnoses		Total Resurfacing Hip Osteoarthritis		Primary Total Hip Osteoarthritis	
		Significant HR	Figure	Significant HR	Figure	Significant HR	Figure
	Primary Diagnosis	♦	Figure HT128	NT		NT	
	Class	NT		NT		♦	Figure HT138
	Class and Sex	NT		NT		♦	Figure HT139
Patient							
	Age	NT		♦	Figure HT131	NT	
	Sex	NT		♦	Figure HT132	NT	
	Male Sex by Age	NT		♦	Figure HT133	NT	
	Female Sex by Age	NT			Figure HT134	NT	
Prosthesis							
	Head Size	NT		♦	Figure HT135	NT	
	Head Size and Sex	NT		♦	Figure HT136	NT	

♦ Note Significant Hazard Ratio difference between categories where $p < 0.05$ Not tested: Insufficient numbers to make statistical comparisons

Use of Hip Replacement

There are 1,036,341 hip replacements with a procedure date up to and including 31 December 2025. This represents an additional 64,085 hip procedures compared to the number reported last year. The relative frequency of each type of hip procedure is provided in Table H4.

For further information on the **closure of the database** please see the Glossary of this report.

Table H4 Number of Hip Replacements

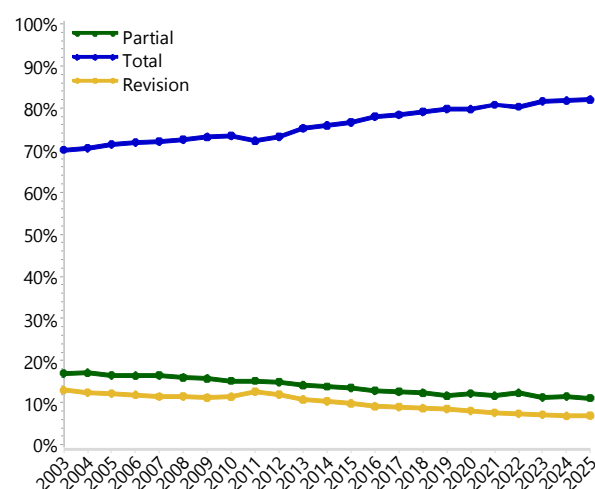
Hip Category	Number	Percent
Partial	141456	13.6
Total	794730	76.7
Revision	100155	9.7
TOTAL	1036341	100.0

The number of hip replacement procedures undertaken in 2025 is a 137.9% increase since 2003. The corresponding increase in primary total hip replacement is 178.4%; for primary partial, it is 55.3%, and for revision hip replacement, it is 26.9%.

There have been 2,165 more hip replacement procedures undertaken in 2025 compared to the previous year. During this time, the use of primary total hip replacement increased by 3.9%, accounting for 82.0% of all hip replacement procedures in 2025. Primary partial hip replacement increased by 0.1%, accounting for 11.1% of hip procedures in 2025.

The proportion of revision hip procedures has declined from a peak of 12.9% in 2003 to 6.9% in 2025. This equates to 3,821 fewer revision procedures in 2025 than would have been expected if the proportion of revision procedures had remained at the level reported in 2003 (Figure H1).

Figure H1 Proportion of Hip Replacement





Hip Replacement

ASA Score and BMI in Hip Replacement

Data are reported on hip replacement procedures for both the American Society of Anesthesiologists – Physical Status Classification (ASA score) and Body Mass Index (BMI). ASA score and BMI are both known to impact the outcome of hip replacement surgery. The Registry commenced collection of ASA score in 2012 and BMI data in 2015.

There are ASA score data on 647,960 hip replacement procedures and BMI data on 521,775 hip replacement procedures. Since its initial collection, ASA score has been recorded for 97.5% of procedures. BMI has been recorded for 89.7% of procedures since collection commenced.

ASA SCORE

There are five ASA score classifications:¹⁰

1. A normal healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation

There is a difference in ASA score depending on the class of hip replacement. Partial hip replacement procedures have a higher proportion of patients with ASA scores 3 and 4 compared to patients undergoing primary total or revision hip replacement. Total hip replacement procedures have more patients with ASA scores 1 and 2 (Table H5).

BMI Category

BMI for adults is classified into six main categories:¹¹

Underweight	<18.5
Normal	18.5 – 24.9
Pre-obese	25.0 – 29.9
Obese Class 1	30.0 – 34.9
Obese Class 2	35.0 – 39.9
Obese Class 3	≥40.0

The majority of hip replacement procedures are undertaken in patients who have a normal BMI or are pre-obese (Table H6).

Table H5 ASA Score for Hip Replacement

ASA Score	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
ASA 1	195	0.2	41240	8.0	1779	3.3	43214	6.7
ASA 2	7287	9.3	265940	51.6	16965	31.8	290192	44.8
ASA 3	47729	60.6	198475	38.5	29828	55.8	276032	42.6
ASA 4	23171	29.4	10143	2.0	4806	9.0	38120	5.9
ASA 5	322	0.4	48	0.0	32	0.1	402	0.1
TOTAL	78704	100.0	515846	100.0	53410	100.0	647960	100.0

Table H6 BMI Category for Hip Replacement

BMI Category	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Underweight (<18.5)	3940	9.7	4746	1.1	689	1.7	9375	1.8
Normal (18.5 – 24.9)	20053	49.4	97923	22.2	9413	23.9	127389	24.4
Pre Obese (25.0 – 29.9)	11584	28.5	160608	36.4	13439	34.1	185631	35.6
Obese Class 1 (30.0 – 34.9)	3644	9.0	109852	24.9	9258	23.5	122754	23.5
Obese Class 2 (35.0 – 39.9)	1009	2.5	46311	10.5	4135	10.5	51455	9.9
Obese Class 3 (≥40.0)	395	1.0	22280	5.0	2496	6.3	25171	4.8
TOTAL	40625	100.0	441720	100.0	39430	100.0	521775	100.0

Note: BMI has not been presented for patients aged ≤19 years

¹⁰ <https://journals.lww.com/anesthesiologyopen/fulltext/10.1097/ao9.0000000000000002~american-society-of-anesthesiologists-statement-on-asa>

¹¹ <https://www.health.gov.au/topics/overweight-and-obesity/bmi-and-waist>

Primary Partial Hip Replacement

Classes of Partial Hip Replacement

There are four classes of primary partial hip replacement. These are defined by the type of prostheses used.

Partial resurfacing involves the use of one or more button prostheses to replace part of the natural articulating surface on one or both sides of the hip joint. These prostheses are no longer used.

Unipolar monoblock involves the use of a femoral stem prosthesis with a fixed large head that replaces the natural femoral head.

Unipolar modular involves the use of a femoral stem and exchangeable large head prosthesis that replaces the natural femoral head.

Bipolar involves the use of a femoral stem and standard head prosthesis that articulates with a non-fixed component replacing the natural femoral head.

Use of Partial Hip Replacement

The most common class of primary partial hip replacement is unipolar modular, followed by bipolar and unipolar monoblock (Table HP1).

Table HP1 Primary Partial Hip Replacement by Class

Hip Class	Number	Percent
Unipolar Monoblock	29480	20.8
Unipolar Modular	62457	44.2
Bipolar	49504	35.0
TOTAL	141441	100.0

Note: Excludes 15 partial resurfacing hip procedures.

Partial resurfacing hip procedures have not been performed since 2014

In 2025, bipolar hip replacement was more commonly used than unipolar modular. The use of unipolar monoblock has declined since 2004 and now accounts for only 0.9% of primary partial hip replacements (Figure HP1).

Cemented fixation remains the most common fixation method for partial hip replacement (Figure HP2).

The 10 most used femoral prostheses for partial hip replacement are listed in Table HP2. The Exeter V40, CPCS and C-Stem AMT were the most frequently used femoral prostheses.

Detailed demographic information on primary partial hip replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website:

<https://registry.aoa.org.au/annual-reports-2026>

Figure HP1 Primary Partial Hip Replacement by Class

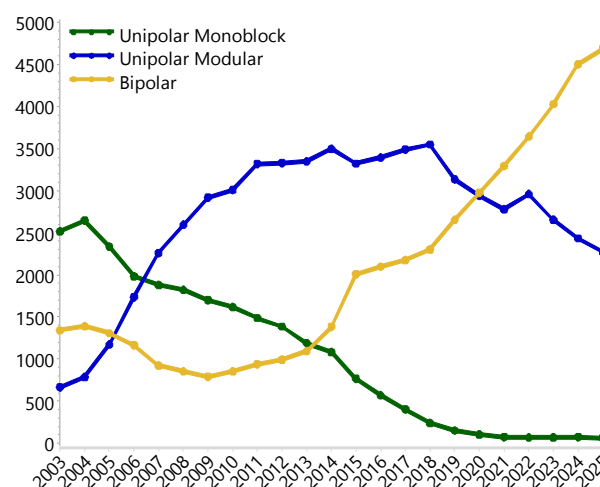
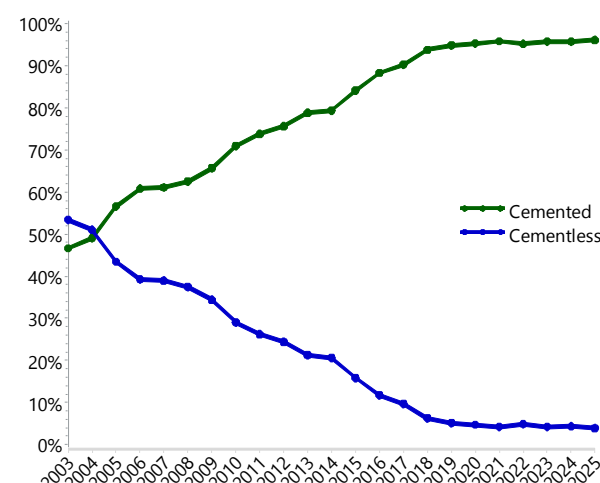


Figure HP2 Primary Partial Hip Replacement by Fixation (All Diagnoses)



Detailed information on partial resurfacing hip replacement is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>



Primary Partial Hip Replacement

Table HP2 10 Most Used Femoral Prostheses in Primary Partial Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1988	Austin-Moore Type	3492	Exeter V40	3351	Exeter V40	3504	Exeter V40	3739	Exeter V40
810	Exeter V40	874	CPT	917	CPT	732	CPCS	808	CPCS
526	Thompson Type	732	CPCS	772	CPCS	627	CPT	510	C-Stem AMT
186	Alloclassic	497	C-Stem AMT	490	C-Stem AMT	528	C-Stem AMT	308	MS 30
127	Elite Plus	205	Short Exeter V40	217	Taper Fit	284	Taper Fit	306	Evolve
105	CPT	185	CORAIL	167	CORAIL	228	MS 30	234	Short Exeter V40
95	Spectron EF	102	Quadra-C	149	Short Exeter V40	220	Short Exeter V40	213	Taper Fit
74	C-Stem	82	Taper Fit	110	Quadra-C	179	CORAIL	143	CPT
65	CPCS	70	ETS	93	MS 30	136	Quadra-C	138	CORAIL
63	Omnifit	60	Polarstem	73	Polarstem	118	Polarstem	107	Polarstem
10 Most Used									
4039	(10) 89.3%	6299	(10) 94.5%	6339	(10) 93.9%	6556	(10) 93.5%	6506	(10) 92.7%
Remainder									
482	(52) 10.7%	370	(39) 5.5%	410	(35) 6.1%	454	(33) 6.5%	514	(39) 7.3%
TOTAL									
4521	(62) 100.0%	6669	(49) 100.0%	6749	(45) 100.0%	7010	(43) 100.0%	7020	(49) 100.0%

Note: Excludes partial resurfacing

The CPT femoral stem has been identified as having a higher than anticipated revision rate

Primary Partial Hip Replacement

Outcome for Fractured Neck of Femur

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified. Due to the restriction to modern prostheses, 41,457 (29.3%) partial hip replacement procedures have been excluded from this analysis in 2025.

Fractured neck of femur is the principal diagnosis for the three main classes of primary partial hip replacement: unipolar monoblock (98.1%), unipolar modular (96.6%) and bipolar (94.9%). A comparative analysis of partial hip replacement and total conventional hip replacement has been undertaken for fractured neck of femur and is presented after the primary total conventional hip replacement for osteoarthritis section of this report: [Outcome of Total Conventional Compared to Partial Hip Replacement](#).

The outcome of primary partial hip replacement varies depending on the class. Outcomes are restricted to 10 years because of the high mortality in this group.

The prosthesis class variation in mortality is almost certainly due to patient selection (Table HP3).

When used for fractured neck of femur, bipolar has a lower cumulative percent revision compared to unipolar modular after 2.5 years. While unipolar monoblock has the lowest cumulative percent revision, this most likely is related to recent low rate of use, patient selection, restriction of analyses to modern prostheses and the high competing risk of mortality (Table HP4 and Figure HP4). The difference in outcome between bipolar and unipolar modular classes is more apparent in patients aged <75 years (Table HP5 and Figure HP5).



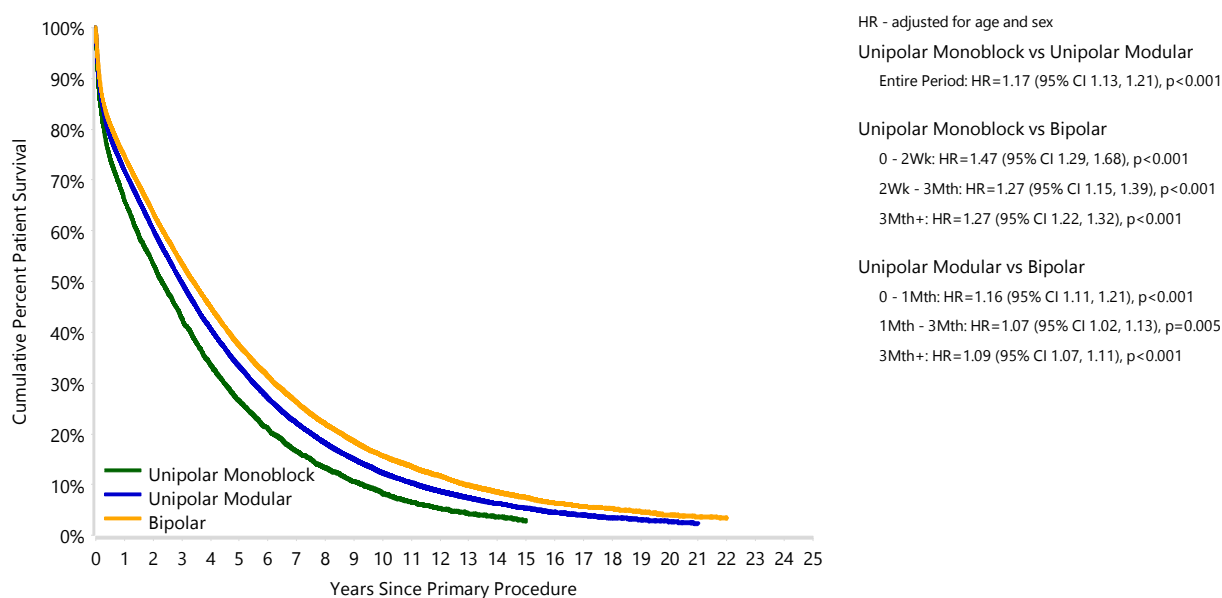
Primary Partial Hip Replacement

Table HP3 Cumulative Percent Survival of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Deceased	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3462	3837	65.9 (64.4, 67.4)	53.5 (51.8, 55.0)	42.8 (41.2, 44.3)	26.5 (25.0, 27.9)	16.6 (15.4, 17.8)	8.3 (7.4, 9.2)
Unipolar Modular	38307	49446	71.8 (71.4, 72.2)	60.2 (59.8, 60.7)	49.8 (49.4, 50.3)	33.3 (32.8, 33.8)	22.2 (21.7, 22.6)	12.4 (12.0, 12.7)
Bipolar	24281	39619	74.7 (74.3, 75.1)	63.5 (63.0, 64.0)	53.6 (53.0, 54.1)	37.4 (36.8, 38.0)	26.3 (25.7, 26.9)	15.7 (15.2, 16.2)
TOTAL	66050	92902						

Note: Restricted to modern prostheses
Restricted to first procedure performed per patient

Figure HP3 Cumulative Percent Survival of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)



Number Deceased	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3837	2455	1950	1533	917	548	239
Unipolar Modular	49446	33304	26486	20744	12304	7254	3167
Bipolar	39619	25615	19062	14103	7764	4303	1813

Note: Restricted to modern prostheses
Restricted to first procedure performed per patient

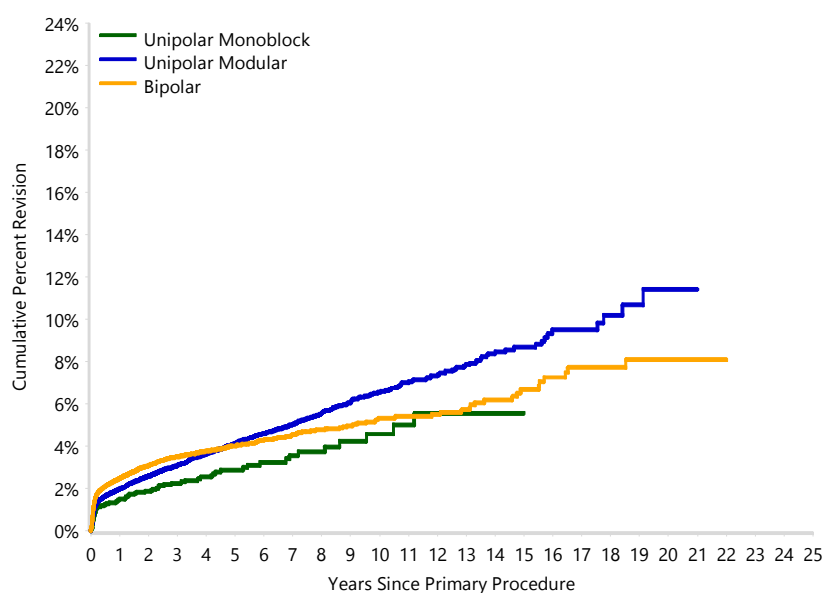
Primary Partial Hip Replacement

Table HP4 Cumulative Percent Revision of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	84	3927	1.5 (1.1, 2.0)	1.9 (1.4, 2.4)	2.3 (1.8, 2.9)	2.9 (2.3, 3.7)	3.6 (2.8, 4.6)	4.6 (3.4, 6.2)
Unipolar Modular	1601	51168	2.0 (1.9, 2.1)	2.6 (2.4, 2.8)	3.1 (2.9, 3.3)	4.1 (3.9, 4.4)	5.0 (4.7, 5.3)	6.6 (6.1, 7.0)
Bipolar	1232	40826	2.5 (2.3, 2.7)	3.1 (2.9, 3.3)	3.5 (3.3, 3.7)	4.0 (3.8, 4.3)	4.5 (4.2, 4.9)	5.3 (4.9, 5.8)
TOTAL	2917	95921						

Note: Restricted to modern prostheses

Figure HP4 Cumulative Percent Revision of Primary Partial Hip Replacement by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for age and sex

Unipolar Monoblock vs Unipolar Modular

Entire Period: HR=0.74 (95% CI 0.59, 0.92), p=0.006

Bipolar vs Unipolar Monoblock

0 - 3Mth: HR=1.68 (95% CI 1.33, 2.12), p<0.001

3Mth - 6Mth: HR=1.44 (95% CI 1.02, 2.03), p=0.040

6Mth - 1.5Yr: HR=1.37 (95% CI 1.03, 1.81), p=0.029

1.5Yr - 2Yr: HR=1.38 (95% CI 0.94, 2.03), p=0.104

2Yr+: HR=0.77 (95% CI 0.59, 1.00), p=0.046

Bipolar vs Unipolar Modular

0 - 1Mth: HR=1.34 (95% CI 1.16, 1.55), p<0.001

1Mth - 3Mth: HR=1.14 (95% CI 0.97, 1.33), p=0.106

3Mth - 2.5Yr: HR=1.00 (95% CI 0.88, 1.14), p=0.951

2.5Yr+: HR=0.51 (95% CI 0.42, 0.61), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3927	2505	1989	1564	931	557	243
Unipolar Modular	51168	34382	27302	21348	12637	7417	3229
Bipolar	40826	26352	19555	14446	7929	4366	1836

Note: Restricted to modern prostheses



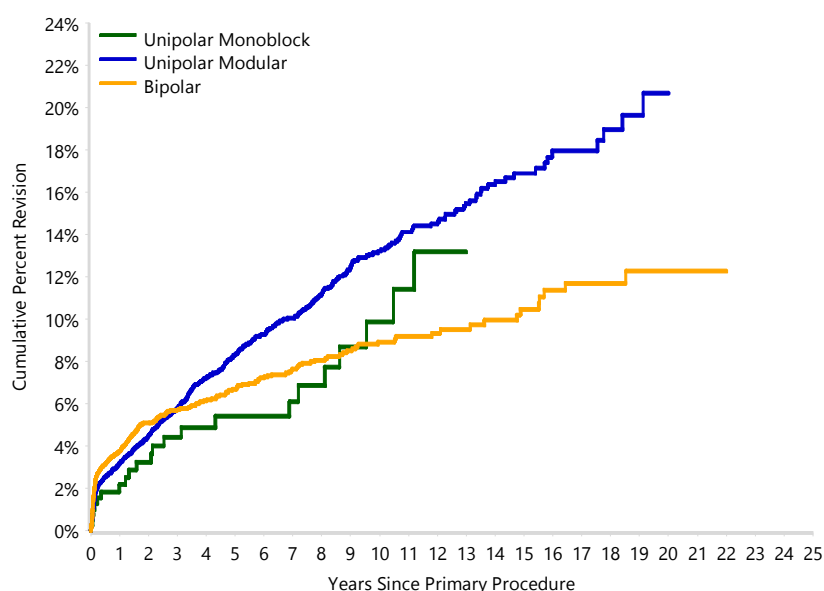
Primary Partial Hip Replacement

Table HP5 Cumulative Percent Revision of Primary Partial Hip Replacement in Patients Aged <75 Years by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	23	422	2.2 (1.1, 4.3)	3.2 (1.8, 5.8)	4.4 (2.6, 7.4)	5.4 (3.3, 8.8)	6.1 (3.7, 9.9)	9.9 (6.1, 15.7)
Unipolar Modular	554	7007	3.2 (2.8, 3.6)	4.5 (4.0, 5.0)	5.8 (5.2, 6.4)	8.3 (7.6, 9.2)	10.0 (9.1, 11.0)	13.2 (12.0, 14.5)
Bipolar	396	6992	3.8 (3.3, 4.3)	5.1 (4.6, 5.7)	5.7 (5.1, 6.4)	6.7 (6.0, 7.4)	7.6 (6.8, 8.5)	8.9 (7.9, 10.0)
TOTAL	973	14421						

Note: Restricted to modern prostheses

Figure HP5 Cumulative Percent Revision of Primary Partial Hip Replacement in Patients Aged <75 Years by Class (Primary Diagnosis Fractured NOF)



HR - adjusted for age and sex

Unipolar Monoblock vs Bipolar

0 - 2Yr: HR=0.63 (95% CI 0.34, 1.14), p=0.126

2Yr+: HR=1.67 (95% CI 0.92, 3.05), p=0.094

Unipolar Modular vs Unipolar Monoblock

Entire Period: HR=1.40 (95% CI 0.92, 2.13), p=0.113

Unipolar Modular vs Bipolar

0 - 3Mth: HR=0.78 (95% CI 0.62, 0.97), p=0.026

3Mth - 1.5Yr: HR=0.94 (95% CI 0.71, 1.24), p=0.649

1.5Yr - 2Yr: HR=1.26 (95% CI 0.72, 2.18), p=0.415

2Yr - 3Yr: HR=2.09 (95% CI 1.31, 3.34), p=0.002

3Yr - 3.5Yr: HR=4.35 (95% CI 1.92, 9.87), p<0.001

3.5Yr+: HR=2.28 (95% CI 1.72, 3.00), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	422	292	251	221	164	130	67
Unipolar Modular	7007	5262	4455	3765	2698	1961	1135
Bipolar	6992	4911	3855	3118	2059	1387	784

Note: Restricted to modern prostheses



Primary Partial Hip Replacement

Unipolar Monoblock

DEMOGRAPHICS

There are 29,480 unipolar monoblock procedures recorded. This is an additional 63 procedures compared to the previous report.

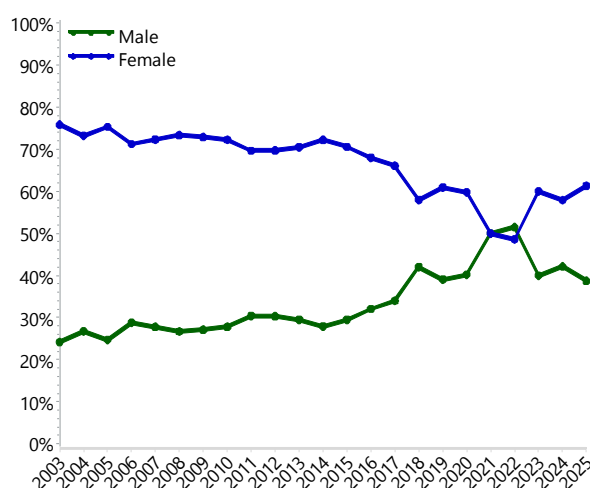
For further information on the **closure of the database** please see the Glossary of this report.

The yearly use of unipolar monoblock hip replacement in Australia in 2025 has decreased by 97.5% compared to 2003. While the number of procedures reported in 2025 is small, this has decreased further by 18.4% compared to 2024.

Fractured neck of femur is the principal diagnosis for primary unipolar monoblock hip replacement.

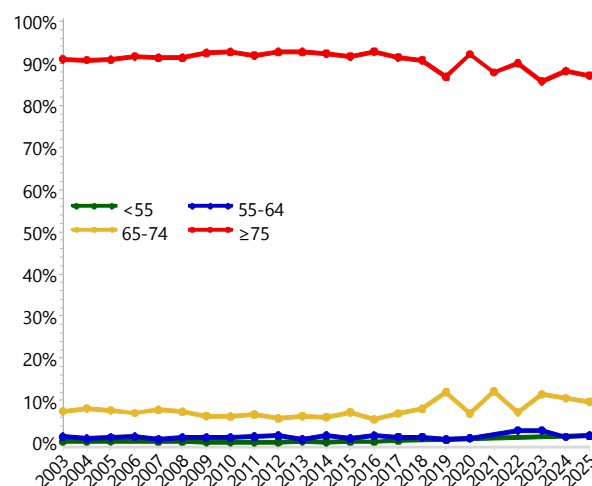
The majority of patients are female and aged ≥ 75 years.

Figure HP6 Primary Unipolar Monoblock Hip Replacement by Sex



The proportion of patients aged ≥ 85 years has increased from 51.0% in 2003 to 54.1% in 2025. The mean age of patients is 84.5 years (Table HP6, Figure HP6, and Figure HP7).

Figure HP7 Primary Unipolar Monoblock Hip Replacement by Age



The Exeter Trauma Stem (ETS) is the only unipolar monoblock prosthesis used in 2025 (Table HP7).

Table HP6 Age and Sex of Primary Unipolar Monoblock Hip Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	8090	27.4%	32	107	84	83.5	7.8
Female	21390	72.6%	16	108	86	85.0	7.2
TOTAL	29480	100.0%	16	108	85	84.5	7.4

Table HP7 Most Used Prostheses in Primary Unipolar Monoblock Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1988	Austin-Moore Type	70	ETS	69	ETS	76	ETS	62	ETS
526	Thompson Type			1	Austin-Moore Type				
10 Most Used									
2514 (2)	100.0%	70 (1)	100.0%	70 (2)	100.0%	76 (1)	100.0%	62 (1)	100.0%



Primary Partial Hip Replacement

Outcome for Fractured Neck of Femur

The cumulative percent revision at 10 years for unipolar monoblock replacement undertaken for fractured neck of femur is 4.6% (Table HP8 and Figure HP8).

The main reason for revision is dislocation/instability, followed by infection, fracture and chondrolysis/acetabular erosion (Table HP9). Of the revisions of unipolar monoblock hip replacements, the majority are revised to a total hip replacement (Table HP10).

Age <75 years is a risk factor for revision. The rate of revision for this age group is higher than for those 75-84 years and also ≥85 years (Table HP11 and Figure HP9).

There is no difference in the rate of revision between males and females (Table HP12 and Figure HP10).

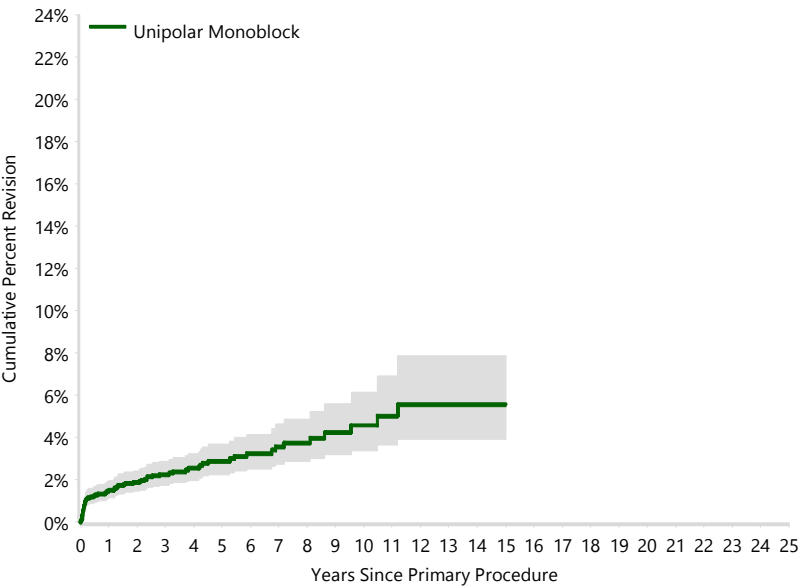
All unipolar monoblock hip replacements in 2025 used cemented fixation.

Table HP8 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	84	3927	1.5 (1.1, 2.0)	1.9 (1.4, 2.4)	2.3 (1.8, 2.9)	2.9 (2.3, 3.7)	3.6 (2.8, 4.6)	4.6 (3.4, 6.2)
TOTAL	84	3927						

Note: Restricted to modern prostheses

Figure HP8 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3927	2505	1989	1564	931	557	243

Note: Restricted to modern prostheses



Primary Partial Hip Replacement

Table HP9 Primary Unipolar Monoblock Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Prosthesis Dislocation/Instability	22	26.2
Infection	21	25.0
Fracture	13	15.5
Chondrolysis/Acetab. Erosion	11	13.1
Pain	9	10.7
Loosening	5	6.0
Malposition	1	1.2
Other	2	2.4
TOTAL	84	100.0

Note: Restricted to modern prostheses

Table HP9 Primary Unipolar Monoblock Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Prosthesis Dislocation/Instability	22	26.2
Infection	21	25.0
Fracture	13	15.5
Chondrolysis/Acetab. Erosion	11	13.1
Pain	9	10.7
Loosening	5	6.0
Malposition	1	1.2
Other	2	2.4
TOTAL	84	100.0

Note: Restricted to modern prostheses

Table HP10 Primary Unipolar Monoblock Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
THR (Femoral/Acetabular)	50	59.5
Femoral Component	11	13.1
Cement Spacer	10	11.9
Removal of Prostheses	7	8.3
Minor Components	3	3.6
Bipolar Head and Femoral	3	3.6
TOTAL	84	100.0

Note: Restricted to modern prostheses

Table HP10 Primary Unipolar Monoblock Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
THR (Femoral/Acetabular)	50	59.5
Femoral Component	11	13.1
Cement Spacer	10	11.9
Removal of Prostheses	7	8.3
Minor Components	3	3.6
Bipolar Head and Femoral	3	3.6
TOTAL	84	100.0

Note: Restricted to modern prostheses



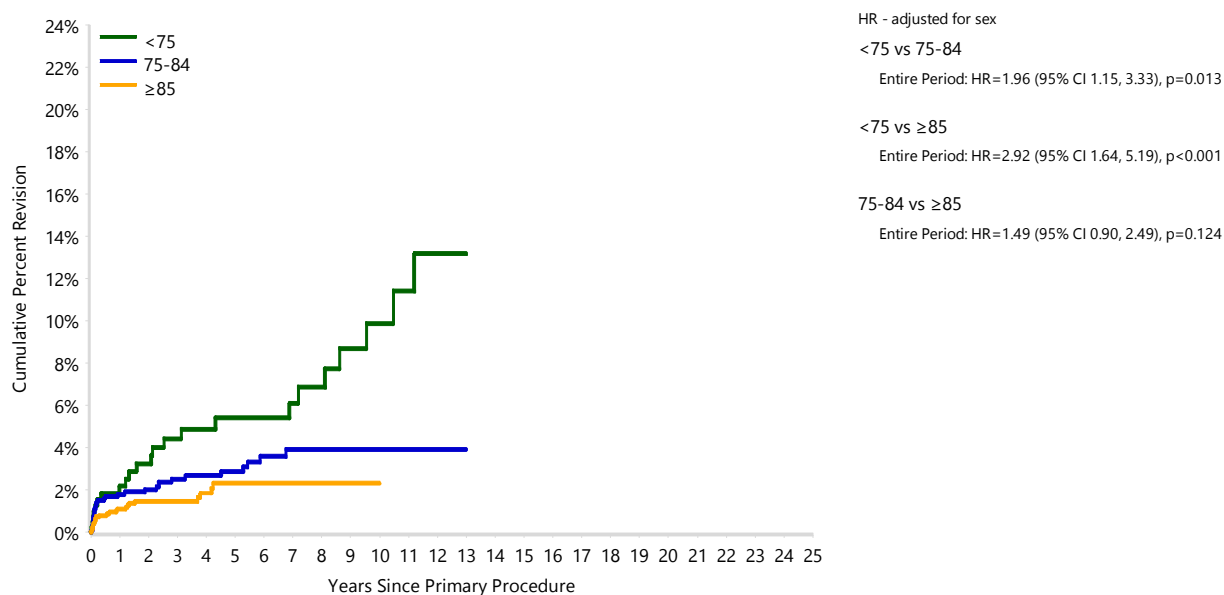
Primary Partial Hip Replacement

Table HP11 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	23	422	2.2 (1.1, 4.3)	3.2 (1.8, 5.8)	4.4 (2.6, 7.4)	5.4 (3.3, 8.8)	6.1 (3.7, 9.9)	9.9 (6.1, 15.7)
75-84	35	1451	1.8 (1.2, 2.7)	2.0 (1.4, 3.0)	2.5 (1.7, 3.6)	2.9 (2.0, 4.1)	3.9 (2.7, 5.7)	3.9 (2.7, 5.7)
≥85	26	2054	1.1 (0.7, 1.7)	1.5 (1.0, 2.2)	1.5 (1.0, 2.2)	2.3 (1.5, 3.6)	2.3 (1.5, 3.6)	2.3 (1.5, 3.6)
TOTAL	84	3927						

Note: Restricted to modern prostheses

Figure HP9 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Age (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	422	292	251	221	164	130	67
75-84	1451	1006	841	686	450	283	127
≥85	2054	1207	897	657	317	144	49

Note: Restricted to modern prostheses

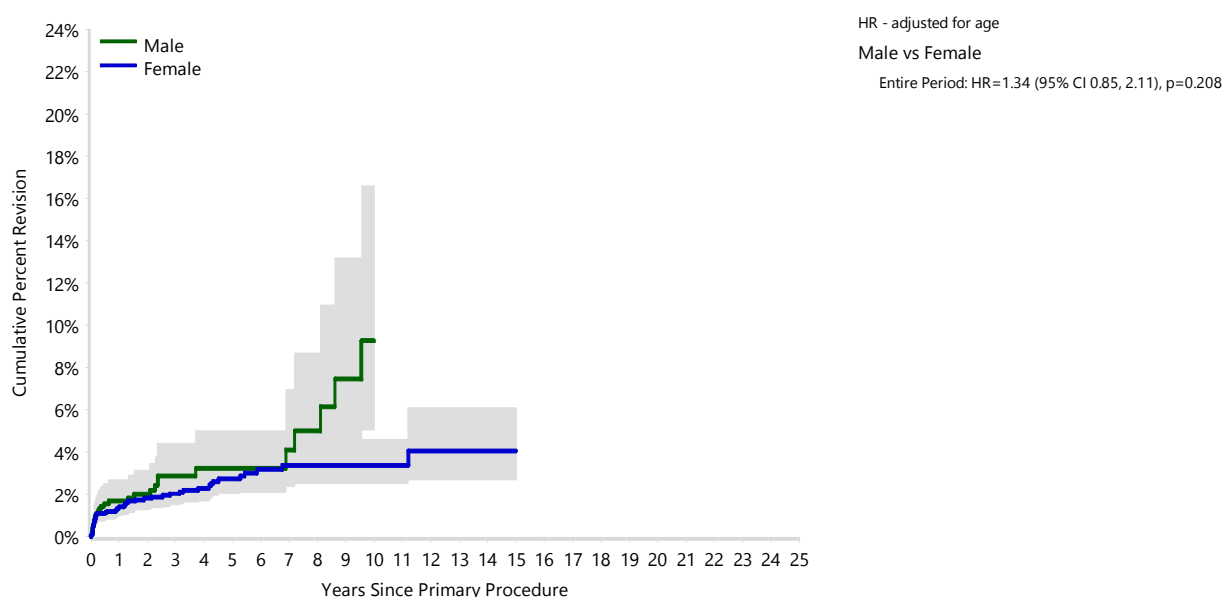
Primary Partial Hip Replacement

Table HP12 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Sex (Primary Diagnosis Fractured NOF)

Sex	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	30	1281	1.7 (1.0, 2.7)	2.0 (1.3, 3.2)	2.9 (1.9, 4.4)	3.2 (2.1, 5.0)	4.1 (2.4, 6.9)	9.3 (5.1, 16.6)
Female	54	2646	1.4 (1.0, 2.0)	1.8 (1.3, 2.5)	2.0 (1.5, 2.8)	2.7 (2.0, 3.7)	3.4 (2.5, 4.6)	3.4 (2.5, 4.6)
TOTAL	84	3927						

Note: Restricted to modern prostheses

Figure HP10 Cumulative Percent Revision of Primary Unipolar Monoblock Hip Replacement by Sex (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	1281	698	497	348	184	110	43
Female	2646	1807	1492	1216	747	447	200

Note: Restricted to modern prostheses

Primary Partial Hip Replacement

Unipolar Modular

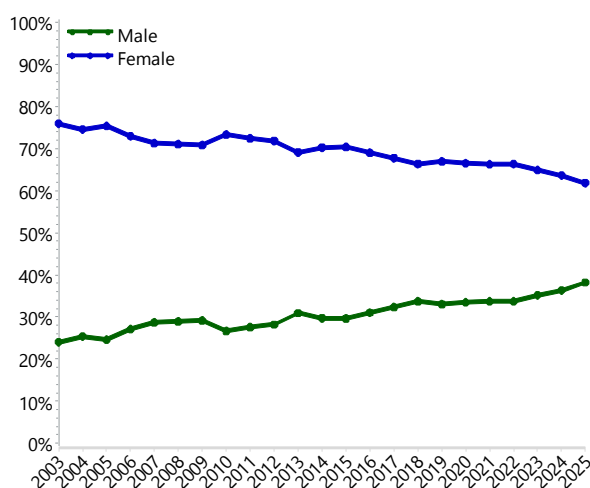
Demographics

There are 62,457 unipolar modular procedures recorded. This is an additional 2,296 procedures compared to the previous report.

In 2025, the number of unipolar modular procedures decreased by 158 procedures (6.5%) compared to 2024 but has increased by 241.6% since 2003.

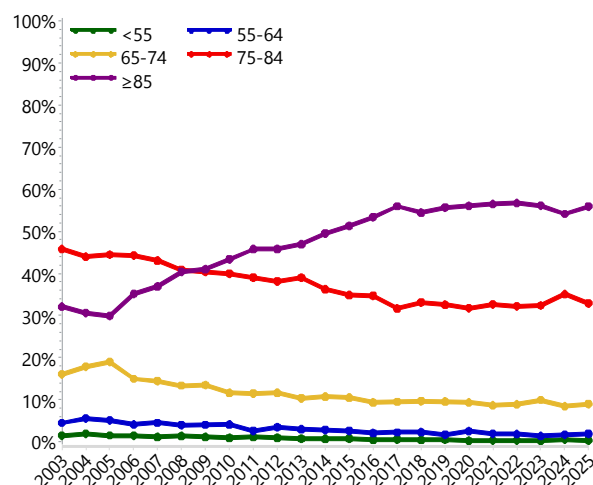
Fractured neck of femur is the principal diagnosis for primary unipolar modular hip replacement (96.3%).

Figure HP11 Primary Unipolar Modular Hip Replacement by Sex



The majority of patients are female and aged ≥ 75 years. The proportion of patients aged ≥ 85 years has increased from 32.1% in 2003 to 55.9% in 2025. The mean age of patients is 83.1 years (Table HP13, Figure HP11 and Figure HP12).

Figure HP12 Primary Unipolar Modular Hip Replacement by Age



Overall, there have been 261 unipolar modular head and stem combinations recorded by the Registry. The 10 most frequently used unipolar modular head prostheses and femoral stems are listed in Table HP14 and Table HP15.

In 2025, 14 different unipolar modular head prostheses were used. The Unitrax head is the most frequently used. The 10 most used unipolar modular head prostheses account for 99.7% of all primary unipolar modular hip procedures (Table HP14).

There were 19 different stem prostheses used in 2025. The most frequently used stem is the Exeter V40. The 10 most used femoral stems account for 99.4% of all primary unipolar modular hip procedures (Table HP15).

The cumulative percent revision of unipolar modular head/stem prosthesis combinations with more than 100 procedures is detailed in Table HP16.

Table HP13 Age and Sex of Primary Unipolar Modular Hip Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	19335	31.0%	5	106	84	82.2	9.3
Female	43122	69.0%	18	108	85	83.5	8.4
TOTAL	62457	100.0%	5	108	84	83.1	8.7

Primary Partial Hip Replacement

Table HP14 10 Most Used Unipolar Head Prostheses in Primary Unipolar Modular Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
193	Unitrax	2075	Unitrax	1823	Unitrax	1810	Unitrax	1680	Unitrax
142	Unipolar Head (Zimmer)	411	Unipolar Head (S&N)	401	Unipolar Head (S&N)	318	Unipolar Head (S&N)	263	Unipolar Head (S&N)
127	Unipolar Head (S&N)	318	Cathcart	302	Cathcart	223	Cathcart	210	Cathcart
75	VerSys	97	VerSys	66	VerSys	27	Unipolar Head (Signature)	80	Unipolar Head (Signature)
64	Unipolar Head (Mathys)	25	Unipolar Head (Mathys)	18	Unipolar Head (Mathys)	25	VerSys	13	VerSys
46	Elite	16	Unipolar Head (Signature)	17	Unipolar Head (Signature)	8	Unipolar Head (Mathys)	8	Articul/Eze
16	Ultima	6	Femoral Head (Stryker)	8	Femoral Head (Stryker)	6	Femoral Head (S&N)	6	Femoral Head (Stryker)
1	Metasul	3	Articul/Eze	4	Femoral Head (S&N)	6	Trinity	4	Femoral Head (S&N)
1	Optimom	2	Femoral Head (S&N)	3	Femoral Head (Zimmer)	4	Femoral Head (Stryker)	3	Femoral Head (Medacta)
1	Unipolar Head (Sulzer)	1	Articul/Eze Zir	2	Articul/Eze	2	Articul/Eze	2	Articul/Eze Zir
10 Most Used									
666	(10) 100.0%	2954	(10) 99.9%	2644	(10) 99.7%	2429	(10) 99.8%	2269	(10) 99.7%
Remainder									
0	(0) 0%	4	(4) 0.1%	8	(6) 0.3%	4	(3) 0.2%	6	(4) 0.3%
TOTAL									
666	(10) 100.0%	2958	(14) 100.0%	2652	(16) 100.0%	2433	(13) 100.0%	2275	(14) 100.0%

Table HP15 10 Most Used Femoral Stem Prostheses in Primary Unipolar Modular Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
180	Exeter V40	1962	Exeter V40	1744	Exeter V40	1702	Exeter V40	1569	Exeter V40
111	Alloclassic	360	CPCS	348	CPCS	265	CPCS	237	CPCS
91	CPT	279	C-Stem AMT	275	C-Stem AMT	195	C-Stem AMT	193	C-Stem AMT
70	Spectron EF	109	Short Exeter V40	78	Short Exeter V40	105	Short Exeter V40	112	Short Exeter V40
49	Fullfix	93	CPT	60	CPT	56	Polarstem	82	Evolve
38	SL-Plus	43	CORAIL	43	Polarstem	32	CORAIL	27	CORAIL
33	Elite Plus	30	Polarstem	31	CORAIL	27	Evolve	26	Polarstem
18	Basis	23	twinSys (ctd)	18	twinSys (ctd)	20	CPT	9	CPT
15	CCA	13	Evolve	17	Evolve	7	Taper Fit	4	Accolade II
15	Thompson Modular Stem	13	Spectron EF	9	Accolade II	7	twinSys (ctd)	3	Anthology
10 Most Used									
620	(10) 93.1%	2925	(10) 98.9%	2623	(10) 98.9%	2416	(10) 99.3%	2262	(10) 99.4%
Remainder									
46	(13) 6.9%	33	(15) 1.1%	29	(11) 1.1%	17	(7) 0.7%	13	(9) 0.6%
TOTAL									
666	(23) 100.0%	2958	(25) 100.0%	2652	(21) 100.0%	2433	(17) 100.0%	2275	(19) 100.0%



Primary Partial Hip Replacement

Table HP16 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Prosthesis Combination

Unipolar Head	Femoral Component	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cathcart	C-Stem AMT	66	2971	1.8 (1.3, 2.4)	2.3 (1.7, 3.0)	2.5 (1.9, 3.3)	3.6 (2.7, 4.9)	3.9 (2.8, 5.2)	
	CORAIL	100	1700	3.1 (2.3, 4.1)	4.2 (3.3, 5.4)	5.4 (4.3, 6.8)	6.6 (5.2, 8.3)	9.0 (7.2, 11.3)	11.3 (8.9, 14.3)
Unipolar Head (S&N)	Anthology	6	108	4.2 (1.6, 10.9)	4.2 (1.6, 10.9)	4.2 (1.6, 10.9)			
	CPCS	217	7914	2.0 (1.7, 2.3)	2.4 (2.0, 2.8)	2.8 (2.4, 3.2)	3.7 (3.2, 4.3)	4.3 (3.7, 5.1)	5.5 (4.6, 6.6)
	Polarstem	8	296	1.3 (0.4, 4.0)	1.9 (0.7, 5.2)	4.2 (1.8, 10.0)			
	Spectron EF	126	3150	1.6 (1.2, 2.2)	2.5 (2.0, 3.2)	3.0 (2.4, 3.7)	4.0 (3.3, 5.0)	5.3 (4.4, 6.5)	7.4 (6.0, 9.2)
Unipolar Head (Signature)	Evolve	8	302	2.0 (0.8, 4.9)	3.7 (1.7, 8.2)	4.8 (2.3, 10.1)			
Unitrax	Exeter V40	926	30341	2.0 (1.8, 2.2)	2.6 (2.4, 2.8)	3.1 (2.8, 3.3)	4.1 (3.8, 4.4)	5.0 (4.6, 5.4)	6.6 (6.0, 7.2)
	Short Exeter V40	13	769	1.6 (0.9, 2.9)	1.6 (0.9, 2.9)	2.0 (1.1, 3.6)	2.5 (1.3, 4.6)		
VerSys	CPT	194	5010	2.1 (1.7, 2.5)	2.9 (2.5, 3.5)	3.5 (2.9, 4.1)	4.6 (3.9, 5.4)	5.7 (4.9, 6.7)	6.8 (5.7, 8.1)
Other (34)		24	416	5.5 (3.6, 8.5)	6.3 (4.2, 9.5)	6.3 (4.2, 9.5)	7.7 (5.1, 11.6)	7.7 (5.1, 11.6)	
TOTAL		1688	52977						

Note: Restricted to modern prostheses

Only combinations with >100 procedures have been listed

Primary Partial Hip Replacement

Outcome for Fractured Neck of Femur

The cumulative percent revision at 10 years for unipolar modular hip replacement, when undertaken for fractured neck of femur, is 6.6% (Table HP17 and Figure HP13).

There are 1,601 revisions of primary unipolar modular hip replacement with a primary diagnosis of fractured neck of femur.

The main reasons for revision are infection, prosthesis dislocation/instability, chondrolysis/acetabular erosion, fracture, pain and loosening (Table HP18).

Most revisions are acetabular only, followed by head only or revised to a total hip replacement (Table HP19).

Age, sex, and femoral stem fixation are risk factors for revision. The rate of revision decreases with increasing age (Table HP20 and Figure HP14). Males have a higher rate of revision than females (Table HP21 and Figure HP15).

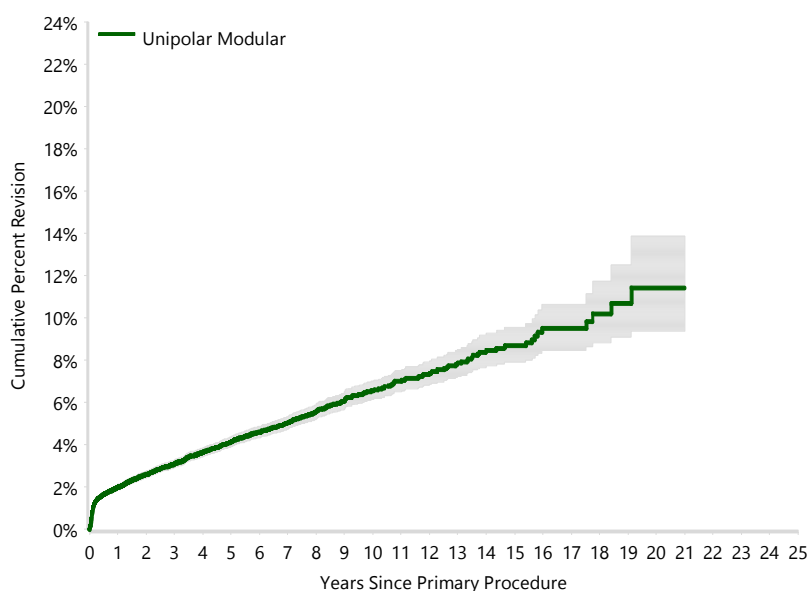
Cementless fixation has a higher rate of revision compared to cemented fixation (Table HP22 and Figure HP16). The cumulative incidence of revision for pain, fracture and chondrolysis/acetabular erosion is higher for cementless compared to cemented fixation (Figure HP17).

Table HP17 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Modular	1601	51168	2.0 (1.9, 2.1)	2.6 (2.4, 2.8)	3.1 (2.9, 3.3)	4.1 (3.9, 4.4)	5.0 (4.7, 5.3)	6.6 (6.1, 7.0)
TOTAL	1601	51168						

Note: Restricted to modern prostheses

Figure HP13 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Modular	51168	34382	27302	21348	12637	7417	3229

Note: Restricted to modern prostheses



Primary Partial Hip Replacement

Table HP18 Primary Unipolar Modular Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Infection	420	26.2
Prosthesis Dislocation/Instability	340	21.2
Chondrolysis/Acetab. Erosion	257	16.1
Fracture	252	15.7
Pain	152	9.5
Loosening	126	7.9
Lysis	19	1.2
Malposition	3	0.2
Other	32	2.0
TOTAL	1601	100.0

Note: Restricted to modern prostheses

Table HP19 Primary Unipolar Modular Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
Acetabular Component	623	38.9
Head Only	286	17.9
THR (Femoral/Acetabular)	264	16.5
Femoral Component	166	10.4
Bipolar Head and Femoral	78	4.9
Cement Spacer	54	3.4
Removal of Prostheses	53	3.3
Minor Components	42	2.6
Bipolar Only	26	1.6
Reinsertion of Components	7	0.4
Head/Insert	2	0.1
TOTAL	1601	100.0

Note: Restricted to modern prostheses
Femoral heads are usually replaced when the acetabular component and/or femoral stem is revised

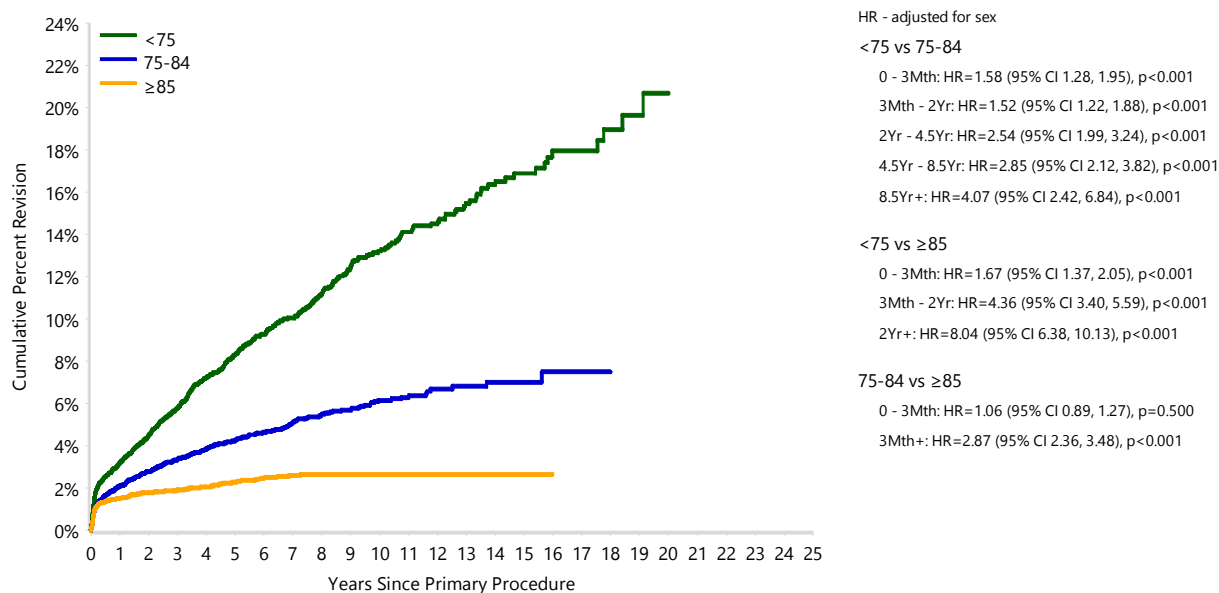
Primary Partial Hip Replacement

Table HP20 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	554	7007	3.2 (2.8, 3.6)	4.5 (4.0, 5.0)	5.8 (5.2, 6.4)	8.3 (7.6, 9.2)	10.0 (9.1, 11.0)	13.2 (12.0, 14.5)
75-84	630	18431	2.1 (1.9, 2.3)	2.8 (2.5, 3.1)	3.3 (3.1, 3.7)	4.3 (3.9, 4.6)	5.1 (4.7, 5.6)	6.2 (5.6, 6.8)
≥85	417	25730	1.5 (1.4, 1.7)	1.8 (1.6, 2.0)	1.9 (1.7, 2.1)	2.3 (2.0, 2.5)	2.6 (2.3, 2.9)	2.6 (2.3, 3.0)
TOTAL	1601	51168						

Note: Restricted to modern prostheses

Figure HP14 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Age (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	7007	5262	4455	3765	2698	1961	1135
75-84	18431	13341	10954	8906	5703	3489	1555
≥85	25730	15779	11893	8677	4236	1967	539

Note: Restricted to modern prostheses



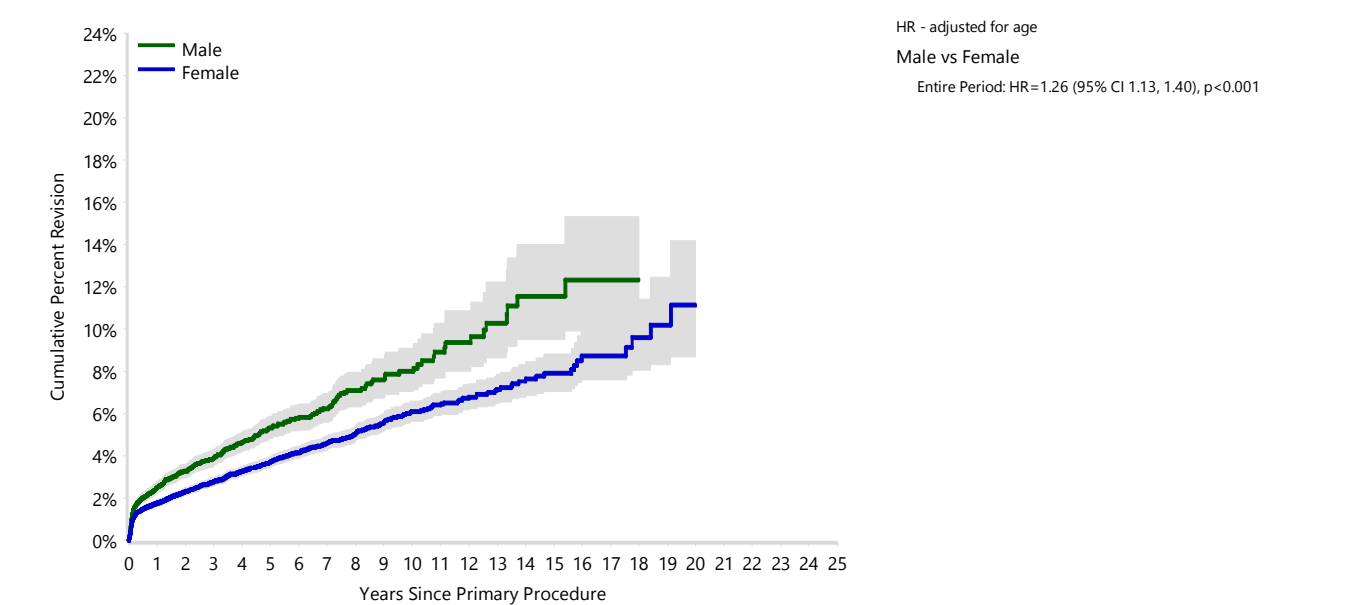
Primary Partial Hip Replacement

Table HP21 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Sex (Primary Diagnosis Fractured NOF)

Sex	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	535	16036	2.5 (2.2, 2.8)	3.3 (3.0, 3.6)	3.9 (3.5, 4.3)	5.3 (4.8, 5.9)	6.2 (5.6, 7.0)	8.0 (7.0, 9.1)
Female	1066	35132	1.8 (1.6, 1.9)	2.3 (2.1, 2.5)	2.8 (2.6, 3.0)	3.7 (3.5, 4.0)	4.6 (4.3, 4.9)	6.1 (5.6, 6.6)
TOTAL	1601	51168						

Note: Restricted to modern prostheses

Figure HP15 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Sex (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	16036	9237	6762	4926	2590	1430	569
Female	35132	25145	20540	16422	10047	5987	2660

Note: Restricted to modern prostheses

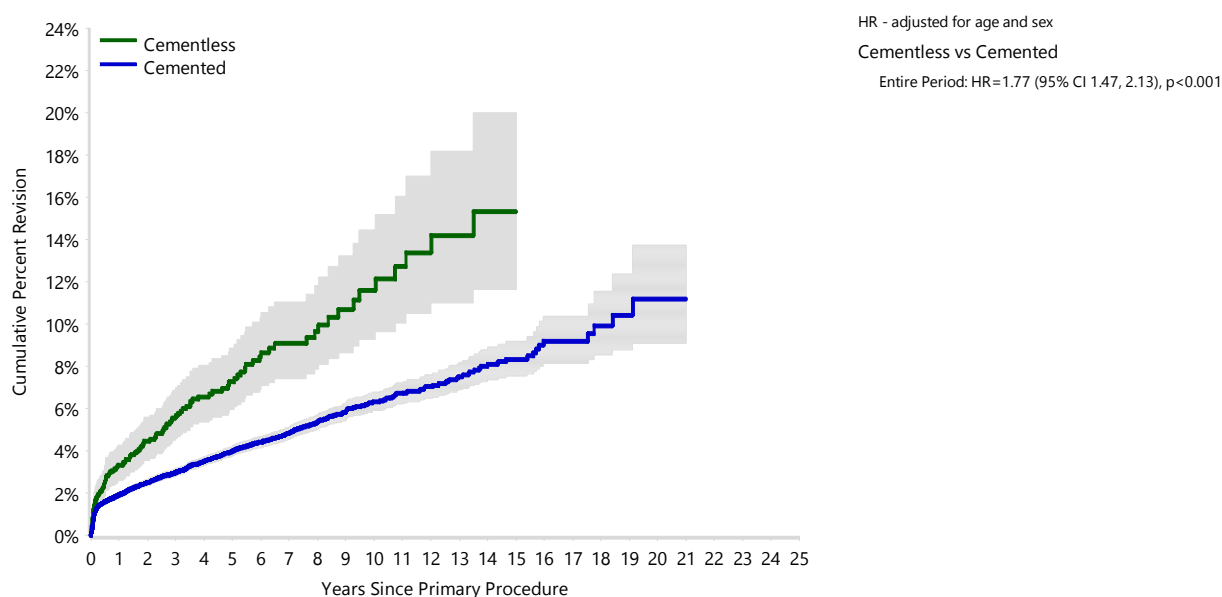
Primary Partial Hip Replacement

Table HP22 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)

Femoral Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	122	2041	3.3 (2.6, 4.3)	4.5 (3.6, 5.6)	5.7 (4.6, 7.0)	7.3 (5.9, 8.9)	9.1 (7.4, 11.1)	11.6 (9.3, 14.4)
Cemented	1479	49127	1.9 (1.8, 2.1)	2.5 (2.4, 2.7)	3.0 (2.8, 3.2)	4.0 (3.8, 4.2)	4.8 (4.6, 5.2)	6.3 (5.9, 6.8)
TOTAL	1601	51168						

Note: Restricted to modern prostheses

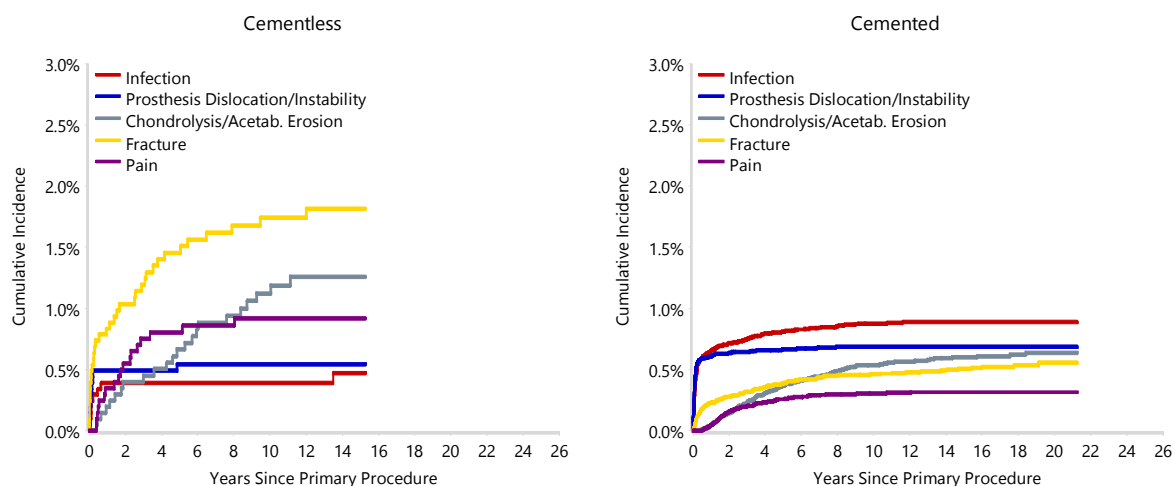
Figure HP16 Cumulative Percent Revision of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	2041	1429	1155	921	603	370	166
Cemented	49127	32953	26147	20427	12034	7047	3063

Note: Restricted to modern prostheses

Figure HP17 Cumulative Incidence Revision Diagnosis of Primary Unipolar Modular Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses

Primary Partial Hip Replacement

Bipolar

DEMOGRAPHICS

There are 49,504 bipolar hip replacement procedures recorded. This is an additional 4,757 procedures compared to the previous report.

Since 2010, there has been an increase in the number of bipolar procedures undertaken each year, with 4.0% more procedures in 2025 compared to 2024. The total number of bipolar procedures has increased by 249.2% since 2003.

Fractured neck of femur is the principal diagnosis for bipolar hip replacement.

The majority of patients are female and aged ≥ 75 years. The proportion of patients aged ≥ 85 years has increased from 26.0% in 2003 to 45.3% in 2025 (Figure HP18 and Figure HP19).

The mean age of patients is 81.7 years (Table HP23, Figure HP18 and Figure HP19).

Figure HP18 Primary Bipolar Hip Replacement by Sex

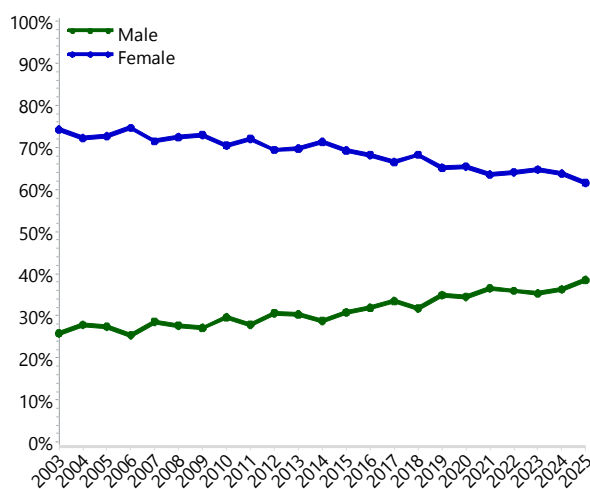
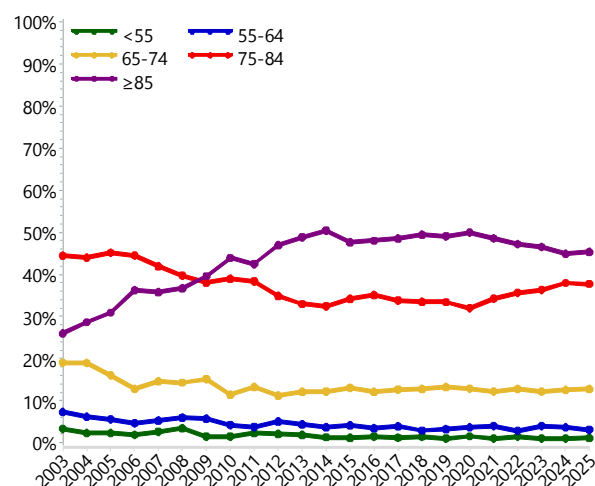


Figure HP19 Primary Bipolar Hip Replacement by Age



Overall, there have been 354 bipolar head and stem combinations recorded by the Registry. In 2025, there were 11 different bipolar heads, and 46 different femoral stem prostheses used.

In 2025, the UHR remains the most frequently used bipolar head (Table HP24). The Exeter V40 is the most frequently used femoral stem. The 10 most used femoral stems account for 90.8% of all bipolar hip procedures (Table HP25).

The cumulative percent revision of bipolar head/stem prosthesis combinations with > 100 procedures is detailed in Table HP26.

Table HP23 Age and Sex of Primary Bipolar Hip Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	16265	32.9%	9	105	82	80.8	10.4
Female	33239	67.1%	9	107	84	82.2	9.4
TOTAL	49504	100.0%	9	107	83	81.7	9.8

Primary Partial Hip Replacement

Table HP24 10 Most Used Bipolar Head Prostheses in Primary Bipolar Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
760	UHR	1667	UHR	1722	UHR	1931	UHR	2330	UHR
140	Hastings	857	Multipolar Bipolar	981	Multipolar Bipolar	880	Multipolar Bipolar	654	Tandem
115	Convene	409	Tandem	455	Tandem	540	Tandem	484	Multipolar Bipolar
91	Bipolar Head (Zimmer)	375	Self-Centering	360	Self-Centering	486	Self-Centering	443	Self-Centering
87	Self-Centering	143	BioBall	265	BioBall	351	BioBall	280	BioBall
59	Multipolar Bipolar	137	Bipolar Head (Medacta)	198	Bipolar Head (Medacta)	287	Bipolar Head (Medacta)	262	Bipolar Head (Medacta)
39	Bipolar Head (Mathys)	25	Bipolar Head (Mathys)	15	Bipolar Head (Lima)	16	Vario-Cup (Bipolar Head)	192	Bipolar Head (Lima)
19	Bipolar Head (Lima)	20	Bipolar Head (Lima)	12	Bipolar Head (Mathys)	8	Bipolar Head (Implantcast)	14	Ringloc
19	Ringloc	8	Bipolar Head (Implantcast)	11	Bipolar Head (Implantcast)	1	Bipolar Head (Lima)	11	Vario-Cup (Bipolar Head)
5	UHL			8	Vario-Cup (Bipolar Head)	1	Bipolar Head (Mathys)	9	Bipolar Head (Implantcast)
10 Most Used									
1334 (10) 99.5%		3641 (9) 100.0%		4027 (10) 100.0%		4501 (10) 100.0%		4679 (10) 99.9%	
Remainder									
7 (2) 0.5%		0 (0) 0%		0 (0) 0%		0 (0) 0%		4 (1) 0.1%	
TOTAL									
1341 (12) 100.0%		3641 (9) 100.0%		4027 (10) 100.0%		4501 (10) 100.0%		4683 (11) 100.0%	

Table HP25 10 Most Used Femoral Stem Prostheses in Primary Bipolar Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
630	Exeter V40	1530	Exeter V40	1607	Exeter V40	1802	Exeter V40	2170	Exeter V40
94	Elite Plus	781	CPT	857	CPT	607	CPT	571	CPCS
75	Alloclassic	372	CPCS	424	CPCS	467	CPCS	317	C-Stem AMT
65	CPCS	218	C-Stem AMT	215	C-Stem AMT	333	C-Stem AMT	306	MS 30
61	C-Stem	142	CORAIL	214	Taper Fit	277	Taper Fit	224	Evolve
59	Omnifit	102	Quadra-C	136	CORAIL	224	MS 30	213	Taper Fit
33	VerSys	96	Short Exeter V40	110	Quadra-C	147	CORAIL	134	CPT
26	ABGII	82	Taper Fit	90	MS 30	136	Quadra-C	122	Short Exeter V40
25	CCA	49	Absolut	71	Short Exeter V40	115	Short Exeter V40	111	CORAIL
25	Spectron EF	37	MS 30	41	Evolve	65	X-Acta	86	Quadra-P
10 Most Used									
1093 (10) 81.5%		3409 (10) 93.6%		3765 (10) 93.5%		4173 (10) 92.7%		4254 (10) 90.8%	
Remainder									
248 (46) 18.5%		232 (33) 6.4%		262 (31) 6.5%		328 (31) 7.3%		429 (36) 9.2%	
TOTAL									
1341 (56) 100.0%		3641 (43) 100.0%		4027 (41) 100.0%		4501 (41) 100.0%		4683 (46) 100.0%	



Primary Partial Hip Replacement

Table HP26 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Prosthesis Combination

Bipolar Head	Femoral Component	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
BioBall	Evolve	4	112	3.5 (1.1, 10.8)					
	Taper Fit	22	932	2.7 (1.8, 4.2)	2.9 (1.9, 4.5)	2.9 (1.9, 4.5)			
Bipolar Head (Lima)	Evolve	3	186						
Bipolar Head (Medacta)	AMiStem C	5	150	4.0 (1.7, 9.5)					
	Quadra-C	19	939	1.9 (1.1, 3.1)	2.0 (1.2, 3.3)	2.3 (1.4, 3.7)	2.3 (1.4, 3.7)	3.6 (1.7, 7.6)	
	Quadra-P	2	100						
	X-Acta	4	304	1.6 (0.6, 4.2)	1.6 (0.6, 4.2)	1.6 (0.6, 4.2)			
Multipolar Bipolar	Avenir	7	127	5.7 (2.6, 12.4)	5.7 (2.6, 12.4)	5.7 (2.6, 12.4)			
	CPT	264	7577	3.0 (2.6, 3.4)	3.8 (3.3, 4.3)	4.0 (3.5, 4.6)	4.6 (4.1, 5.3)	4.9 (4.3, 5.7)	5.6 (4.6, 6.8)
	MS 30	9	791	1.3 (0.6, 2.7)	1.3 (0.6, 2.7)	1.3 (0.6, 2.7)	2.3 (0.9, 5.6)		
	VerSys	8	318	1.2 (0.4, 3.8)	3.5 (1.7, 7.4)	3.5 (1.7, 7.4)	3.5 (1.7, 7.4)	3.5 (1.7, 7.4)	
Self-Centering	C-Stem AMT	43	1896	1.7 (1.1, 2.4)	2.6 (1.8, 3.6)	3.0 (2.2, 4.2)	3.5 (2.5, 5.0)	4.1 (2.7, 6.2)	
	CORAIL	59	1650	3.4 (2.6, 4.5)	4.0 (3.1, 5.2)	4.3 (3.3, 5.5)	4.3 (3.3, 5.5)	4.6 (3.5, 6.2)	4.6 (3.5, 6.2)
Tandem	CPCS	145	4731	2.6 (2.2, 3.2)	3.1 (2.6, 3.7)	3.5 (2.9, 4.1)	4.0 (3.3, 4.8)	5.1 (4.1, 6.3)	5.7 (4.4, 7.2)
	Polarstem	5	282	1.6 (0.6, 4.3)	1.6 (0.6, 4.3)	1.6 (0.6, 4.3)			
	Spectron EF	10	213	2.1 (0.8, 5.4)	4.0 (1.9, 8.2)	4.7 (2.3, 9.2)	5.5 (2.9, 10.5)	5.5 (2.9, 10.5)	
UHR	Accolade II	2	220	1.0 (0.3, 4.1)	1.0 (0.3, 4.1)	1.0 (0.3, 4.1)	1.0 (0.3, 4.1)		
	Exeter	12	206	1.6 (0.5, 4.9)	2.2 (0.8, 5.8)	3.5 (1.6, 7.6)	4.9 (2.5, 9.7)	4.9 (2.5, 9.7)	4.9 (2.5, 9.7)
	Exeter V40	611	20377	2.3 (2.1, 2.6)	2.9 (2.7, 3.2)	3.4 (3.1, 3.7)	3.9 (3.6, 4.2)	4.4 (4.0, 4.8)	5.1 (4.6, 5.7)
	GMRS	18	242	1.8 (0.7, 4.8)	4.5 (2.2, 8.9)	6.2 (3.3, 11.3)	9.4 (5.4, 16.1)	12.2 (7.2, 20.3)	
	Short Exeter V40	17	578	2.5 (1.5, 4.4)	3.2 (1.9, 5.3)	3.2 (1.9, 5.3)	5.3 (2.8, 10.0)		
Other (97)		52	1088	3.6 (2.6, 5.1)	4.2 (3.0, 5.8)	5.4 (3.9, 7.3)	7.2 (5.2, 9.9)	7.9 (5.6, 11.0)	12.5 (8.1, 19.0)
TOTAL		1321	43019						

Note: Restricted to modern prostheses

Only prostheses with > 100 procedures have been listed.

Primary Partial Hip Replacement

OUTCOME FOR FRACTURED NECK OF FEMUR

The cumulative percent revision at 10 years for primary bipolar hip replacement undertaken for fractured neck of femur is 5.3% (Table HP27 and Figure HP20).

There are 1,232 revisions of primary bipolar hip replacement procedures with a primary diagnosis of fractured neck of femur.

The main reasons for revision are infection, prosthesis dislocation/instability, fracture, chondrolysis/acetabular erosion and loosening (Table HP28). There are a lower proportion of revisions for chondrolysis/acetabular erosion with a bipolar partial hip replacement compared to unipolar modular.

The most frequent type of revision is acetabular component only, followed by bipolar only, total hip replacement (femoral/acetabular), and bipolar head and femoral stem replacement (Table HP29).

Age and sex are risk factors for revision. The rate of revision decreases with increasing age (Table HP30 and Figure HP21). Males have a higher rate of revision than females (Table HP31 and Figure HP22).

The rate of revision decreases with increasing age.

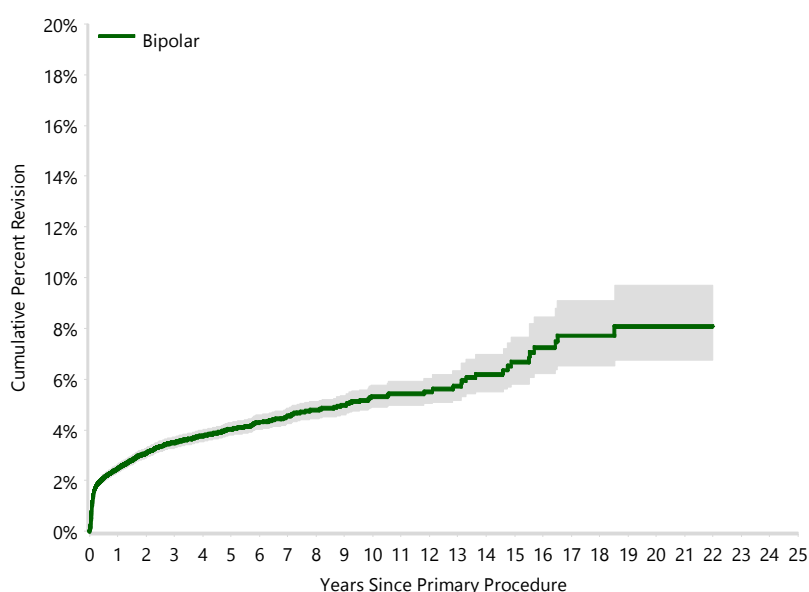
Cementless fixation has a higher rate of revision compared to cemented fixation for the first 3 months only (Table HP32 and Figure HP23). The cumulative incidence of revision for fracture and prosthesis dislocation/instability with cementless fixation is higher than for cemented fixation (Figure HP24).

Table HP27 Cumulative Percent Revision of Primary Bipolar Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Bipolar	1232	40826	2.5 (2.3, 2.7)	3.1 (2.9, 3.3)	3.5 (3.3, 3.7)	4.0 (3.8, 4.3)	4.5 (4.2, 4.9)	5.3 (4.9, 5.8)
TOTAL	1232	40826						

Note: Restricted to modern prostheses

Figure HP20 Cumulative Percent Revision of Primary Bipolar Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Bipolar	40826	26352	19555	14446	7929	4366	1836

Note: Restricted to modern prostheses



Primary Partial Hip Replacement

Table HP28 Bipolar Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Infection	382	31.0
Prosthesis Dislocation/Instability	333	27.0
Fracture	220	17.9
Chondrolysis/Acetab. Erosion	100	8.1
Loosening	91	7.4
Pain	71	5.8
Lysis	6	0.5
Malposition	3	0.2
Other	26	2.1
TOTAL	1232	100.0

Note: Restricted to modern prostheses

Table HP29 Primary Bipolar Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
Acetabular Component	374	30.4
Bipolar Only	283	23.0
THR (Femoral/Acetabular)	221	17.9
Bipolar Head and Femoral	172	14.0
Head Only	42	3.4
Femoral Component	41	3.3
Cement Spacer	40	3.2
Removal of Prostheses	30	2.4
Minor Components	24	1.9
Head/Insert	4	0.3
Reinsertion of Components	1	0.1
TOTAL	1232	100.0

Note: Restricted to modern prostheses

Femoral heads are usually replaced when the acetabular component and/or femoral stem is revised.

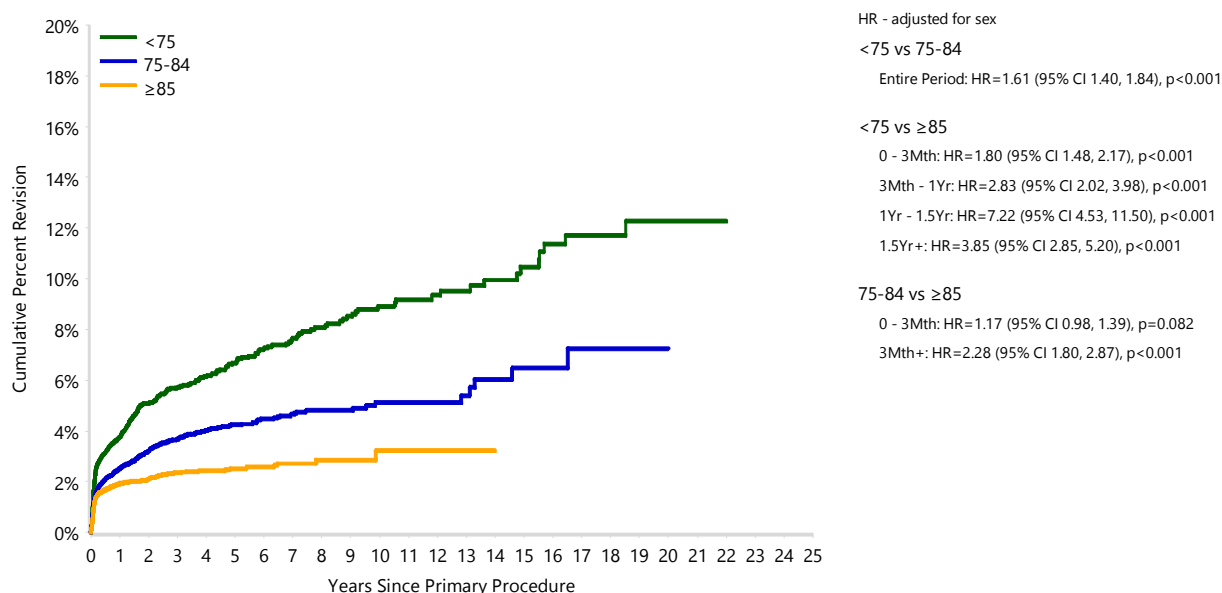
Primary Partial Hip Replacement

Table HP30 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	396	6992	3.8 (3.3, 4.3)	5.1 (4.6, 5.7)	5.7 (5.1, 6.4)	6.7 (6.0, 7.4)	7.6 (6.8, 8.5)	8.9 (7.9, 10.0)
75-84	481	14943	2.5 (2.3, 2.8)	3.2 (2.9, 3.5)	3.7 (3.3, 4.0)	4.2 (3.8, 4.7)	4.6 (4.2, 5.1)	5.1 (4.5, 5.8)
≥85	355	18891	1.9 (1.7, 2.2)	2.1 (1.9, 2.4)	2.4 (2.1, 2.6)	2.5 (2.2, 2.8)	2.7 (2.4, 3.1)	3.2 (2.5, 4.2)
TOTAL	1232	40826						

Note: Restricted to modern prostheses

Figure HP21 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Age (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<75	6992	4911	3855	3118	2059	1387	784
75-84	14943	10198	7694	5856	3401	1955	801
≥85	18891	11243	8006	5472	2469	1024	251

Note: Restricted to modern prostheses



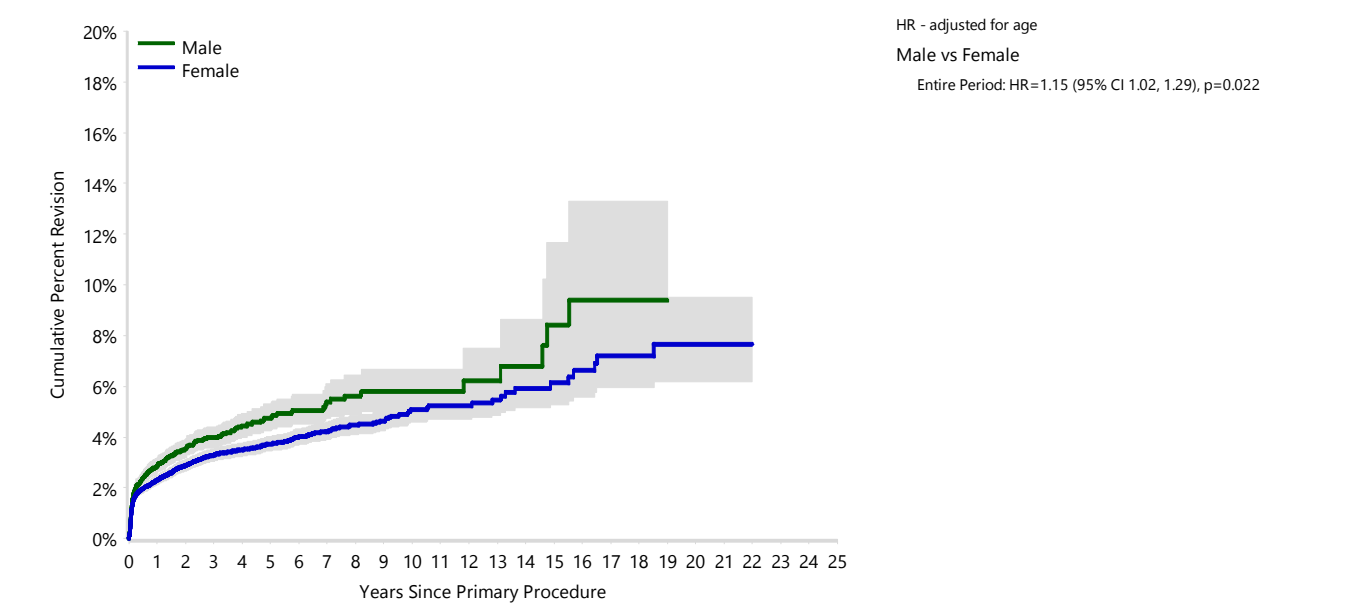
Primary Partial Hip Replacement

Table HP31 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Sex
(Primary Diagnosis Fractured NOF)

Sex	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	425	13630	2.9 (2.6, 3.2)	3.6 (3.2, 3.9)	4.0 (3.6, 4.4)	4.7 (4.2, 5.3)	5.4 (4.7, 6.1)	5.8 (5.0, 6.7)
Female	807	27196	2.3 (2.1, 2.5)	2.9 (2.7, 3.1)	3.3 (3.0, 3.5)	3.7 (3.5, 4.0)	4.2 (3.9, 4.6)	5.1 (4.6, 5.6)
TOTAL	1232	40826						

Note: Restricted to modern prostheses

Figure HP22 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Sex
(Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Male	13630	7637	5215	3562	1721	867	336
Female	27196	18715	14340	10884	6208	3499	1500

Note: Restricted to modern prostheses

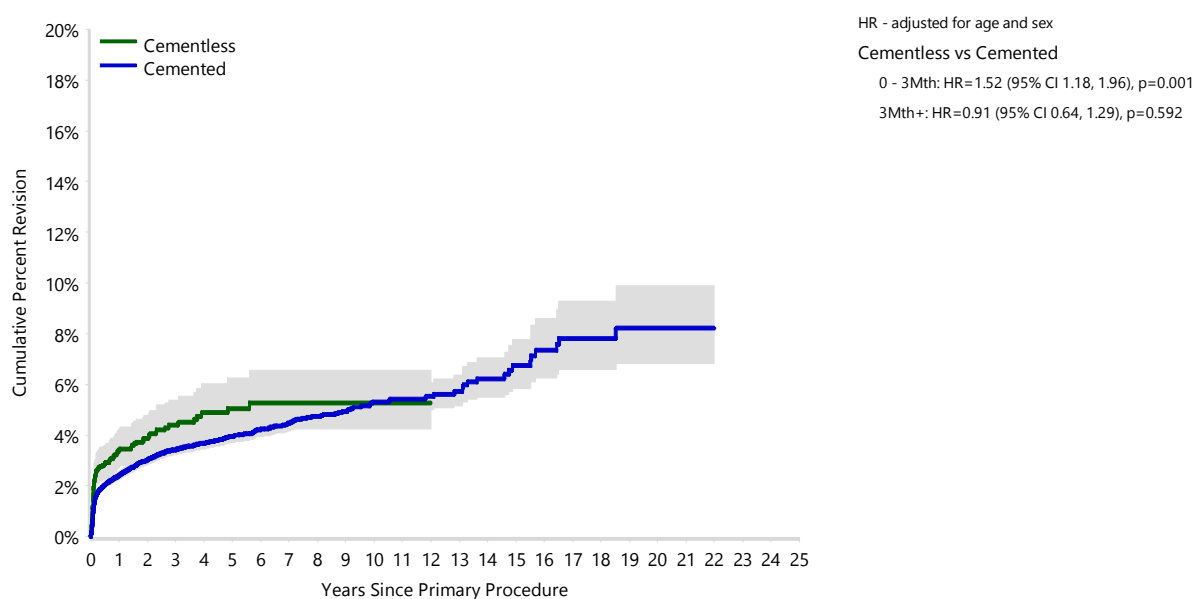
Primary Partial Hip Replacement

Table HP32 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)

Femoral Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	98	2616	3.4 (2.7, 4.2)	3.9 (3.1, 4.8)	4.4 (3.6, 5.4)	5.1 (4.1, 6.2)	5.3 (4.2, 6.6)	5.3 (4.2, 6.6)
Cemented	1134	38210	2.4 (2.3, 2.6)	3.0 (2.8, 3.2)	3.4 (3.2, 3.7)	3.9 (3.7, 4.2)	4.5 (4.2, 4.8)	5.3 (4.9, 5.8)
TOTAL	1232	40826						

Note: Restricted to modern prostheses

Figure HP23 Cumulative Percent Revision of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



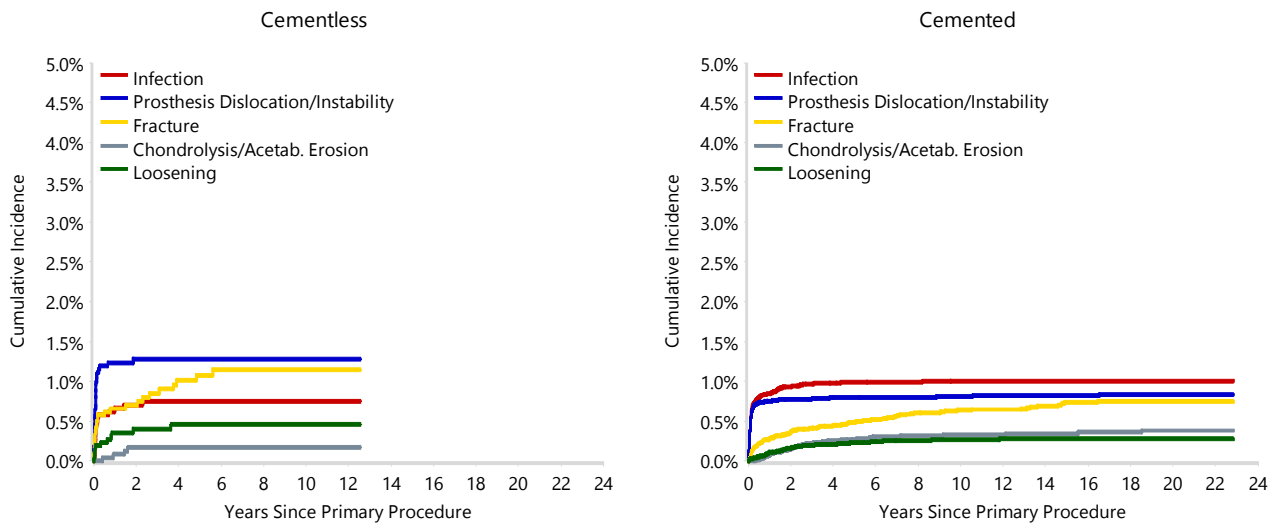
Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cementless	2616	1671	1233	944	517	287	101
Cemented	38210	24681	18322	13502	7412	4079	1735

Note: Restricted to modern prostheses



Primary Partial Hip Replacement

Figure HP24 Cumulative Incidence Revision Diagnosis of Primary Bipolar Hip Replacement by Femoral Fixation (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses

Primary Total Hip Replacement

Classes of Total Hip Replacement

A total hip replacement procedure replaces both the femoral and acetabular articular surfaces. Primary total hip replacement is subcategorised into two classes. These are defined by the type of femoral prosthesis used.

Total conventional involves acetabular replacement combined with resection of the femoral head and replacement with a stemmed femoral prosthesis and femoral head prosthesis.

Total resurfacing involves acetabular replacement and the use of a femoral prosthesis that replaces the femoral articular surface without resecting the head.

Detailed demographic information on primary total hip replacement is available in the supplementary report 'Demographics of Hip, Knee & Shoulder Arthroplasty' on the AOANJRR website:
<https://registry.aoa.org.au/annual-reports-2026>

Use of Total Hip Replacement

There are 794,472 primary total hip replacement procedures. Of these, total conventional is the most common class, followed by total resurfacing (Table HT1).

Table HT1 Primary Total Hip Replacement by Class

Total Hip Class	Number	Percent
Total Conventional	772334	97.2
Total Resurfacing	22138	2.8
TOTAL	794472	100.0

Note: Excludes 258 thrust plate procedures

Osteoarthritis is the principal diagnosis for primary total hip replacement (88.1%).

Total conventional hip replacement (all bearing surfaces included) has a lower cumulative percent revision compared to total resurfacing at 20 years (Table HT2).

Table HT2 Cumulative Percent Revision of Primary Total Hip Replacement by Class

Total Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	2365	22138	1.7 (1.5, 1.8)	3.0 (2.8, 3.3)	4.6 (4.3, 4.9)	8.6 (8.2, 9.0)	11.6 (11.1, 12.1)	14.1 (13.6, 14.7)
Total Conventional	37177	772334	1.8 (1.7, 1.8)	2.7 (2.6, 2.7)	3.4 (3.4, 3.5)	5.4 (5.3, 5.5)	7.8 (7.7, 7.9)	10.6 (10.4, 10.7)
TOTAL	39542	794472						

Note: The data extends for 25 years but only data for the first 20 years follow-up is presented.

Primary Total Conventional Hip Replacement

DEMOGRAPHICS

There are 772,334 primary total conventional hip replacement procedures. This is an additional 51,517 procedures compared to the previous report.

For further information on the **closure of the database** please see the Glossary of this report.

The proportion of males and females has been stable for many years with a female predominance. This is primarily due to larger numbers of females compared to males in older age groups (Table HT1).

Figure HT1 Primary Total Conventional Hip Replacement by Sex





Primary Total Hip Replacement

The mean age of patients is 67.9 years. There has been minimal change in the proportion of patients aged 55–64 years (21.9% in 2003 to 21.7% in 2025) and for patients aged <55 years (11.7% in 2003 to 10.6% in 2025) (Table HT3 and Figure HT2).

Primary total conventional hip replacement increased by 3.4% in 2025 compared to the previous year and by 198.4% since 2003.

The use of cementless fixation has increased from 51.3% in 2003 to 63.7% in 2025. Hybrid fixation has increased from 34.8% to 35.0%, and cemented fixation has declined from 13.9% to 1.2% (Figure HT3).

Figure HT2 Primary Total Conventional Hip Replacement by Age

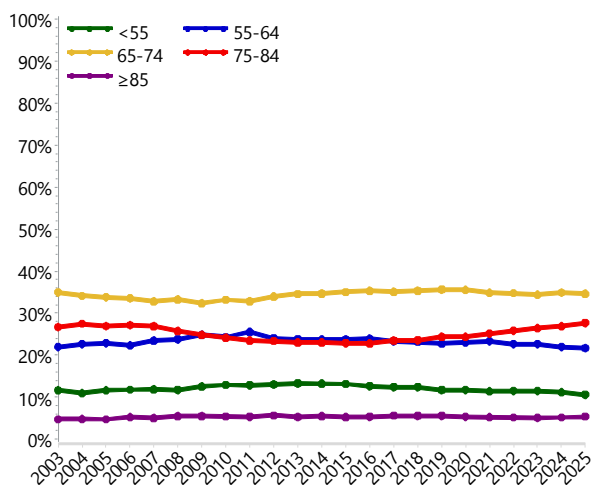


Figure HT3 Primary Total Conventional Hip Replacement by Fixation

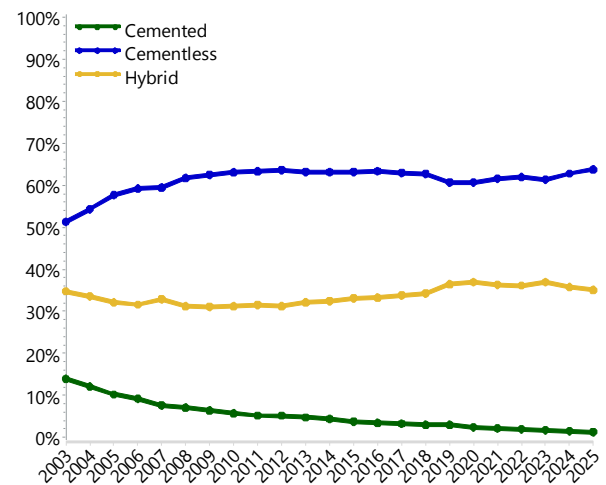


Table HT3 Age and Sex of Primary Total Conventional Hip Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	347002	44.9%	11	108	67	66.5	11.5
Female	425332	55.1%	11	103	70	69.1	11.2
TOTAL	772334	100.0%	11	108	69	67.9	11.4



Primary Total Hip Replacement

The Exeter V40, Accolade II, and CORAIL are the most used femoral stems for primary total conventional hip replacement (Table HT4). In 2025, 66.9% of primary total conventional hip replacements used stems in the 10 most used femoral component list. Eight of these stems are cementless. The 10 most used cemented and cementless stems are listed in Table HT5 and Table HT6, respectively. The 10 most used cemented stems account for 89.1% of cemented stem procedures. The 10 most used cementless stems account for 77.7% of cementless stem procedures.

The Trident II/Tritanium (Shell), Trident (Shell) and Trinity are the most frequently used acetabular prostheses for primary total conventional hip replacement. In 2025, 89.8% of primary total conventional hip procedures used acetabular components from the 10 most used list (Table HT7). All of the acetabular components in this list are cementless prostheses. The 10 most used cemented and cementless acetabular prostheses are listed separately in Table HT8 and Table HT9, respectively.

Table HT4 10 Most Used Femoral Components in Primary Total Conventional Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3901	Exeter V40	7842	Exeter V40	8414	Exeter V40	8419	Exeter V40	8468	Exeter V40
1029	ABGII	3915	CORAIL	4683	Accolade II	5135	Accolade II	5562	Accolade II
1000	Synergy	3787	Accolade II	4354	CORAIL	4094	CORAIL	3929	CORAIL
819	Alloclassic	3314	Metafix	3454	Metafix	3503	Metafix	3330	Polarstem
809	VerSys	2836	Polarstem	2955	Polarstem	3421	Polarstem	2842	Metafix
780	Spectron EF	1564	Quadra-H	2009	Paragon	2150	Paragon	2518	AMiStem-P
713	Secur-Fit Plus HA	1520	Paragon	1758	Quadra-C	1514	Taperloc Microplasty	2178	Quadra-P
618	Omnifit	1509	Quadra-C	1567	CPT	1366	Quadra-C	2138	Paragon
565	C-Stem	1449	AMiStem H	1507	AMiStem H	1320	Short Exeter V40	1665	Short Exeter V40
485	S-Rom	1333	CPT	1437	Quadra-H	1256	Taperloc	1454	Taperloc Microplasty
10 Most Used									
10719 (10)	62.8%	29069 (10)	67.7%	32138 (10)	66.6%	32178 (10)	65.3%	34084 (10)	66.9%
Remainder									
6353 (73)	37.2%	13881 (77)	32.3%	16087 (75)	33.4%	17103 (77)	34.7%	16857 (83)	33.1%
TOTAL									
17072 (83)	100.0%	42950 (87)	100.0%	48225 (85)	100.0%	49281 (87)	100.0%	50941 (93)	100.0%



Primary Total Hip Replacement

Table HT5 10 Most Used Cemented Femoral Components in Primary Total Conventional Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3901	Exeter V40	7842	Exeter V40	8414	Exeter V40	8419	Exeter V40	8468	Exeter V40
780	Spectron EF	1509	Quadra-C	1758	Quadra-C	1366	Quadra-C	1665	Short Exeter V40
565	C-Stem	1333	CPT	1567	CPT	1320	Short Exeter V40	1029	AMiStem C
477	CPT	922	Short Exeter V40	1207	Taper Fit	1043	CPT	943	Taper Fit
445	Elite Plus	901	CPCS	1161	Short Exeter V40	947	Taper Fit	909	MS 30
358	MS 30	853	Taper Fit	944	CPCS	797	CPCS	745	CPCS
338	Omnifit	592	Evolve	687	Evolve	751	X-Acta	737	Evolve
321	Charnley	555	C-Stem AMT	685	X-Acta	653	MS 30	706	Quadra-C
245	CPCS	369	MS 30	602	C-Stem AMT	582	Evolve	633	Quadra-P
122	Exeter	360	X-Acta	427	MS 30	564	C-Stem AMT	583	X-Acta
10 Most Used									
7552 (10) 91.7%		15236 (10) 93.5%		17452 (10) 93.9%		16442 (10) 90.0%		16418 (10) 89.1%	
Remainder									
680 (26) 8.3%		1056 (20) 6.5%		1134 (21) 6.1%		1834 (24) 10.0%		2004 (26) 10.9%	
TOTAL									
8232 (36) 100.0%		16292 (30) 100.0%		18586 (31) 100.0%		18276 (34) 100.0%		18422 (36) 100.0%	

Table HT6 10 Most Used Cementless Femoral Components in Primary Total Conventional Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1029	ABGII	3874	CORAIL	4683	Accolade II	5135	Accolade II	5562	Accolade II
980	Synergy	3787	Accolade II	4273	CORAIL	4001	CORAIL	3862	CORAIL
819	Alloclassic	3314	Metafix	3454	Metafix	3503	Metafix	2871	Polarstem
739	VerSys	2596	Polarstem	2574	Polarstem	2895	Polarstem	2842	Metafix
713	Secur-Fit Plus HA	1564	Quadra-H	2009	Paragon	2150	Paragon	2518	AMiStem-P
485	S-Rom	1520	Paragon	1507	AMiStem H	1514	Taperloc Microplasty	2138	Paragon
482	Secur-Fit	1449	AMiStem H	1437	Quadra-H	1256	Taperloc	1545	Quadra-P
376	CORAIL	1050	Taperloc Microplasty	1255	Taperloc Microplasty	1156	ACTIS	1454	Taperloc Microplasty
334	Accolade I	1000	Taperloc	1210	Taperloc	1058	AMiStem-P	1354	ACTIS
334	Mallory-Head	850	Origin	990	ACTIS	974	Quadra-P	1106	Avenir Complete
10 Most Used									
6291 (10) 71.2%		21004 (10) 78.8%		23392 (10) 78.9%		23642 (10) 76.3%		25252 (10) 77.7%	
Remainder									
2549 (47) 28.8%		5654 (53) 21.2%		6247 (54) 21.1%		7363 (55) 23.7%		7267 (57) 22.3%	
TOTAL									
8840 (57) 100.0%		26658 (63) 100.0%		29639 (64) 100.0%		31005 (65) 100.0%		32519 (67) 100.0%	



Primary Total Hip Replacement

Table HT7 10 Most Used Acetabular Components in Primary Total Conventional Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3986	Trident (Shell)	9483	Trident (Shell)	9520	Trident (Shell)	8865	Trident (Shell)	7427	Trident II/Tritanium (Shell)
1748	Reflection (Shell)	6214	Trinity	7029	Trinity	6991	Trinity	6552	Trident (Shell)
1524	Trilogy	4642	PINNACLE	5236	PINNACLE	5460	G7	6304	Trinity
955	Vitalock	4098	G7	5104	G7	4824	PINNACLE	6134	Mpact
907	Duraloc	3974	R3	4201	Mpact	4811	Trident II/Tritanium (Shell)	5844	G7
827	ABGII	3546	Mpact	4050	R3	4747	Mpact	4527	PINNACLE
793	Allofit	1644	Versafitcup CC	3045	Trident II/Tritanium (Shell)	4460	R3	4453	R3
729	Mallory-Head	1397	Logical G	1847	Versafitcup CC	1791	Versafitcup CC	1812	Versafitcup CC
539	Contemporary	1396	Trident/Tritanium (Shell)	1509	Logical G	1672	Logical G	1440	Trident II (Shell)
537	PINNACLE	786	Trident II/Tritanium (Shell)	858	Trident/Tritanium (Shell)	605	RM Cup	1276	Logical G
10 Most Used									
12545 (10)	73.5%	37180 (10)	86.6%	42399 (10)	87.9%	44226 (10)	89.7%	45769 (10)	89.8%
Remainder									
4527 (69)	26.5%	5770 (63)	13.4%	5826 (62)	12.1%	5055 (62)	10.3%	5172 (60)	10.2%
TOTAL									
17072 (79)	100.0%	42950 (73)	100.0%	48225 (72)	100.0%	49281 (72)	100.0%	50941 (70)	100.0%

Table HT8 10 Most Used Cemented Acetabular Components in Primary Total Conventional Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
539	Contemporary	427	Exeter X3 Rimfit	399	Exeter X3 Rimfit	320	Exeter X3 Rimfit	312	Exeter X3 Rimfit
256	Exeter	76	Avantage	122	Avantage	94	Avantage	81	Avantage
251	Reflection (Cup)	41	Reflection (Cup)	39	Reflection (Cup)	46	Reflection (Cup)	33	Apricot
227	Exeter Contemporary	40	Marathon	37	Marathon	37	Marathon	27	Marathon
199	Charnley Ogee	30	Muller	27	Apricot	34	Apricot	24	Reflection (Cup)
149	Elite Plus LPW	25	Apricot	23	BI-MENTUM	31	Polarcup	20	Polarcup
130	Low Profile Cup	17	Exeter Contemporary	23	Exeter Contemporary	21	BI-MENTUM	12	CCB
109	Elite Plus Ogee	16	Trident (Cup)	21	Dual Mobility Cup	13	Versacem	10	Fixa
102	Charnley	15	Novae E	20	Polarcup	11	Dual Mobility Cup	10	Trident (Cup)
90	ZCA	15	ZCA	19	ZCA	10	Exceed	10	ZCA
10 Most Used									
2052 (10)	85.4%	702 (10)	87.1%	730 (10)	90.7%	617 (10)	88.5%	539 (10)	90.4%
Remainder									
351 (16)	14.6%	104 (18)	12.9%	75 (17)	9.3%	80 (19)	11.5%	57 (12)	9.6%
TOTAL									
2403 (26)	100.0%	806 (28)	100.0%	805 (27)	100.0%	697 (29)	100.0%	596 (22)	100.0%



Primary Total Hip Replacement

Table HT9 10 Most Used Cementless Acetabular Components in Primary Total Conventional Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3986	Trident (Shell)	9482	Trident (Shell)	9520	Trident (Shell)	8865	Trident (Shell)	7427	Trident II/Tritanium (Shell)
1748	Reflection (Shell)	6214	Trinity	7029	Trinity	6990	Trinity	6552	Trident (Shell)
1524	Trilogy	4642	PINNACLE	5236	PINNACLE	5460	G7	6304	Trinity
955	Vitalock	4098	G7	5104	G7	4824	PINNACLE	6134	Mpact
907	Duraloc	3974	R3	4201	Mpact	4811	Trident II/Tritanium (Shell)	5843	G7
827	ABGII	3546	Mpact	4050	R3	4747	Mpact	4527	PINNACLE
793	Allofit	1644	Versafitcup CC	3045	Trident II/Tritanium (Shell)	4459	R3	4453	R3
729	Mallory-Head	1397	Logical G	1847	Versafitcup CC	1791	Versafitcup CC	1812	Versafitcup CC
537	PINNACLE	1396	Trident/Tritanium (Shell)	1509	Logical G	1672	Logical G	1440	Trident II (Shell)
521	Fitmore	786	Trident II/Tritanium (Shell)	858	Trident/Tritanium (Shell)	605	RM Cup	1276	Logical G
10 Most Used									
12527 (10)	85.4%	37179 (10)	88.3%	42399 (10)	89.4%	44224 (10)	91.1%	45768 (10)	90.9%
Remainder									
2142 (43)	14.6%	4947 (41)	11.7%	5001 (42)	10.6%	4342 (42)	8.9%	4556 (44)	9.1%
TOTAL									
14669 (53)	100.0%	42126 (51)	100.0%	47400 (52)	100.0%	48566 (52)	100.0%	50324 (54)	100.0%

Note: In 2024, 2 shells in the cementless group were inserted with cement

OUTCOME FOR ALL DIAGNOSES

Hip replacement prosthesis use and availability change with time. In order to keep data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified. This has resulted in 181,755 (24.2%) hip procedures being excluded from the analysis for the 2026 Annual Report.

Osteoarthritis is the principal diagnosis for primary total conventional hip replacement, followed by fractured neck of femur, osteonecrosis, developmental dysplasia, rheumatoid arthritis, and tumour (Table HT10). Osteoarthritis has a lower rate of revision compared to fractured neck of femur, rheumatoid arthritis and osteonecrosis. Osteoarthritis also has a lower rate of revision compared to developmental dysplasia, with the exception of the small period between 2 weeks and 3 months (Figure HT4).

Detailed information on prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

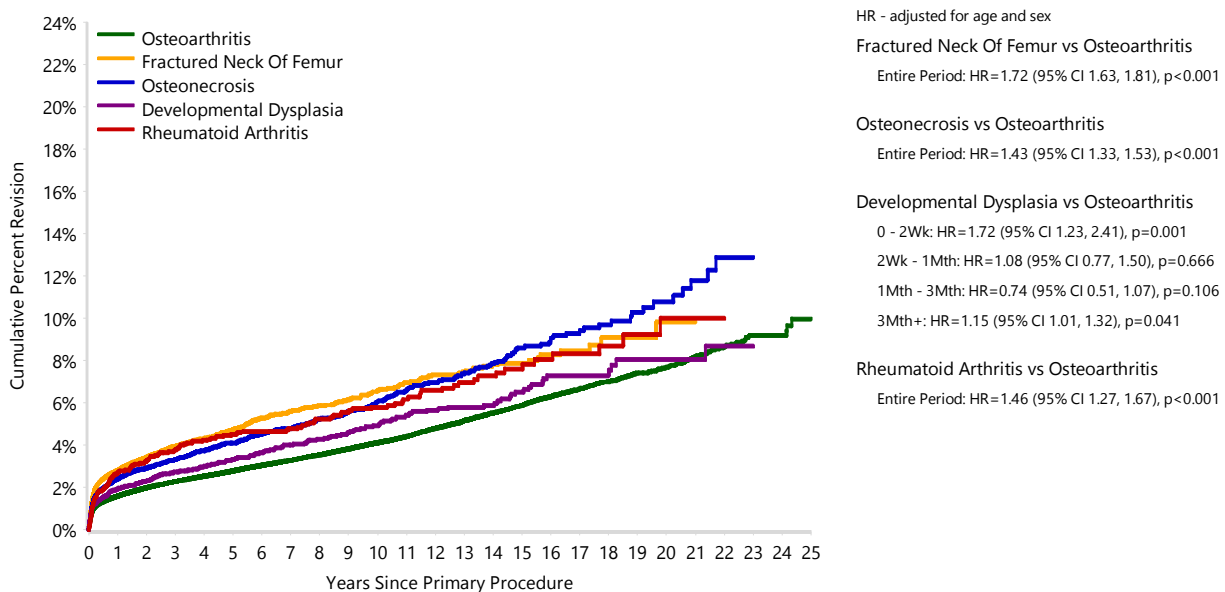
Primary Total Hip Replacement

Table HT10 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	16280	496964	1.6 (1.6, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.8)	4.1 (4.0, 4.2)	5.9 (5.8, 6.0)	7.7 (7.4, 7.9)
Fractured Neck Of Femur	1520	33438	2.8 (2.6, 3.0)	3.9 (3.7, 4.2)	4.7 (4.5, 5.0)	6.6 (6.2, 7.0)	7.9 (7.3, 8.5)	9.8 (8.1, 11.9)
Osteonecrosis	844	18023	2.4 (2.2, 2.6)	3.3 (3.1, 3.6)	4.1 (3.8, 4.4)	6.1 (5.6, 6.5)	8.6 (7.8, 9.5)	10.8 (9.5, 12.3)
Developmental Dysplasia	313	7917	1.9 (1.6, 2.2)	2.7 (2.4, 3.1)	3.3 (2.9, 3.8)	4.9 (4.4, 5.6)	6.5 (5.7, 7.5)	8.1 (6.8, 9.6)
Rheumatoid Arthritis	201	3830	2.7 (2.2, 3.2)	3.8 (3.2, 4.4)	4.5 (3.8, 5.2)	5.8 (5.0, 6.7)	7.6 (6.4, 9.0)	10.0 (7.8, 12.7)
Tumour	157	2919	4.2 (3.4, 5.1)	6.2 (5.2, 7.4)	8.3 (6.9, 10.0)	13.1 (10.4, 16.4)	14.6 (11.4, 18.5)	
Failed Internal Fixation	165	2162	5.1 (4.2, 6.1)	7.3 (6.2, 8.5)	8.2 (7.0, 9.6)	9.7 (8.2, 11.4)	11.0 (9.0, 13.5)	
Other Inflammatory Arthritis	102	2145	2.2 (1.7, 3.0)	3.3 (2.6, 4.2)	4.1 (3.3, 5.1)	5.7 (4.6, 7.1)	7.1 (5.6, 8.9)	11.2 (7.6, 16.5)
Other (3)	94	1074	6.2 (4.8, 7.9)	8.1 (6.5, 10.1)	9.2 (7.5, 11.4)	11.3 (9.1, 14.0)	14.1 (10.1, 19.7)	
TOTAL	19676	568472						

Note: All procedures using metal/metal prostheses have been excluded. Restricted to modern prostheses.
Only primary diagnoses with >2,000 procedures have been listed.

Figure HT4 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	496964	441522	347132	267382	112862	34301	6491
Fractured Neck Of Femur	33438	27604	19815	13466	3943	814	105
Osteonecrosis	18023	15783	12032	8968	3699	1186	318
Developmental Dysplasia	7917	7013	5399	4209	1989	801	234
Rheumatoid Arthritis	3830	3462	2851	2283	1139	444	109

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded. Only primary diagnoses with >2,500 procedures have been listed. Excluding diagnosis "Tumour"



Primary Total Hip Replacement

Prosthesis Types

There are 1,536 different stem and acetabular combinations for primary total conventional hip replacement. This is a similar number of prosthesis combinations reported in the previous report.

The cumulative percent revision of the 94 prosthesis combinations with ≥ 500 procedures is listed in Table HT11 to Table HT13. Although the listed combinations are a small proportion of the possible combinations, they represent 93.3% of all primary total conventional hip replacement procedures. A large number of prosthesis combinations have been used in small numbers. The 'Other' group consists of all prosthesis combinations with < 500 procedures. This group accounts for 6.7% of all primary total conventional hip replacement procedures.

There are 7 cemented primary total conventional stem and acetabular combinations with ≥ 500 procedures. The CPT/ZCA has the lowest 15 year cumulative percent revision of 7.2% (n=1,073) (Table HT11).

There are 56 cementless primary total conventional stem and acetabular combinations with ≥ 500 procedures listed. The Anthology/ Reflection (Shell) has the lowest 15 year cumulative percent revision of 3.7% (n=907) (Table HT12).

There are 31 combinations of primary total hip replacement with hybrid fixation with ≥ 500 procedures listed. The Exeter V40/PINNACLE has the lowest cumulative percent revision at 15 years of 4.2% (n=3,073), followed by the Exeter V40 with Trident (Shell) with a cumulative percent revision of 5.3% (n=101,664) (Table HT13).

Table HT11 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cemented Fixation by Prosthesis Combination

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
C-Stem AMT	Marathon	21	702	1.9 (1.1, 3.3)	2.4 (1.5, 3.9)	2.8 (1.8, 4.5)	3.6 (2.3, 5.5)		
CPCS	Reflection (Cup)	115	1205	2.1 (1.4, 3.1)	3.1 (2.2, 4.3)	4.0 (2.9, 5.3)	8.3 (6.5, 10.5)	16.8 (13.7, 20.6)	25.7 (20.6, 31.6)
CPT	ZCA	62	1073	1.1 (0.6, 2.0)	2.4 (1.7, 3.6)	3.0 (2.1, 4.3)	5.1 (3.8, 6.9)	7.2 (5.3, 9.7)	11.9 (8.6, 16.3)
Exeter V40	Exeter X3 Rimfit	199	6473	1.6 (1.3, 2.0)	2.4 (2.1, 2.8)	2.9 (2.5, 3.4)	3.7 (3.2, 4.3)		
MS 30	Low Profile Cup	25	504	1.0 (0.4, 2.4)	1.0 (0.4, 2.4)	1.5 (0.7, 3.2)	3.5 (2.0, 6.1)	8.7 (5.4, 13.8)	
Short Exeter V40	Exeter X3 Rimfit	20	644	1.6 (0.9, 3.0)	2.7 (1.7, 4.4)	3.2 (2.0, 5.0)	4.2 (2.5, 7.0)		
Spectron EF	Reflection (Cup)	142	1673	1.1 (0.7, 1.7)	1.8 (1.3, 2.6)	2.9 (2.1, 3.8)	7.2 (5.9, 8.8)	12.6 (10.6, 14.9)	15.6 (13.0, 18.6)
Other (283)		307	5046	3.8 (3.3, 4.4)	5.1 (4.5, 5.8)	6.2 (5.5, 7.0)	8.7 (7.7, 9.9)	11.4 (9.7, 13.4)	12.5 (10.3, 15.1)
TOTAL		891	17320						

Note: Restricted to modern prostheses

Some cementless components have been cemented

Procedures using metal/metal prostheses have been included

Only prostheses with ≥ 500 procedures have been listed

Primary Total Hip Replacement

Table HT12 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cementless Fixation by Prosthesis Combination

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACTIS	PINNACLE	53	3184	1.6 (1.2, 2.1)	1.8 (1.4, 2.4)				
AMISem H	Mpact	141	4971	1.6 (1.2, 1.9)	2.4 (2.0, 2.9)	3.1 (2.6, 3.7)			
	Versafitcup CC	130	4292	1.3 (1.0, 1.7)	1.8 (1.4, 2.3)	2.6 (2.1, 3.2)	4.4 (3.6, 5.4)		
AMISem-P	Mpact	36	2918	1.3 (1.0, 1.9)					
	Versafitcup CC	6	675	0.9 (0.4, 2.0)					
Accolade II	Trident (Shell)	624	21903	1.9 (1.7, 2.1)	2.6 (2.4, 2.8)	3.1 (2.8, 3.3)	3.9 (3.5, 4.4)		
	Trident II/ Tritanium (Shell)	152	7472	1.9 (1.6, 2.3)	2.7 (2.2, 3.3)				
	Trident/ Tritanium (Shell)	177	4411	2.3 (1.9, 2.8)	3.4 (2.9, 4.0)	3.9 (3.4, 4.6)	4.8 (4.1, 5.7)		
Anthology	R3	342	9356	2.1 (1.8, 2.4)	2.6 (2.3, 3.0)	3.0 (2.7, 3.4)	3.8 (3.4, 4.2)	4.7 (4.1, 5.3)	
	Reflection (Shell)*	32	907	1.9 (1.2, 3.0)	2.2 (1.4, 3.4)	2.6 (1.7, 3.8)	3.4 (2.3, 4.8)	3.7 (2.6, 5.3)	
Avenir	Continuum*	67	1461	3.1 (2.3, 4.1)	3.5 (2.7, 4.6)	4.1 (3.2, 5.3)	5.0 (3.9, 6.4)		
	G7	38	1215	2.5 (1.7, 3.5)	3.2 (2.3, 4.5)	3.7 (2.6, 5.2)			
Avenir Complete	G7	19	1254	1.8 (1.1, 2.9)					
C2	Delta-TT	40	1424	1.2 (0.7, 1.9)	2.1 (1.4, 3.0)	2.4 (1.7, 3.4)	3.4 (2.4, 4.7)		
CORAIL	BI-MENTUM	18	828	1.8 (1.0, 2.9)	2.3 (1.4, 3.7)				
	G7	15	894	1.0 (0.5, 2.0)	1.7 (1.0, 2.9)	2.0 (1.2, 3.5)			
	PINNACLE	3033	72321	1.7 (1.6, 1.8)	2.5 (2.4, 2.6)	3.1 (3.0, 3.2)	4.6 (4.4, 4.8)	7.0 (6.7, 7.3)	8.5 (7.8, 9.3)
	PINNACLE*MoM	158	966	2.2 (1.4, 3.3)	3.7 (2.6, 5.1)	5.9 (4.6, 7.6)	12.3 (10.3, 14.7)	17.9 (15.4, 20.7)	19.5 (16.8, 22.5)
	Trident (Shell)	32	783	2.5 (1.6, 3.8)	3.4 (2.3, 5.0)	4.0 (2.7, 5.7)	6.1 (4.0, 9.2)		
	Trinity	38	1839	1.6 (1.1, 2.3)	2.0 (1.5, 2.8)	2.1 (1.5, 2.9)			
EVOK	Austral	32	952	2.7 (1.8, 4.0)	4.4 (3.0, 6.3)	4.4 (3.0, 6.3)			
	Logical G	44	964	2.8 (1.9, 4.1)	4.4 (3.2, 5.9)	4.9 (3.6, 6.5)			
H-Max	Delta-TT	97	1863	1.9 (1.4, 2.6)	3.3 (2.5, 4.2)	3.9 (3.1, 4.9)	6.1 (4.9, 7.5)		
HACTIV	Logical G	84	1413	3.7 (2.8, 4.8)	4.8 (3.8, 6.1)	5.4 (4.3, 6.7)			
	Saturne	37	1461	1.4 (0.9, 2.1)	2.3 (1.6, 3.4)	3.0 (2.1, 4.4)			
Korus	Fin II	16	505	2.9 (1.7, 4.8)	3.3 (2.1, 5.4)	3.3 (2.1, 5.4)			
MasterLoc	Mpact	35	2047	1.4 (1.0, 2.1)	1.9 (1.3, 2.7)	2.0 (1.4, 2.8)			
	Versafitcup CC	21	1395	1.0 (0.6, 1.7)	1.8 (1.2, 2.7)	1.8 (1.2, 2.7)			
Metafix	Trinity	580	26038	1.4 (1.3, 1.6)	2.1 (1.9, 2.3)	2.4 (2.2, 2.6)	3.3 (2.9, 3.7)		
MiniHip	Trinity	47	1389	2.5 (1.8, 3.4)	3.0 (2.2, 4.1)	3.2 (2.4, 4.3)	3.4 (2.6, 4.6)		
Optimys	RM Cup	88	3782	1.8 (1.4, 2.3)	2.3 (1.8, 2.8)	2.6 (2.1, 3.2)	3.3 (2.4, 4.4)		
Origin	Logical G	190	5305	2.4 (2.0, 2.8)	3.2 (2.8, 3.8)	3.9 (3.3, 4.5)	5.8 (4.6, 7.2)		
Paragon	Trinity	139	7984	1.6 (1.3, 1.9)	2.0 (1.7, 2.3)	2.0 (1.7, 2.4)			
Polarstem	EP-Fit Plus	15	2810	0.2 (0.1, 0.4)	0.4 (0.2, 0.7)	0.5 (0.3, 0.8)	0.7 (0.4, 1.2)		
	Polarcup	16	733	1.4 (0.8, 2.6)	1.7 (1.0, 3.1)	2.5 (1.5, 4.2)			
	R3	744	25244	2.0 (1.8, 2.2)	2.5 (2.3, 2.7)	2.9 (2.7, 3.2)	3.9 (3.6, 4.2)	5.2 (4.1, 6.5)	
Profemur L	Procotyl L	29	2188	0.9 (0.6, 1.4)	1.2 (0.8, 1.9)	1.8 (1.1, 2.8)	2.6 (1.5, 4.6)		



Primary Total Hip Replacement

Table HT12 *Continued*

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Quadra-H	Mpact	298	6867	2.0 (1.7, 2.4)	2.9 (2.6, 3.4)	3.9 (3.4, 4.4)	6.4 (5.4, 7.4)		
	Trident (Shell)*	29	712	1.5 (0.9, 2.8)	2.7 (1.7, 4.2)	3.1 (2.1, 4.7)	5.0 (3.4, 7.4)		
	Versafitcup CC	488	11846	1.8 (1.6, 2.0)	2.5 (2.2, 2.8)	3.0 (2.7, 3.4)	4.9 (4.4, 5.4)	8.1 (6.6, 9.8)	
	Versafitcup DM	55	1295	2.6 (1.9, 3.7)	3.8 (2.9, 5.0)	4.2 (3.2, 5.5)	5.2 (3.9, 6.9)		
Quadra-P	Mpact	37	2176	1.4 (1.0, 2.0)	2.4 (1.6, 3.4)	2.6 (1.8, 3.8)			
	Versafitcup CC	15	1037	1.5 (0.8, 2.7)	2.3 (1.2, 4.3)	3.8 (1.6, 8.8)			
S-Rom	PINNACLE	268	3897	2.5 (2.1, 3.0)	4.1 (3.5, 4.7)	4.9 (4.2, 5.6)	6.3 (5.6, 7.2)	7.5 (6.6, 8.5)	9.3 (7.9, 11.0)
SL-Plus	EP-Fit Plus*	54	1229	1.5 (1.0, 2.4)	2.0 (1.4, 3.0)	2.7 (1.9, 3.7)	3.7 (2.8, 5.0)	4.3 (3.2, 5.7)	
	R3	123	1855	2.5 (1.9, 3.3)	3.9 (3.1, 4.9)	4.3 (3.4, 5.3)	6.3 (5.2, 7.5)	7.8 (6.5, 9.3)	
Secur-Fit	Trident (Shell)	630	10706	2.0 (1.7, 2.2)	3.0 (2.7, 3.3)	3.7 (3.3, 4.1)	4.9 (4.5, 5.4)	6.6 (6.1, 7.2)	8.3 (7.5, 9.1)
Secur-Fit Plus	Trident (Shell)	106	3193	1.3 (1.0, 1.8)	1.8 (1.4, 2.4)	2.3 (1.9, 2.9)	3.2 (2.6, 3.9)	4.1 (3.4, 5.0)	
Synergy	R3	237	6056	1.9 (1.6, 2.3)	2.5 (2.1, 2.9)	2.9 (2.5, 3.4)	3.8 (3.3, 4.4)	5.1 (4.4, 5.8)	
	Reflection (Shell)*	473	7912	1.5 (1.3, 1.8)	2.3 (2.0, 2.7)	2.7 (2.3, 3.1)	4.0 (3.5, 4.4)	5.7 (5.1, 6.2)	7.5 (6.8, 8.2)
Taperloc	Continuum	18	712	1.5 (0.9, 2.8)	2.3 (1.4, 3.7)	2.6 (1.6, 4.1)			
	G7	217	8294	2.0 (1.7, 2.4)	2.6 (2.2, 3.0)	2.8 (2.5, 3.2)	3.4 (2.9, 4.1)		
Taperloc Microplasty	Continuum*	22	633	2.7 (1.7, 4.3)	3.0 (1.9, 4.7)	3.2 (2.1, 4.9)			
	G7	135	8032	1.4 (1.2, 1.7)	1.8 (1.5, 2.1)	1.9 (1.6, 2.2)	2.5 (1.8, 3.4)		
Tri-Fit TS	Trinity	161	5521	1.4 (1.1, 1.7)	2.2 (1.9, 2.7)	2.6 (2.2, 3.1)	3.4 (2.9, 4.1)		
twinSys (cless)	RM Cup	71	1626	2.4 (1.8, 3.3)	3.1 (2.3, 4.0)	3.4 (2.6, 4.5)	5.0 (3.9, 6.3)		
Other (594)		771	20037	2.3 (2.1, 2.6)	3.3 (3.1, 3.6)	3.8 (3.5, 4.1)	5.3 (4.9, 5.8)	6.9 (6.3, 7.6)	8.2 (7.2, 9.4)
TOTAL		11573	332783						

Note: Restricted to modern prostheses

Procedures using metal/metal prostheses have been included

MoM denotes metal/metal prostheses with head size >32mm

* Indicates a prosthesis combination with no reported use in primary total conventional hip procedures in 2025

Only prostheses with ≥500 procedures have been listed

Primary Total Hip Replacement

Table HT13 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Hybrid Fixation by Prosthesis Combination

Femoral Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
AMiStem C	Mpact	16	1553	1.2 (0.7, 2.0)	1.4 (0.8, 2.3)				
C-Stem AMT	PINNACLE	261	7483	1.6 (1.3, 1.9)	2.4 (2.1, 2.8)	3.2 (2.8, 3.7)	4.8 (4.2, 5.5)	6.9 (5.3, 9.1)	
CPCS	R3	439	10873	2.2 (2.0, 2.5)	3.0 (2.7, 3.3)	3.7 (3.3, 4.1)	5.4 (4.8, 5.9)	6.2 (5.5, 7.0)	
	Reflection (Shell)	142	3220	0.9 (0.6, 1.3)	1.3 (0.9, 1.7)	1.7 (1.3, 2.2)	3.4 (2.8, 4.2)	5.6 (4.6, 6.7)	9.2 (7.2, 11.6)
CPT	Continuum	191	3137	3.1 (2.5, 3.7)	4.1 (3.5, 4.9)	4.9 (4.2, 5.7)	6.5 (5.7, 7.6)	7.4 (6.3, 8.6)	
	G7	206	5729	2.5 (2.2, 3.0)	3.6 (3.1, 4.1)	4.4 (3.8, 5.0)			
	Trabecular Metal (Shell)	158	2578	2.5 (1.9, 3.1)	3.5 (2.8, 4.2)	4.3 (3.6, 5.2)	6.7 (5.7, 8.0)	8.9 (7.4, 10.7)	
Evolve	Agilis	8	746	0.6 (0.2, 1.5)	1.4 (0.7, 2.8)	1.4 (0.7, 2.8)			
	Logical G	105	3507	2.0 (1.6, 2.5)	2.6 (2.1, 3.2)	3.2 (2.6, 3.9)	3.9 (3.2, 4.8)		
Exeter V40	Fixa	51	961	2.9 (2.0, 4.2)	3.5 (2.5, 4.9)	3.9 (2.8, 5.4)	5.7 (4.2, 7.6)		
	G7	26	600	2.9 (1.8, 4.6)	4.1 (2.7, 6.1)	5.6 (3.8, 8.4)			
	PINNACLE	91	3073	1.4 (1.0, 1.8)	1.9 (1.5, 2.5)	2.3 (1.8, 2.9)	3.7 (3.0, 4.7)	4.2 (3.3, 5.4)	
	R3	124	3008	2.1 (1.6, 2.6)	2.9 (2.3, 3.5)	3.6 (3.0, 4.4)	4.4 (3.6, 5.2)	5.6 (4.5, 6.9)	
	Trabecular Metal (Shell)	34	640	2.7 (1.7, 4.3)	3.2 (2.1, 4.9)	4.0 (2.7, 5.9)	5.9 (4.2, 8.4)	6.7 (4.8, 9.5)	
	Trident (Shell)	3435	101664	1.4 (1.3, 1.4)	2.0 (1.9, 2.1)	2.5 (2.4, 2.7)	3.9 (3.7, 4.0)	5.3 (5.1, 5.5)	6.6 (6.3, 7.0)
	Trident II (Shell)	25	2217	1.1 (0.7, 1.7)	1.3 (0.9, 2.0)				
	Trident II/Tritanium (Shell)	116	6289	1.8 (1.5, 2.2)	2.6 (2.1, 3.2)				
	Trident/Tritanium (Shell)	289	7102	1.9 (1.6, 2.3)	2.9 (2.5, 3.3)	3.6 (3.1, 4.0)	4.9 (4.3, 5.5)	7.2 (5.7, 9.2)	
MS 30	Continuum	22	988	1.6 (1.0, 2.6)	1.9 (1.2, 3.0)	2.1 (1.3, 3.2)	2.6 (1.6, 4.2)		
	G7	60	2797	1.7 (1.3, 2.3)	2.3 (1.7, 3.0)	2.8 (2.1, 3.7)			
Polarstem	R3	38	1716	1.9 (1.3, 2.7)	2.6 (1.9, 3.7)	2.8 (2.0, 4.0)			
Quadra-C	Mpact	142	7610	1.1 (0.9, 1.4)	1.7 (1.4, 2.0)	2.0 (1.7, 2.4)	3.2 (2.5, 4.2)		
	Versafitcup CC	48	2534	1.3 (0.9, 1.8)	1.6 (1.1, 2.2)	1.9 (1.4, 2.6)	2.5 (1.8, 3.5)		
Short Exeter V40	Trident (Shell)	137	6232	1.3 (1.0, 1.6)	1.9 (1.6, 2.3)	2.5 (2.1, 3.0)	3.5 (2.8, 4.4)		
	Trident II/Tritanium (Shell)	27	1528	1.9 (1.3, 2.8)	3.3 (1.6, 7.0)				
Spectron EF	R3	126	2469	1.8 (1.4, 2.4)	3.0 (2.4, 3.7)	3.8 (3.1, 4.6)	5.4 (4.5, 6.5)	7.1 (5.8, 8.6)	
	Reflection (Shell)*	388	5210	1.1 (0.9, 1.4)	2.0 (1.6, 2.4)	2.8 (2.4, 3.3)	5.5 (4.8, 6.2)	9.0 (8.1, 10.1)	11.9 (10.7, 13.3)
Taper Fit	Trinity	185	7324	1.7 (1.4, 2.0)	2.4 (2.1, 2.8)	3.0 (2.6, 3.5)	3.7 (3.0, 4.7)		
X-Acta	Mpact	40	2286	1.2 (0.8, 1.8)	1.9 (1.4, 2.7)	2.2 (1.6, 3.1)			
	Versafitcup CC	19	1079	1.3 (0.8, 2.2)	1.5 (0.9, 2.4)	1.8 (1.1, 2.9)	2.3 (1.4, 3.9)		
twinSys (ctd)	RM Cup	26	846	2.3 (1.5, 3.5)	2.9 (2.0, 4.3)	3.4 (2.3, 5.0)			
Other (566)		457	12818	2.2 (1.9, 2.5)	3.1 (2.8, 3.4)	3.8 (3.5, 4.3)	5.6 (5.0, 6.3)	8.1 (6.9, 9.6)	12.8 (9.6, 16.8)
TOTAL		7432	219817						

Note: Restricted to modern prostheses. Procedures using metal/metal prostheses have been included.

^{MoM} denotes metal/metal prostheses with head size >32mm.

* Indicates a prosthesis combination with no reported use in primary total conventional hip procedures in 2025.

Only prostheses with ≥500 procedures have been listed.



Primary Total Hip Replacement

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

The 20-year cumulative percent revision of primary total conventional hip replacement undertaken for osteoarthritis is 7.7% (Table HT14 and Figure HT5).

Reason for Revision

Dislocation and instability are combined together for the analyses as they both reflect a similar reason for revision. Periprosthetic joint infection is the most common reason for revision of primary total conventional hip replacement, followed by fracture, dislocation/instability, and loosening (Table HT15).

The most common reasons for revision vary with time. In the first 10 years, infection and dislocation/instability are the most frequent reasons for revision. After 14 years, fracture and loosening are the predominant reasons for revision (Figure HT6).

Type of Revision

The five most common types of revision are femoral component, head and insert, acetabular component, total hip replacement (femoral/acetabular), and head only (Table HT16).

Age and Sex

There is a difference in the rate of revision with respect to age and this varies with time. In general, the rate of revision decreases with age. Patients aged <55 years have the highest rate of revision. Patients aged ≥75 years have a brief early period where the revision rate is higher than all others, but patients aged ≥75 years later have a lower rate of revision compared to patients aged <55 years after 3 months and compared to patients aged 55-64 years after 6 months, with no difference compared to those aged 65-74 years (Table HT17 and Figure HT7).

Females mostly have a lower rate of revision than males. The exception is that for the first 2 weeks, females have a higher rate of revision. The cumulative percent revision at 20 years is 8.5% for males and 7.1% for females (Table HT18 and Figure HT8).

There is a difference in the rate of revision between age groups within sex. For males, there are only subtle differences in revision rate with age. Males aged ≥75 years have a higher rate of revision when compared to those aged 55-64 years and aged 65-74 years, but not when compared to those aged <55 years (Table HT18 and Figure HT9).

For females, revision rate changes with age are more evident. Elderly females (aged ≥75 years) have a brief period within the first month where the rate of revision is higher than other age categories, but later the revision rate is lower (compared to females aged <55 years after 3 months and females 55-64 years and 65-74 years after 6 months) (Table HT18 and Figure HT10).

For both males and females <65 years of age, loosening is the most common reason for revision. For patients aged ≥65 years, the most common reason for revision is fracture (Figure HT11 and Figure HT12).

ASA and BMI

ASA scores are an indication of comorbidity and have been collected since 2012. The definitions for these scores can be found in the introductory portion of this chapter. There are 397,350 primary total conventional hip replacement procedures for osteoarthritis with these scores.

The majority of patients have an ASA score of 2 or 3. There has been an increase in patients with an ASA score of 3 (Figure HT13). When compared to patients with an ASA score of 1, patients in all other ASA groups have a higher rate of revision (Table HT19 and Figure HT14). The difference in revision rate for each ASA score is partially due to an increase in revision for infection with increasing ASA score (Figure HT15).

When analysed by ASA score and sex, both sexes have lower rates of revision when patients with no or little comorbidity (ASA score 1 or 2) are compared to those with significant comorbidity (ASA scores 3-5). Males have a higher rate of revision than females in both comorbidity categories, but only after 6 months where the ASA score is 3-5 (Table HT20 and Figure HT16).

Patients with ASA scores 1 or 2 have lower rates of revision than those with scores 3-5, regardless of age. Patients with ASA scores 1 or 2 aged <65 years have a lower rate of revision than those with the same ASA scores aged ≥65 years, while revision rates for those with ASA scores 3-5 vary little by age group (Table HT21 and Figure HT17).

BMI data have been collected since 2015. There are 357,102 primary total conventional hip replacement procedures for osteoarthritis with BMI data. Over 80% of patients are in the normal, pre-obese or obese class 1 category, and there has been little change in BMI over time (Figure HT18).

When compared to patients in the normal BMI category, there is no difference in the rate of revision for patients who are underweight or pre-obese. The rate of revision is increased for obese class 1, obese class 2 and obese class 3 compared to patients with a normal BMI (Table HT22 and Figure HT19).

The most common reasons for revision are shown in Figure HT20. There is an increasing rate of revision for infection with increasing obesity class. At 3 years, the cumulative incidence of revision for infection is 0.8% for class 1 obesity, 1.5% for class 2 obesity, and 2.4% for class 3 obesity.

Primary Total Hip Replacement

The cumulative incidence of revision for infection for patients in obese class 3 is over 5-fold compared to patients with a normal BMI (Figure HT20).

An analysis of patient BMI dichotomised into 'not obese' (BMI <30) and 'obese' (BMI ≥30) with sex has been conducted. Obese females have a higher rate of revision than females classed as not obese, while obese males have a higher revision rate compared to not obese males only for the first

1.5 years. There is no difference in rate of revision for obese patients regarding sex. When the not obese groups are compared, males have a higher rate of revision than females after 1 month (Table HT23 and Figure HT21).

Patients who are not obese have a lower rate of revision than obese patients for both age groups (<65 years and ≥65 years) (Table HT24 and Figure HT22).

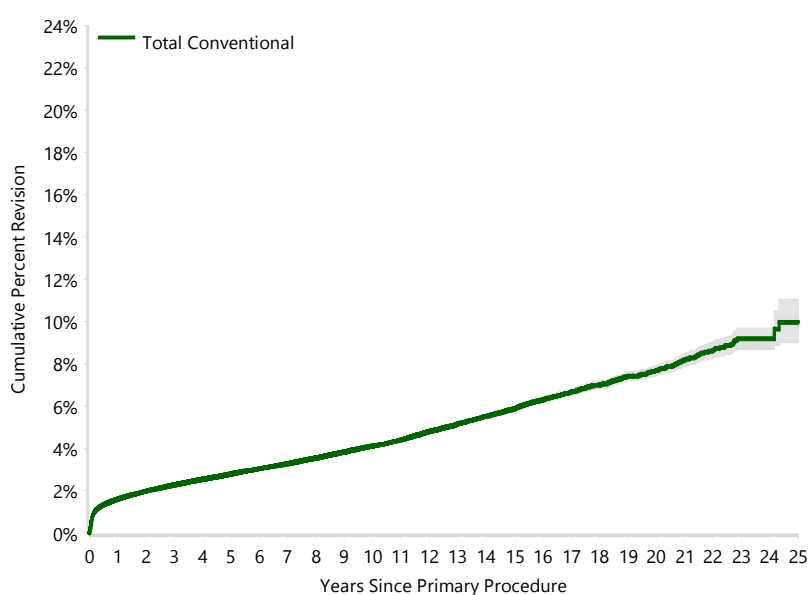
Table HT14 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)

Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	16280	496964	1.6 (1.6, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.8)	4.1 (4.0, 4.2)	5.9 (5.8, 6.0)	7.7 (7.4, 7.9)
TOTAL	16280	496964						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT5 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	496964	441522	347132	267382	112862	34301	6491

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT15 Primary Total Conventional Hip Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Infection	4192	25.7
Fracture	3587	22.0
Prosthesis Dislocation/Instability	3421	21.0
Loosening	3083	18.9
Pain	302	1.9
Leg Length Discrepancy	272	1.7
Malposition	251	1.5
Implant Breakage Stem	182	1.1
Lysis	180	1.1
Implant Breakage Acetabular Insert	110	0.7
Wear Acetabular Insert	96	0.6
Incorrect Sizing	83	0.5
Metal Related Pathology	78	0.5
Implant Breakage Acetabular	52	0.3
Implant Breakage Head	23	0.1
Progression Of Disease	1	0.0
Other	367	2.3
TOTAL	16280	100.0

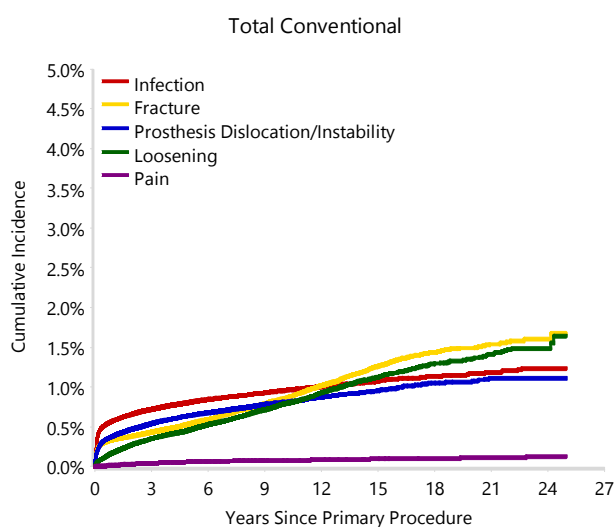
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT16 Primary Total Conventional Hip Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Femoral Component	5563	34.2
Head/Insert	4454	27.4
Acetabular Component	2677	16.4
THR (Femoral/Acetabular)	1867	11.5
Head Only	773	4.7
Cement Spacer	477	2.9
Minor Components	238	1.5
Insert Only	130	0.8
Removal of Prostheses	65	0.4
Reinsertion of Components	20	0.1
Bipolar Head and Femoral	8	0.0
Total Femoral	6	0.0
Cement Only	1	0.0
Bipolar Only	1	0.0
TOTAL	16280	100.0

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Femoral heads are usually replaced when the acetabular component or femoral stem is revised

Figure HT6 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Hip Replacement

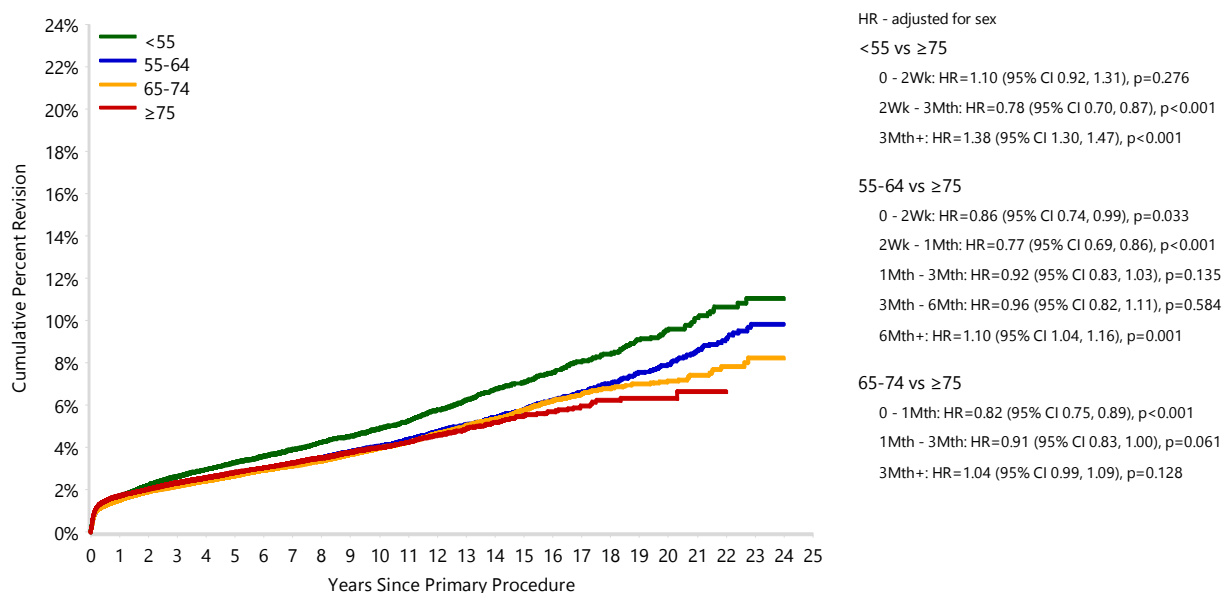
Table HT17 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	2135	51540	1.7 (1.6, 1.8)	2.6 (2.5, 2.8)	3.3 (3.1, 3.5)	4.9 (4.7, 5.1)	7.1 (6.7, 7.5)	9.6 (8.9, 10.4)
55-64	4019	116692	1.5 (1.5, 1.6)	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	4.1 (3.9, 4.2)	5.8 (5.6, 6.0)	7.9 (7.5, 8.4)
65-74	5693	178057	1.5 (1.5, 1.6)	2.2 (2.1, 2.3)	2.7 (2.6, 2.7)	4.0 (3.9, 4.1)	5.8 (5.6, 6.0)	7.2 (6.8, 7.5)
≥75	4433	150675	1.7 (1.6, 1.8)	2.3 (2.3, 2.4)	2.8 (2.7, 2.9)	4.0 (3.9, 4.1)	5.5 (5.2, 5.8)	6.3 (5.8, 6.8)
TOTAL	16280	496964						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT7 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	51540	46410	37414	29838	14249	4885	1321
55-64	116692	104775	84349	66887	31824	11502	2547
65-74	178057	158886	126149	98462	43147	13449	2273
≥75	150675	131451	99220	72195	23642	4465	350

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

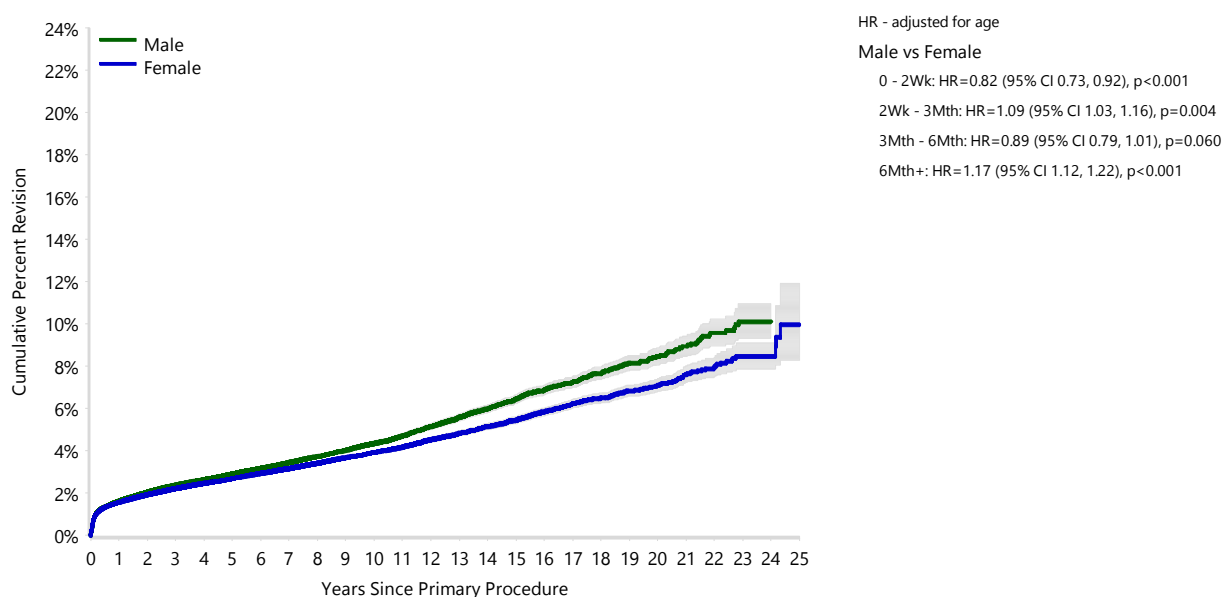
Table HT18 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Sex and Age (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		7780	227056	1.6 (1.6, 1.7)	2.4 (2.3, 2.4)	2.9 (2.8, 3.0)	4.3 (4.2, 4.5)	6.5 (6.3, 6.7)	8.5 (8.1, 8.9)
	<55	1137	28914	1.6 (1.5, 1.7)	2.5 (2.3, 2.7)	3.1 (2.9, 3.3)	4.6 (4.3, 4.9)	7.0 (6.5, 7.6)	9.6 (8.6, 10.6)
	55-64	2042	59208	1.6 (1.5, 1.7)	2.3 (2.1, 2.4)	2.7 (2.6, 2.9)	4.1 (3.9, 4.3)	6.2 (5.8, 6.5)	8.3 (7.7, 9.1)
	65-74	2665	79217	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.8 (2.7, 2.9)	4.2 (4.1, 4.4)	6.2 (5.9, 6.6)	7.9 (7.4, 8.5)
	≥75	1936	59717	1.8 (1.7, 1.9)	2.5 (2.4, 2.7)	3.2 (3.0, 3.3)	4.6 (4.4, 4.9)	6.8 (6.3, 7.4)	7.7 (6.7, 8.8)
Female		8500	269908	1.6 (1.5, 1.6)	2.2 (2.2, 2.3)	2.7 (2.6, 2.7)	3.9 (3.8, 4.0)	5.4 (5.3, 5.6)	7.1 (6.8, 7.4)
	<55	998	22626	1.8 (1.6, 2.0)	2.8 (2.6, 3.0)	3.6 (3.3, 3.8)	5.3 (4.9, 5.7)	7.2 (6.7, 7.8)	9.7 (8.7, 10.8)
	55-64	1977	57484	1.5 (1.4, 1.6)	2.2 (2.1, 2.3)	2.7 (2.5, 2.8)	4.0 (3.8, 4.2)	5.5 (5.2, 5.8)	7.5 (7.0, 8.1)
	65-74	3028	98840	1.5 (1.4, 1.5)	2.1 (2.0, 2.2)	2.6 (2.4, 2.7)	3.8 (3.6, 3.9)	5.4 (5.1, 5.7)	6.6 (6.2, 7.0)
	≥75	2497	90958	1.6 (1.6, 1.7)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	3.6 (3.5, 3.8)	4.8 (4.5, 5.1)	5.6 (5.1, 6.2)
TOTAL		16280	496964						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT8 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Sex (Primary Diagnosis OA)



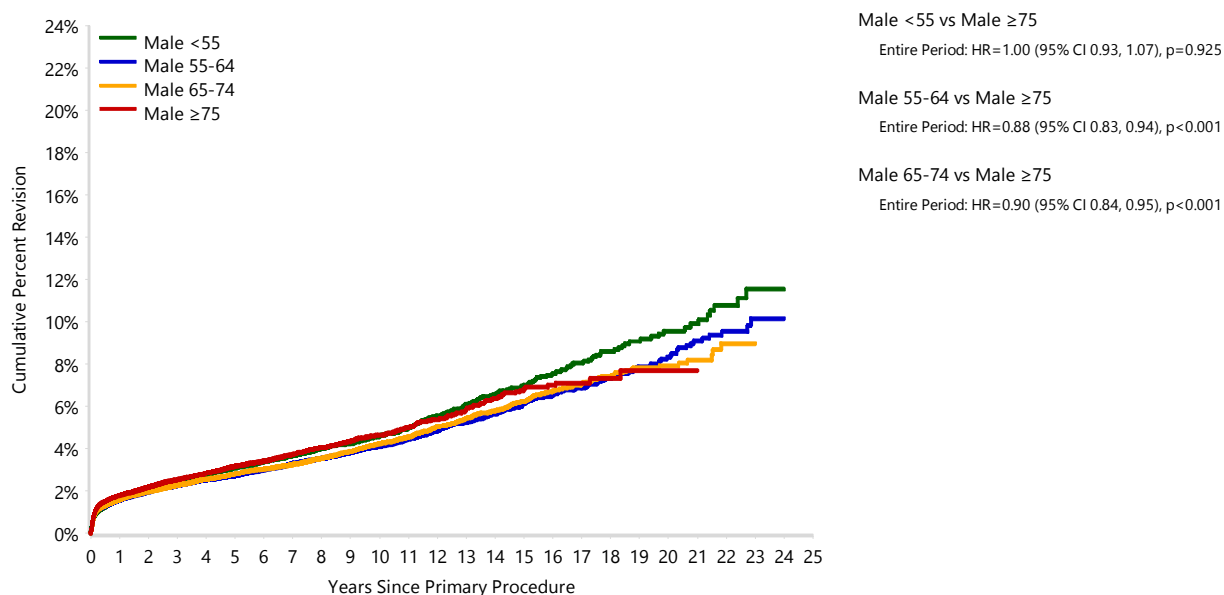
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	227056	201550	158087	120722	49538	14300	2729
Female	269908	239972	189045	146660	63324	20001	3762

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT9 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<55	28914	26136	21141	16787	7746	2407	648
	55-64	59208	53146	42528	33385	15257	5066	1120
	65-74	79217	70546	56000	43474	18612	5514	861
	≥75	59717	51722	38418	27076	7923	1313	100

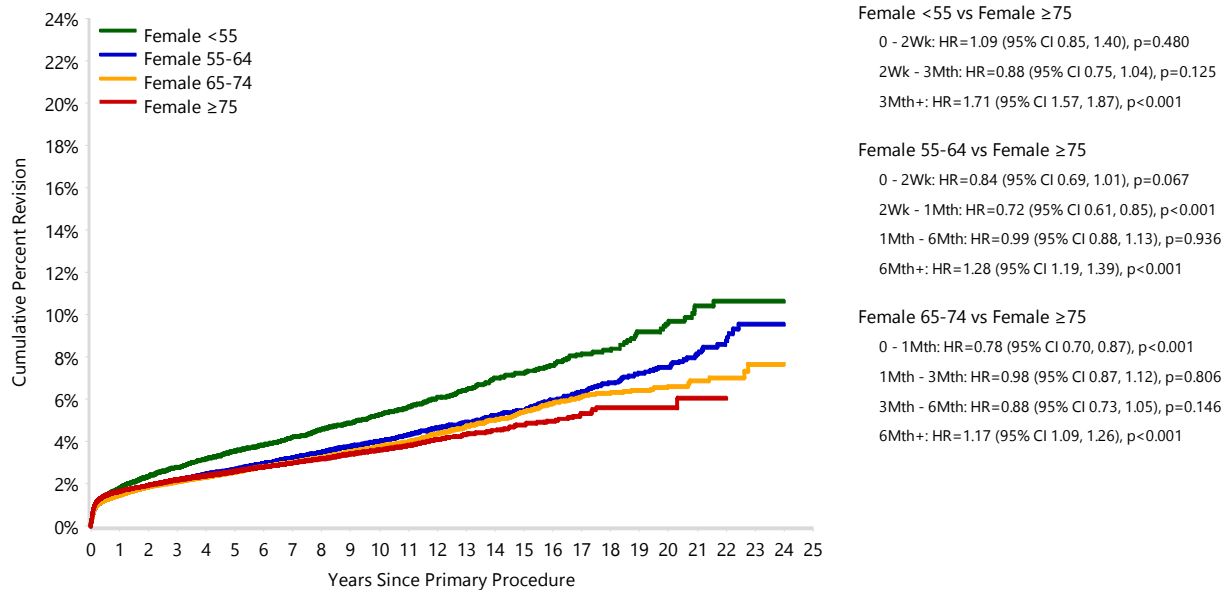
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT10 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis OA)



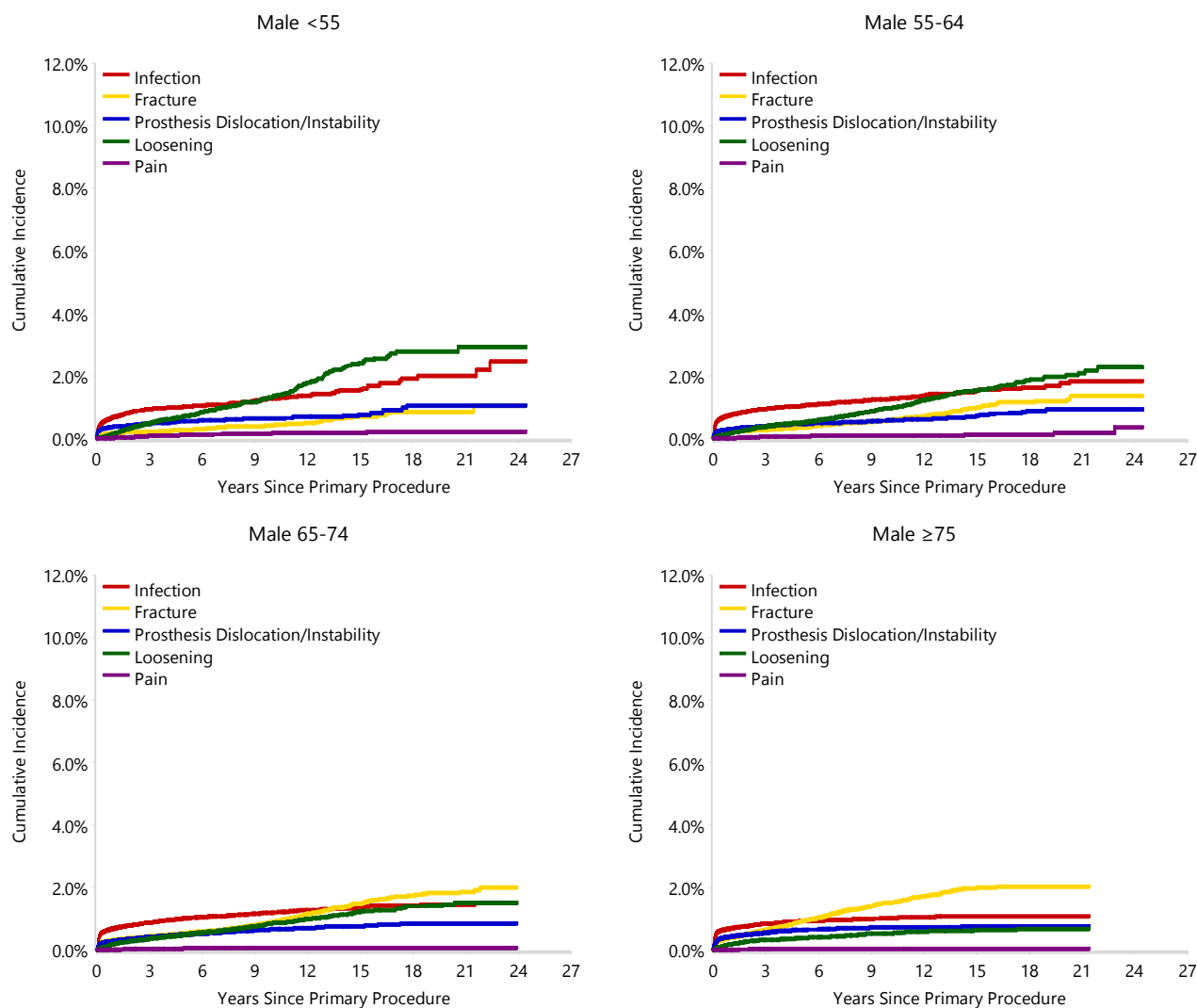
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	<55	22626	20274	16273	13051	6503	2478	673
	55-64	57484	51629	41821	33502	16567	6436	1427
	65-74	98840	88340	70149	54988	24535	7935	1412
	≥75	90958	79729	60802	45119	15719	3152	250

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT11 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis OA)



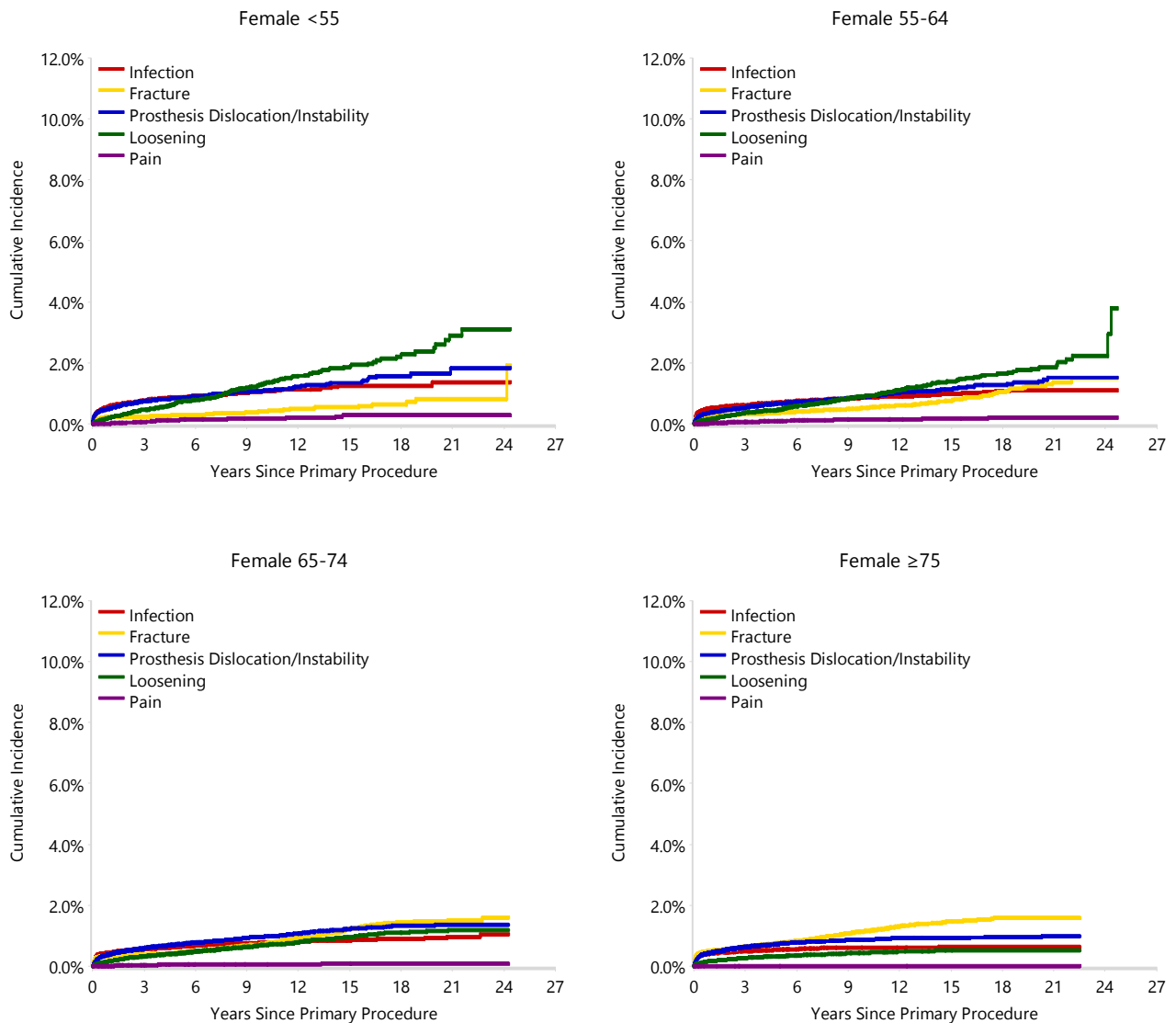
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT12 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis OA)

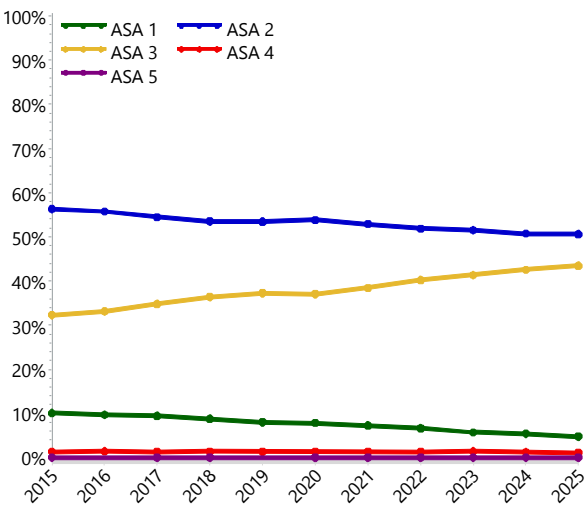


Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT13 Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)





Primary Total Hip Replacement

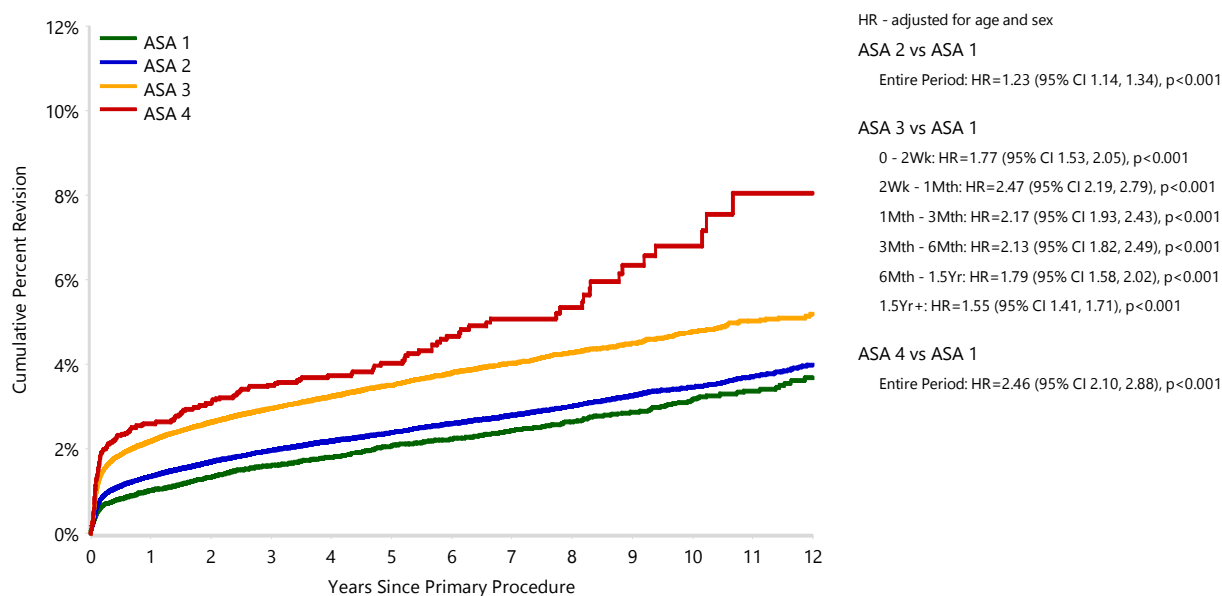
Table HT19 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs	12 Yrs
ASA 1	677	29806	1.0 (0.9, 1.1)	1.3 (1.2, 1.5)	1.6 (1.5, 1.8)	2.1 (1.9, 2.3)	2.6 (2.4, 2.9)	3.2 (2.9, 3.4)	3.7 (3.3, 4.1)
ASA 2	5078	210963	1.4 (1.3, 1.4)	1.7 (1.6, 1.7)	2.0 (1.9, 2.0)	2.4 (2.3, 2.5)	3.0 (2.9, 3.1)	3.5 (3.4, 3.6)	4.0 (3.8, 4.2)
ASA 3	4946	151257	2.2 (2.1, 2.3)	2.6 (2.6, 2.7)	3.0 (2.9, 3.0)	3.5 (3.4, 3.6)	4.3 (4.1, 4.4)	4.8 (4.6, 4.9)	5.2 (4.9, 5.4)
ASA 4	208	5296	2.6 (2.2, 3.1)	3.1 (2.6, 3.6)	3.5 (3.0, 4.1)	4.0 (3.5, 4.7)	5.3 (4.5, 6.3)	6.8 (5.6, 8.3)	8.0 (6.3, 10.2)
ASA 5	1	28	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	14.3 (2.1, 66.6)		
TOTAL	10910	397350							

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT14 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs	12 Yrs
ASA 1	29806	27354	24911	22451	17404	9973	5059	1143
ASA 2	210963	185205	162348	140027	101519	52394	24888	4921
ASA 3	151257	127433	107372	88591	58409	25468	10702	1876
ASA 4	5296	4375	3648	2879	1743	673	274	48

Note: Restricted to modern prostheses

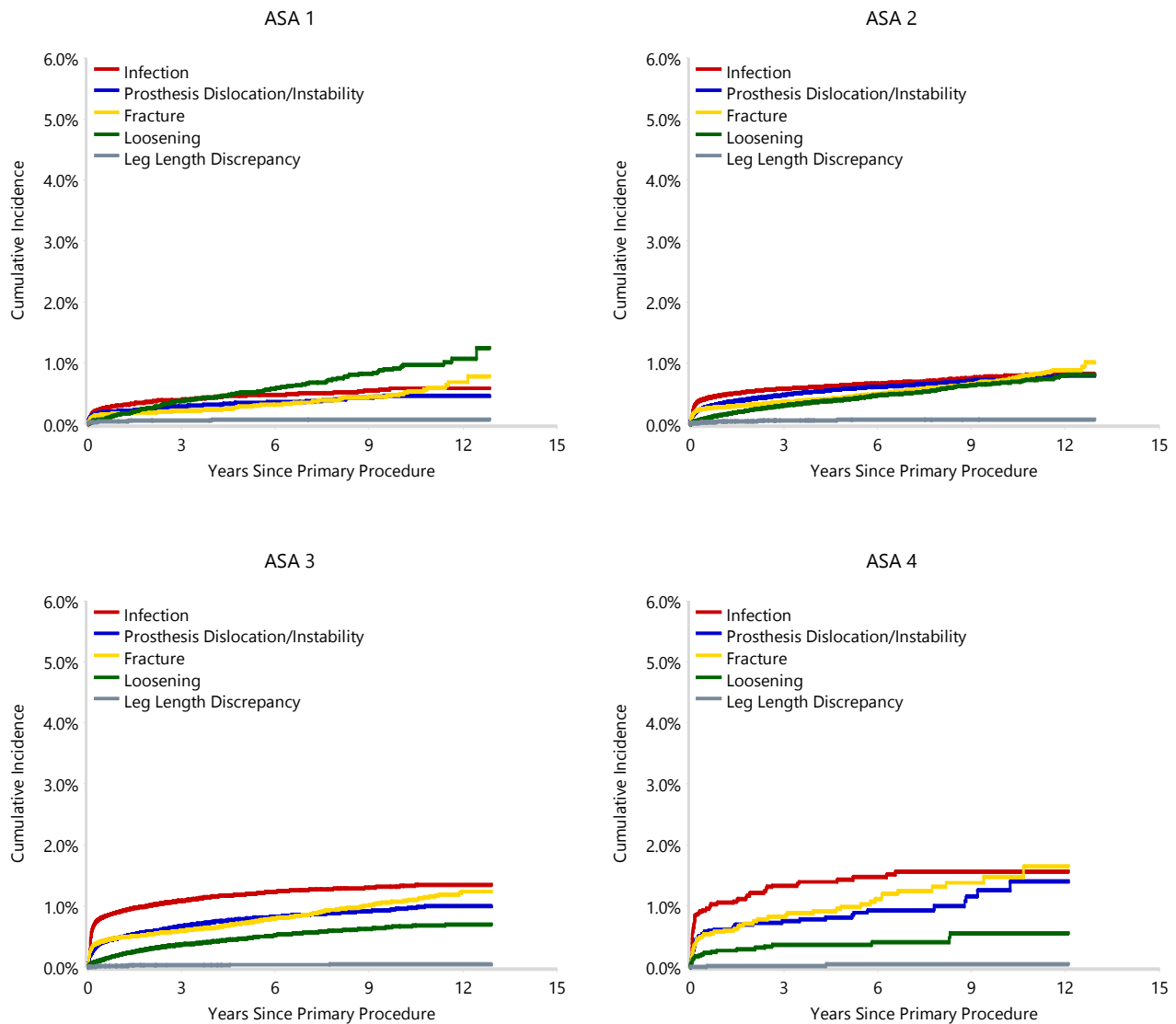
All procedures using metal/metal prostheses have been excluded

Excludes ASA 5 patients due to low numbers



Primary Total Hip Replacement

Figure HT15 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

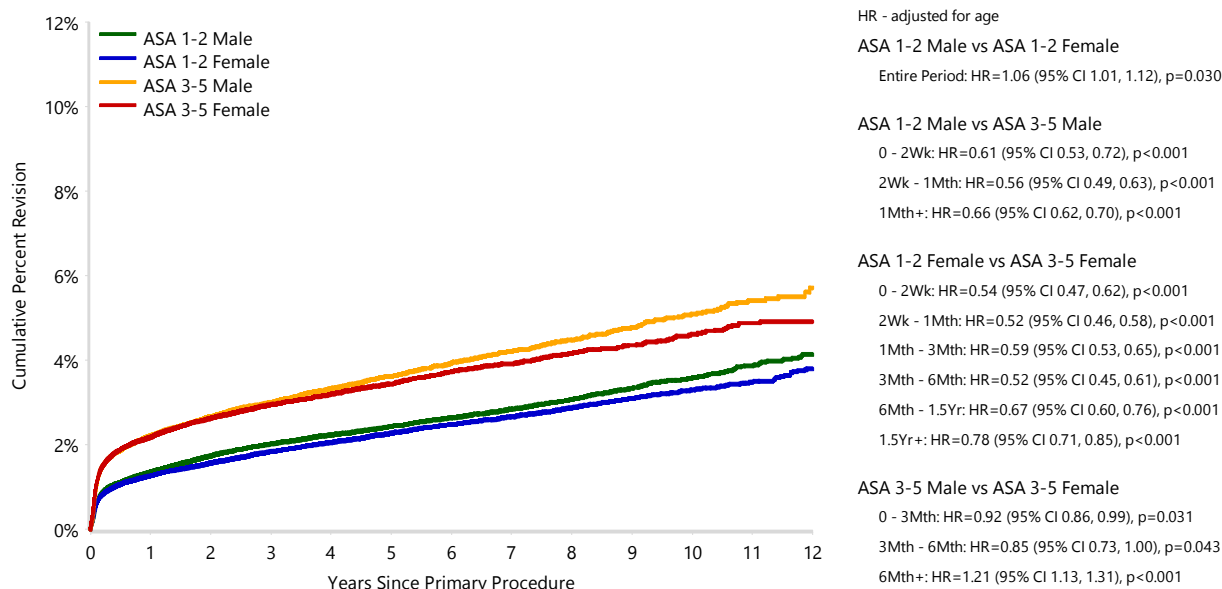
Table HT20 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Sex (Primary Diagnosis OA)

ASA Score	Sex	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	8 Yrs	10 Yrs	12 Yrs
ASA 1-2	Male	2763	110566	1.4 (1.3, 1.4)	1.7 (1.7, 1.8)	2.0 (1.9, 2.1)	3.1 (2.9, 3.2)	3.6 (3.4, 3.7)	4.1 (3.9, 4.4)
	Female	2992	130203	1.3 (1.2, 1.3)	1.6 (1.5, 1.6)	1.8 (1.8, 1.9)	2.9 (2.8, 3.0)	3.3 (3.2, 3.4)	3.8 (3.6, 4.0)
ASA 3-5	Male	2446	72555	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	3.0 (2.9, 3.1)	4.5 (4.3, 4.7)	5.1 (4.8, 5.4)	5.7 (5.3, 6.2)
	Female	2709	84026	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	2.9 (2.8, 3.1)	4.2 (4.0, 4.3)	4.6 (4.4, 4.8)	4.9 (4.6, 5.2)
TOTAL		10910	397350						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT16 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs	12 Yrs
ASA 1-2	Male	110566	97824	75076	54761	28841	13736	2720
	Female	130203	114735	87402	64162	33526	16211	3344
ASA 3-5	Male	72555	60974	42252	27540	11669	4808	856
	Female	84026	70858	49233	32619	14476	6170	1068

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

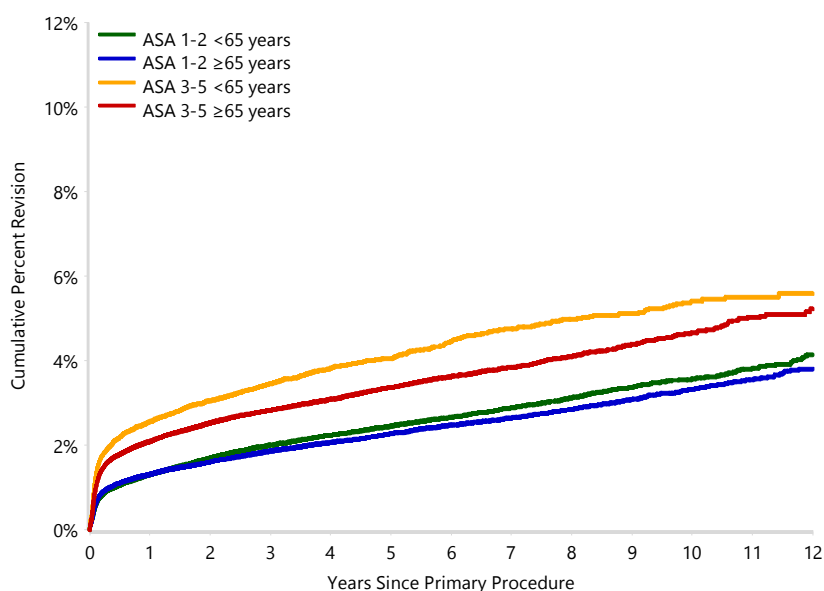
Table HT21 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Age (Primary Diagnosis OA)

ASA Score	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs	12 Yrs
ASA 1-2	<65 years	2526	99853	1.3 (1.2, 1.4)	2.0 (1.9, 2.1)	2.5 (2.3, 2.6)	3.1 (3.0, 3.3)	3.6 (3.4, 3.7)	4.1 (3.9, 4.4)
	≥65 years	3229	140916	1.3 (1.3, 1.4)	1.9 (1.8, 1.9)	2.3 (2.2, 2.4)	2.8 (2.7, 3.0)	3.3 (3.2, 3.5)	3.8 (3.6, 4.0)
ASA 3-5	<65 years	1386	35748	2.6 (2.4, 2.7)	3.5 (3.3, 3.7)	4.1 (3.8, 4.3)	5.0 (4.7, 5.3)	5.4 (5.1, 5.8)	5.6 (5.2, 6.0)
	≥65 years	3769	120833	2.1 (2.0, 2.2)	2.8 (2.7, 2.9)	3.4 (3.3, 3.5)	4.1 (4.0, 4.3)	4.7 (4.5, 4.9)	5.2 (4.9, 5.6)
TOTAL		10910	397350						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT17 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA and Age (Primary Diagnosis OA)



HR - adjusted for age and sex

ASA 1-2 <65 vs ASA 1-2 ≥65 years

Entire Period: HR=0.90 (95% CI 0.84, 0.97), p=0.006

ASA 1-2 <65 vs ASA 3-5 <65

0 - 2Wk: HR=0.53 (95% CI 0.44, 0.63), p<0.001

2Wk - 1Mth: HR=0.41 (95% CI 0.35, 0.48), p<0.001

1Mth - 3Mth: HR=0.50 (95% CI 0.43, 0.59), p<0.001

3Mth - 6Mth: HR=0.46 (95% CI 0.36, 0.58), p<0.001

6Mth+: HR=0.74 (95% CI 0.68, 0.82), p<0.001

ASA 1-2 ≥65 years vs ASA 3-5 ≥65 years

0 - 2Wk: HR=0.71 (95% CI 0.62, 0.82), p<0.001

2Wk - 1Mth: HR=0.49 (95% CI 0.44, 0.55), p<0.001

1Mth - 3Mth: HR=0.56 (95% CI 0.51, 0.62), p<0.001

3Mth - 6Mth: HR=0.60 (95% CI 0.52, 0.70), p<0.001

6Mth+: HR=0.76 (95% CI 0.71, 0.81), p<0.001

ASA 3-5 <65 vs ASA 3-5 ≥65 years

0 - 2Wk: HR=1.20 (95% CI 1.01, 1.42), p=0.038

2Wk - 1Mth: HR=0.97 (95% CI 0.84, 1.11), p=0.631

1Mth - 3Mth: HR=0.96 (95% CI 0.82, 1.11), p=0.581

3Mth - 6Mth: HR=1.12 (95% CI 0.90, 1.39), p=0.319

6Mth+: HR=0.98 (95% CI 0.88, 1.09), p=0.713

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs	12 Yrs
ASA 1-2	<65 years	99853	88741	68681	50927	27994	13956	2906
	≥65 years	140916	123818	93797	67996	34373	15991	3158
ASA 3-5	<65 years	35748	30376	21661	15009	7287	3348	634
	≥65 years	120833	101456	69824	45150	18858	7630	1290

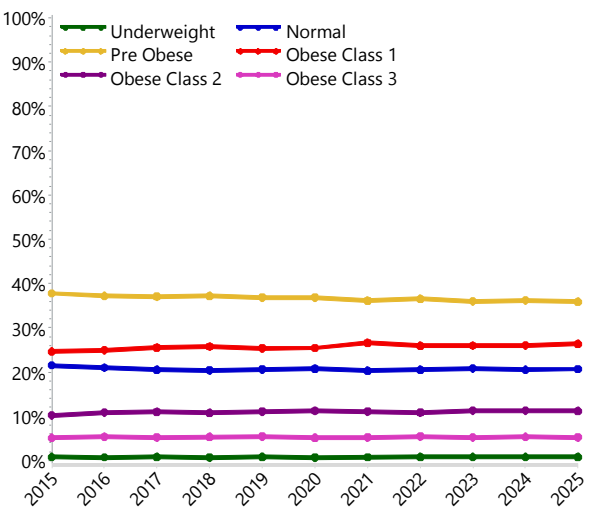
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT18 Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)



Note: BMI has not been presented for patients aged ≤19 years

Table HT22 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)

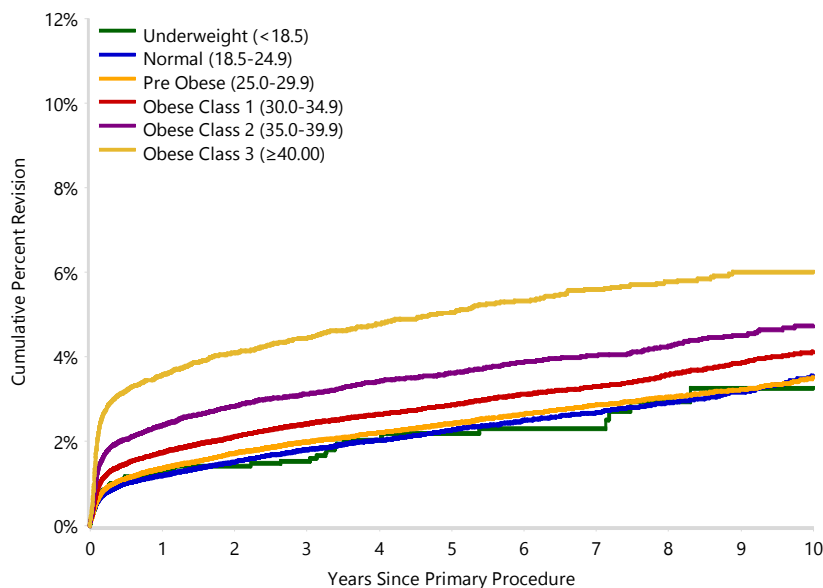
BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight (<18.5)	52	2646	1.3 (1.0, 1.9)	1.4 (1.0, 2.0)	1.5 (1.1, 2.1)	2.0 (1.5, 2.7)	2.2 (1.6, 2.9)	2.3 (1.7, 3.1)	3.3 (2.3, 4.7)
Normal (18.5-24.9)	1544	73671	1.2 (1.1, 1.3)	1.5 (1.4, 1.6)	1.8 (1.7, 1.9)	2.0 (1.9, 2.1)	2.3 (2.1, 2.4)	2.7 (2.5, 2.8)	3.2 (3.0, 3.4)
Pre Obese (25.0-29.9)	2949	130508	1.4 (1.3, 1.4)	1.7 (1.6, 1.8)	2.0 (1.9, 2.1)	2.2 (2.1, 2.3)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.2 (3.1, 3.4)
Obese Class 1 (30.0-34.9)	2475	92062	1.7 (1.7, 1.8)	2.1 (2.0, 2.2)	2.4 (2.3, 2.5)	2.6 (2.5, 2.8)	2.9 (2.7, 3.0)	3.3 (3.2, 3.4)	3.9 (3.7, 4.0)
Obese Class 2 (35.0-39.9)	1334	39375	2.4 (2.2, 2.5)	2.8 (2.7, 3.0)	3.1 (3.0, 3.3)	3.4 (3.2, 3.6)	3.6 (3.4, 3.8)	4.0 (3.8, 4.3)	4.5 (4.2, 4.8)
Obese Class 3 (≥40.0)	893	18840	3.6 (3.3, 3.8)	4.1 (3.8, 4.4)	4.4 (4.1, 4.8)	4.8 (4.5, 5.1)	5.1 (4.7, 5.4)	5.6 (5.2, 6.0)	6.0 (5.6, 6.5)
TOTAL	9247	357102							

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years

Figure HT19 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)



HR - adjusted for age and sex

Underweight (<18.5) vs Normal (18.5-24.9)

Entire Period: HR=0.99 (95% CI 0.75, 1.30), p=0.921

Pre Obese (25.0-29.9) vs Normal (18.5-24.9)

Entire Period: HR=1.05 (95% CI 0.99, 1.12), p=0.094

Obese Class 1 (30.0-34.9) vs Normal (18.5-24.9)

0 - 3Mth: HR=1.47 (95% CI 1.35, 1.60), p<0.001

3Mth+: HR=1.14 (95% CI 1.06, 1.23), p<0.001

Obese Class 2 (35.0-39.9) vs Normal (18.5-24.9)

0 - 3Mth: HR=2.13 (95% CI 1.94, 2.35), p<0.001

3Mth - 6Mth: HR=1.32 (95% CI 1.05, 1.65), p=0.016

6Mth - 1.5Yr: HR=1.54 (95% CI 1.31, 1.80), p<0.001

1.5Yr+: HR=1.15 (95% CI 1.02, 1.30), p=0.024

Obese Class 3 (≥40.0) vs Normal (18.5-24.9)

0 - 3Mth: HR=3.43 (95% CI 3.08, 3.81), p<0.001

3Mth - 6Mth: HR=1.90 (95% CI 1.46, 2.47), p<0.001

6Mth - 1.5Yr: HR=1.78 (95% CI 1.46, 2.18), p<0.001

1.5Yr+: HR=1.35 (95% CI 1.16, 1.58), p<0.001

Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight (<18.5)	2646	2237	1877	1522	1207	937	506	207
Normal (18.5-24.9)	73671	63169	53824	44657	36958	29609	17160	7256
Pre Obese (25.0-29.9)	130508	112285	95895	80358	66820	53977	31847	13446
Obese Class 1 (30.0-34.9)	92062	78598	66954	55776	46223	36858	21676	8957
Obese Class 2 (35.0-39.9)	39375	33445	28398	23608	19622	15779	9151	3813
Obese Class 3 (≥40.0)	18840	15836	13474	11282	9300	7528	4427	1865

Note: Restricted to modern prostheses

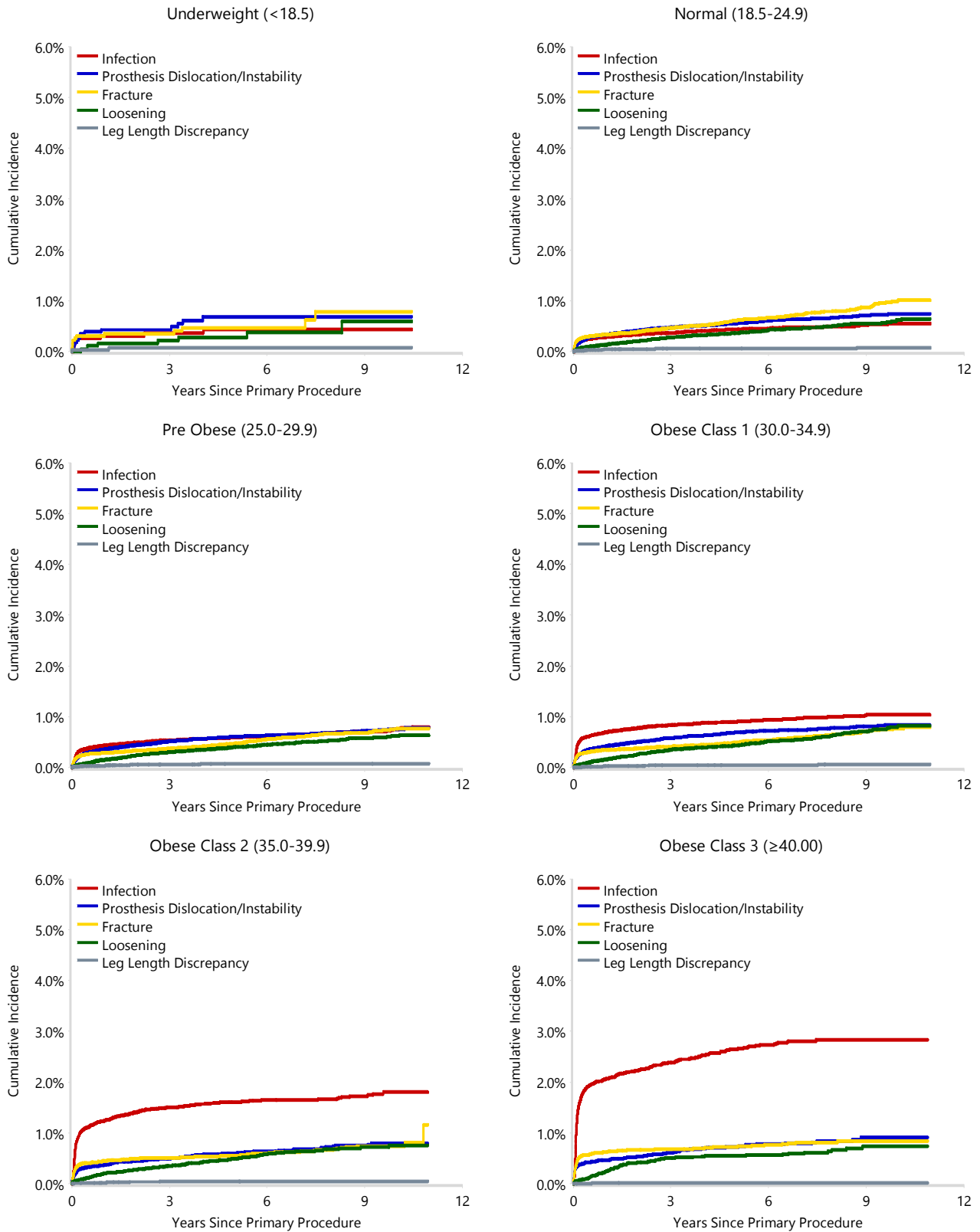
All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years



Primary Total Hip Replacement

Figure HT20 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis OA)



Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years

Primary Total Hip Replacement

Table HT23 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Sex (Primary Diagnosis OA)

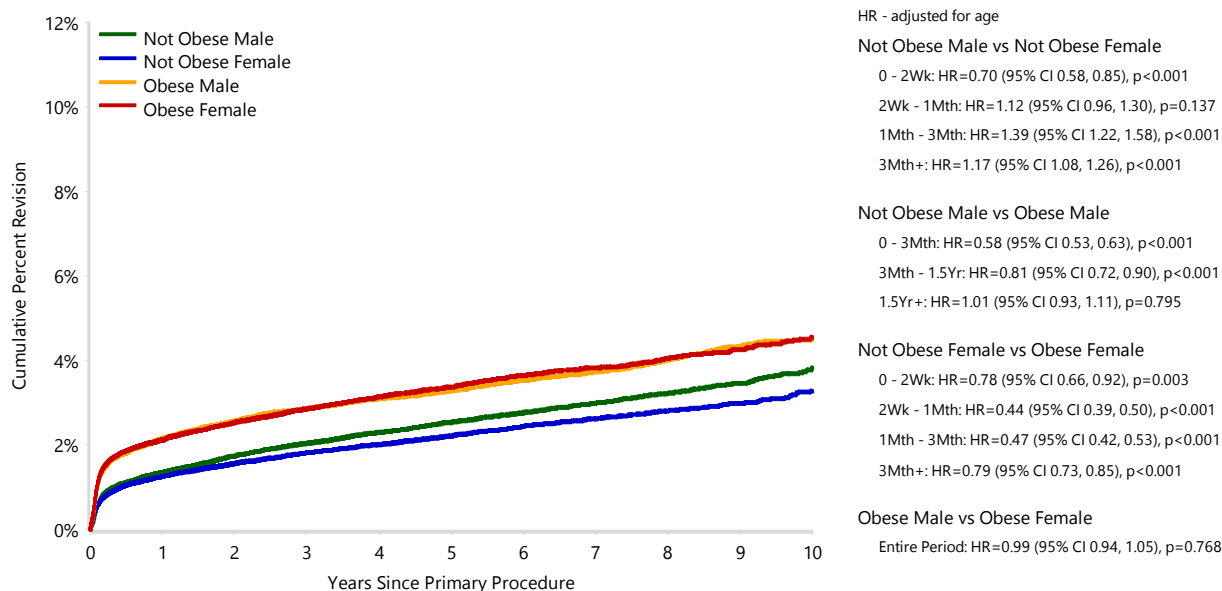
BMI Category	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Not Obese	Male	2203	93225	1.4 (1.3, 1.4)	2.0 (1.9, 2.1)	2.5 (2.4, 2.7)	3.0 (2.9, 3.1)	3.5 (3.3, 3.6)	
	Female	2344	113652	1.3 (1.2, 1.3)	1.8 (1.7, 1.9)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	3.0 (2.8, 3.1)	
Obese	Male	2235	71772	2.2 (2.0, 2.3)	2.9 (2.7, 3.0)	3.3 (3.1, 3.4)	3.7 (3.6, 3.9)	4.3 (4.1, 4.6)	
	Female	2468	78526	2.1 (2.0, 2.2)	2.9 (2.7, 3.0)	3.4 (3.2, 3.5)	3.8 (3.7, 4.0)	4.3 (4.1, 4.5)	
TOTAL		9250	357175						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years

Figure HT21 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Not Obese	Male	93225	80283	57492	38317	22597	9581	16
	Female	113652	97455	69074	46225	26926	11331	19
Obese	Male	71772	61053	43365	28622	16747	6909	9
	Female	78526	66845	47313	31550	18509	7728	9

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years



Primary Total Hip Replacement

Table HT24 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Age (Primary Diagnosis OA)

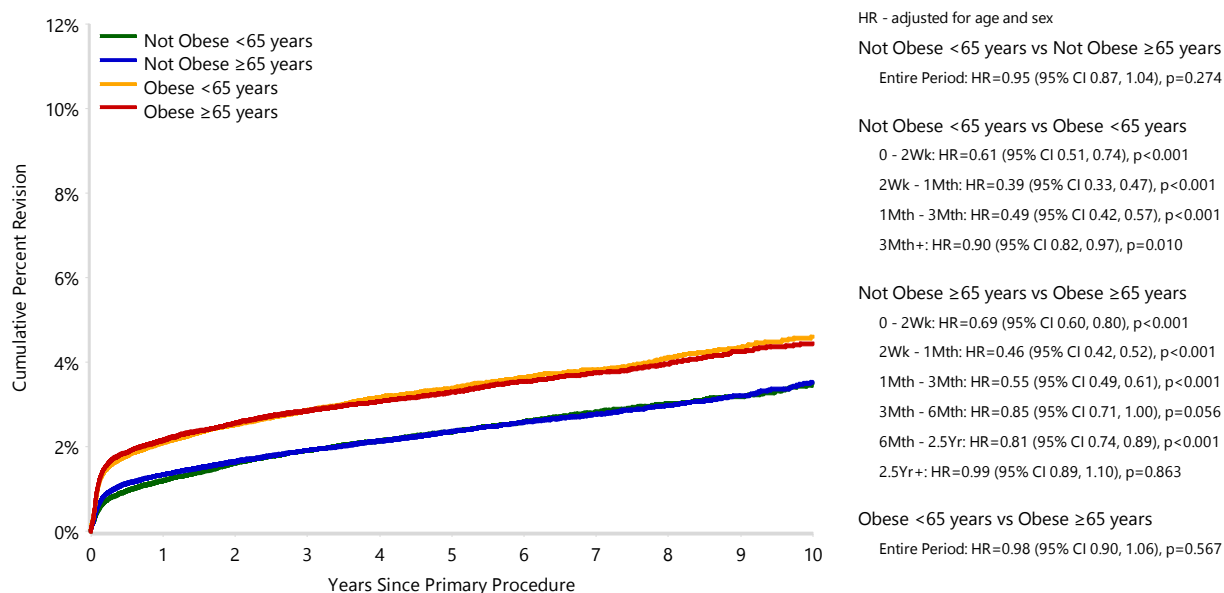
Obesity	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Not Obese	<65 years	1421	62931	1.2 (1.1, 1.3)	1.9 (1.8, 2.0)	2.3 (2.2, 2.5)	2.8 (2.7, 3.0)	3.2 (3.0, 3.4)	
	≥65 years	3126	143946	1.3 (1.3, 1.4)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.2 (3.1, 3.4)	
Obese	<65 years	1895	59016	2.1 (2.0, 2.2)	2.9 (2.7, 3.0)	3.4 (3.2, 3.5)	3.8 (3.6, 4.0)	4.3 (4.1, 4.6)	
	≥65 years	2808	91282	2.2 (2.1, 2.3)	2.9 (2.7, 3.0)	3.3 (3.2, 3.4)	3.7 (3.6, 3.9)	4.3 (4.1, 4.5)	
TOTAL		9250	357175						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years

Figure HT22 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Not Obese	<65 years	62931	54958	40541	28282	17626	8032	16
	≥65 years	143946	122780	86025	56260	31897	12880	19
Obese	<65 years	59016	50855	36912	25160	15477	6826	10
	≥65 years	91282	77043	53766	35012	19779	7811	8

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years

Primary Total Hip Replacement

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Fixation

The analysis of prosthesis fixation was performed for prosthesis combinations using only modern bearing surfaces with recorded use in 2025. These bearing surfaces include mixed ceramic/mixed ceramic and all femoral head materials used in conjunction with cross-linked polyethylene (XLPE). A small proportion of total hip replacement procedures in 2025 use other bearing surface combinations (2.5%); however, these have been excluded from further analysis.

There is no difference in the rate of revision for cemented compared to hybrid fixation. Cementless fixation has a higher rate of revision than hybrid fixation (except for a brief period between 1 and 3 months where there is no difference). Cementless fixation has a higher rate of revision than cemented fixation only for the first 2 weeks, and after this time there is no difference (Table HT25 and Figure HT25).

The outcome with respect to fixation varies with age.

For patients aged <55 years cemented fixation has a higher rate of revision than hybrid fixation, but there is no difference comparing cemented and cementless fixation or hybrid and cementless fixation. For patients aged 55-64 years, cementless fixation has a lower rate of revision compared to hybrid fixation after 1 month, but there is no difference comparing cemented and cementless fixation or cemented and hybrid fixation. For patients in the 65-74 year age group, there is little difference with fixation method (only for the first 3 months cementless fixation has a higher rate of revision compared to hybrid fixation). For patients aged ≥75 years, cementless fixation has a higher rate of revision than both cemented and hybrid fixation (Table HT26 to Figure HT29).

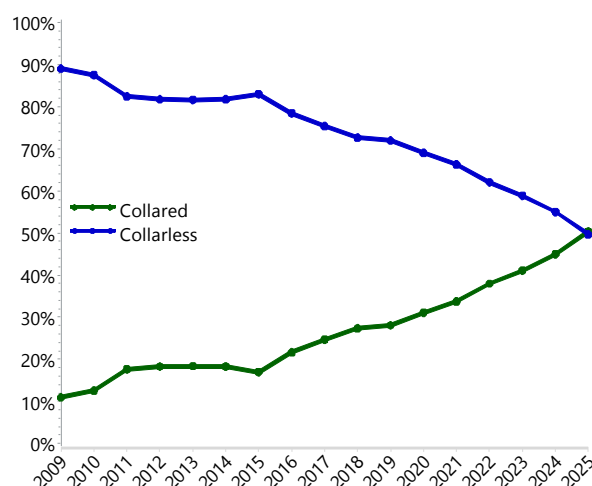
Collared and Collarless Cementless Stems

Some cementless femoral stems offer a choice of components with and without a collar. Collared stems make up 30.0% of all modern cementless stems, the majority of which are tapered wedge designs (Figure HT23). There has been a steady increase in the use of collared cementless stems since 2015. In 2025, 50.4% of cementless stems are collared. A comparison of collared cementless stems has been made to collarless cementless stems. The cumulative percent revision at 15 years is 4.7% for collared stems and 6.2% for collarless stems. Collarless stems have a higher rate of revision compared to collared stems (Table HT27 and Figure HT30). Collarless stems have a higher rate of revision for fracture and loosening (Figure HT31). The types of revision are presented in Table HT28.

An additional analysis was undertaken to determine the effect of surgical approach on the outcome for collared versus collarless cementless stems. For the lateral and posterior approaches, collarless stems have a higher rate of revision for the first 3 months, with no difference after this time (Table HT29, Figure HT32, Table HT30 and Figure HT33). For the anterior approach, collarless stems have a higher rate of revision for the entire period (Table HT31 and Figure HT34).

There is prosthesis dependent variation in the outcome of cementless femoral components with and without a collar (Table HT32 and Table HT33).

Figure HT23 Primary Total Conventional Hip Replacement with Cementless Stems by Collar Use (Primary Diagnosis OA)





Primary Total Hip Replacement

Mini Stems

A mini stem is a short cementless femoral stem where fixation is designed to be entirely metaphyseal. These stems may enable femoral neck sparing and are often selected for younger patients with good quality proximal femoral bone. Mini stems were first used in 2009, and there have been 13,593 procedures using a mini stem prosthesis undertaken for osteoarthritis. This represents 2.7% of all primary total conventional hip procedures. There are 2,149 procedures recorded in 2025 using a mini stem prosthesis. This is an increase of 13.8% compared to 2024. The annual use of mini stems is shown in Figure HT24.

The 9-year cumulative percent revision for primary total conventional hip replacement using a mini stem is 2.9% compared to 4.0% for other cementless femoral stems. The small size of the mini stem cohort, with few prostheses, influences comparisons with other cementless stems. Mini stems have a lower rate of revision from 2 years onwards, with no difference before this time point (Table HT34 and Figure HT35).

Patients aged <65 years have a lower rate of revision in the first month only compared to patients aged ≥65 years when a mini stem is used. Compared to other cementless stems, patients aged <65 years with a mini stem have a lower rate of revision, but patients aged ≥65 years with a mini stem have a lower rate of revision from 1.5 years onward only (Table HT35 and Figure HT36).

Obesity is a risk factor for revision when a mini stem is used (Table HT36 and Figure HT37).

The reasons for revision and type of revision are shown in Figure HT38 and Table HT37. Mini stems have a lower rate of revision for loosening compared to other cementless femoral stems after 5 years (Table HT38 and Figure HT39). Mini stems have an initial higher rate of revision for fracture (in the first 3 months) compared to other cementless stems, but from 3 months onwards, mini stems have a lower rate of revision for this reason (Table HT28 and Figure HT40).

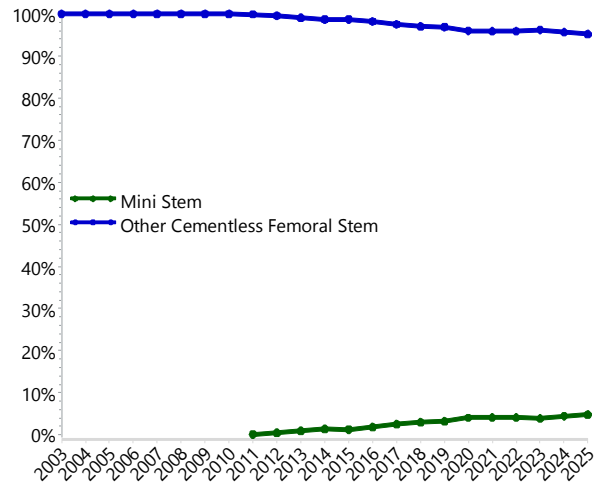
There were 6 different mini stem prostheses used in 2025. Rates of revision vary depending on the type of prosthesis used (Table HT40).

Femoral Stems with Exchangeable Necks

A femoral stem with an exchangeable neck has a separate neck that connects proximally to the stem. There were 4 procedures reported in 2025. Due to the very small utilisation of these prostheses, the analyses have been removed from the Annual Report and appear in the Supplementary Report 'Prostheses with No or Minimal Use'.

Detailed information on femoral stems with exchangeable neck is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

Figure HT24 Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)



Primary Total Hip Replacement

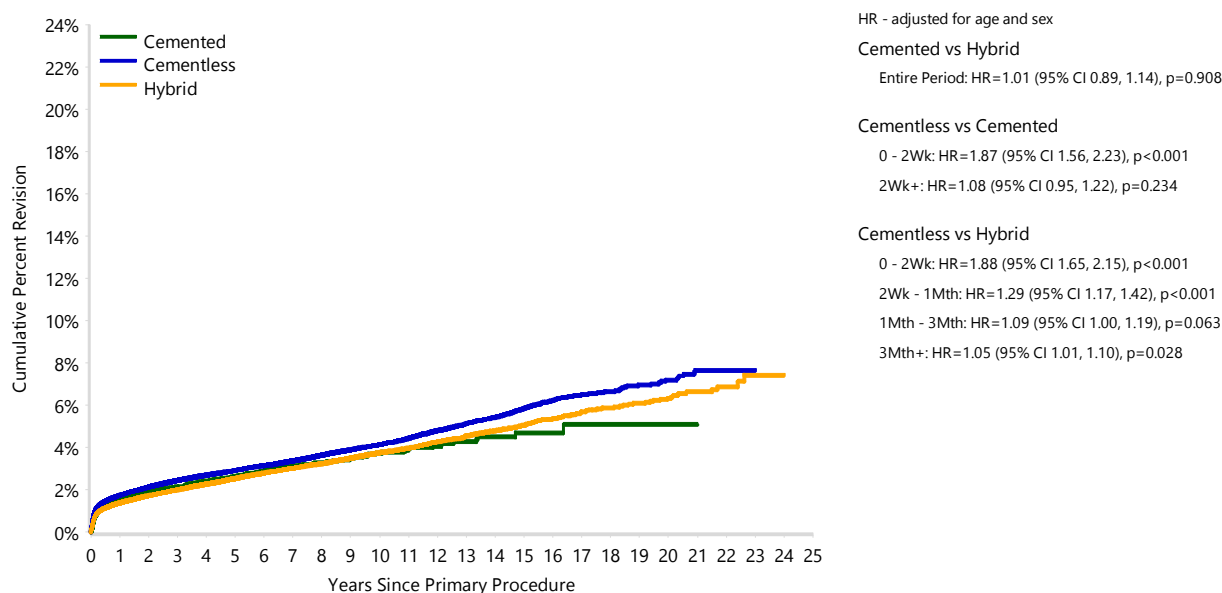
Table HT25 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	274	8846	1.5 (1.3, 1.8)	2.1 (1.8, 2.5)	2.6 (2.3, 3.0)	3.7 (3.3, 4.2)	4.7 (4.0, 5.6)	5.1 (4.1, 6.3)
Cementless	9345	290300	1.7 (1.7, 1.8)	2.4 (2.4, 2.5)	2.9 (2.9, 3.0)	4.1 (4.0, 4.2)	5.9 (5.7, 6.0)	7.2 (6.8, 7.6)
Hybrid	4943	170648	1.4 (1.3, 1.4)	2.0 (1.9, 2.1)	2.5 (2.5, 2.6)	3.8 (3.6, 3.9)	5.1 (4.9, 5.3)	6.3 (6.0, 6.7)
TOTAL	14562	469794						

Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces

Figure HT25 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	8846	8224	6994	5710	2579	376	81
Cementless	290300	255250	197493	149092	57806	14314	1633
Hybrid	170648	152509	120104	92586	38287	11330	1869

Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces



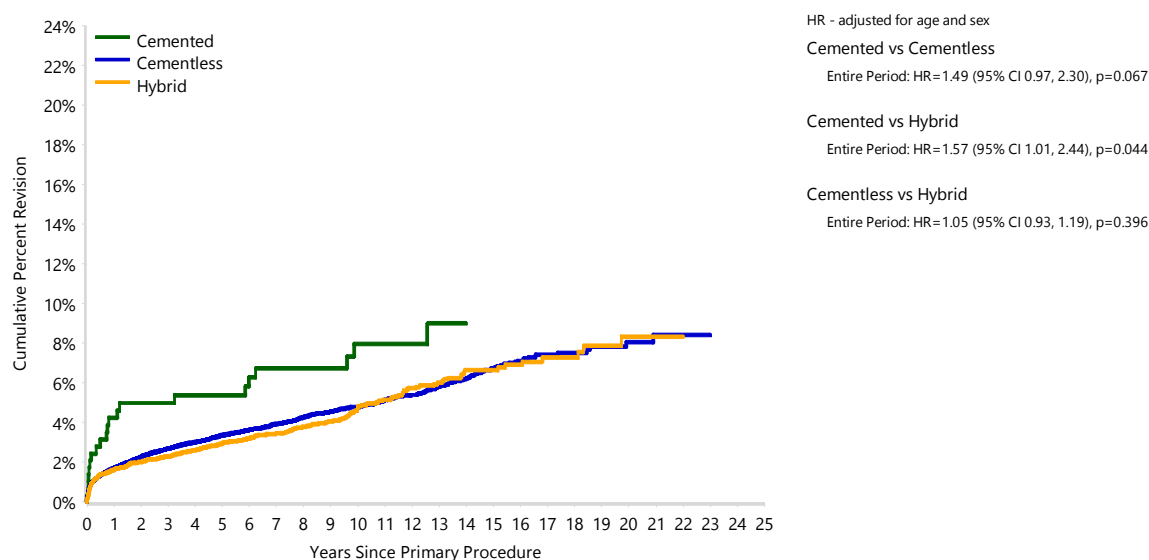
Primary Total Hip Replacement

Table HT26 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age and Fixation (Primary Diagnosis OA)

Age	Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55		1823	47844	1.7 (1.6, 1.8)	2.6 (2.5, 2.8)	3.3 (3.1, 3.5)	4.8 (4.6, 5.1)	6.7 (6.3, 7.2)	8.2 (7.4, 9.0)
	Cemented	21	289	4.2 (2.4, 7.3)	5.0 (3.0, 8.3)	5.4 (3.3, 8.8)	7.9 (5.1, 12.2)		
	Cementless	1464	38680	1.7 (1.6, 1.8)	2.7 (2.5, 2.9)	3.4 (3.2, 3.6)	4.8 (4.5, 5.0)	6.7 (6.3, 7.2)	8.0 (7.2, 9.0)
	Hybrid	338	8875	1.6 (1.4, 1.9)	2.3 (2.0, 2.6)	3.0 (2.6, 3.4)	4.7 (4.2, 5.4)	6.6 (5.8, 7.6)	8.3 (6.8, 10.1)
55-64		3480	109185	1.6 (1.5, 1.6)	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	3.9 (3.8, 4.1)	5.3 (5.1, 5.6)	7.1 (6.6, 7.7)
	Cemented	35	866	2.0 (1.2, 3.2)	2.9 (1.9, 4.2)	3.3 (2.3, 4.8)	3.9 (2.8, 5.6)	4.8 (3.4, 6.8)	
	Cementless	2473	81681	1.6 (1.5, 1.7)	2.2 (2.1, 2.4)	2.6 (2.5, 2.8)	3.8 (3.6, 4.0)	5.1 (4.9, 5.4)	6.8 (6.1, 7.5)
	Hybrid	972	26638	1.5 (1.4, 1.7)	2.2 (2.0, 2.4)	2.8 (2.6, 3.0)	4.3 (4.0, 4.6)	5.9 (5.5, 6.4)	8.0 (7.2, 9.0)
65-74		5101	169111	1.5 (1.5, 1.6)	2.2 (2.1, 2.2)	2.6 (2.6, 2.7)	3.8 (3.7, 4.0)	5.3 (5.1, 5.6)	6.3 (6.0, 6.7)
	Cemented	94	2560	1.5 (1.1, 2.1)	2.2 (1.7, 2.8)	2.7 (2.1, 3.4)	4.2 (3.4, 5.2)	5.2 (4.1, 6.6)	
	Cementless	3308	107244	1.7 (1.6, 1.8)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.9 (3.8, 4.1)	5.7 (5.4, 6.0)	6.7 (6.2, 7.3)
	Hybrid	1699	59307	1.2 (1.1, 1.3)	1.8 (1.7, 2.0)	2.4 (2.2, 2.5)	3.6 (3.4, 3.8)	4.9 (4.6, 5.2)	5.8 (5.3, 6.3)
≥75		4158	143654	1.7 (1.6, 1.8)	2.3 (2.2, 2.4)	2.8 (2.7, 2.9)	3.9 (3.8, 4.1)	5.4 (5.1, 5.7)	6.1 (5.7, 6.6)
	Cemented	124	5131	1.3 (1.0, 1.6)	1.8 (1.5, 2.2)	2.3 (1.9, 2.8)	3.1 (2.5, 3.7)	4.3 (2.7, 6.7)	
	Cementless	2100	62695	2.1 (2.0, 2.2)	2.7 (2.6, 2.8)	3.2 (3.0, 3.3)	4.5 (4.3, 4.8)	7.0 (6.4, 7.6)	7.8 (7.0, 8.8)
	Hybrid	1934	75828	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.5 (3.3, 3.7)	4.4 (4.1, 4.7)	5.1 (4.5, 5.7)
TOTAL		14562	469794						

Note: Restricted to modern prostheses Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces

Figure HT26 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged <55 Years by Fixation (Primary Diagnosis OA)

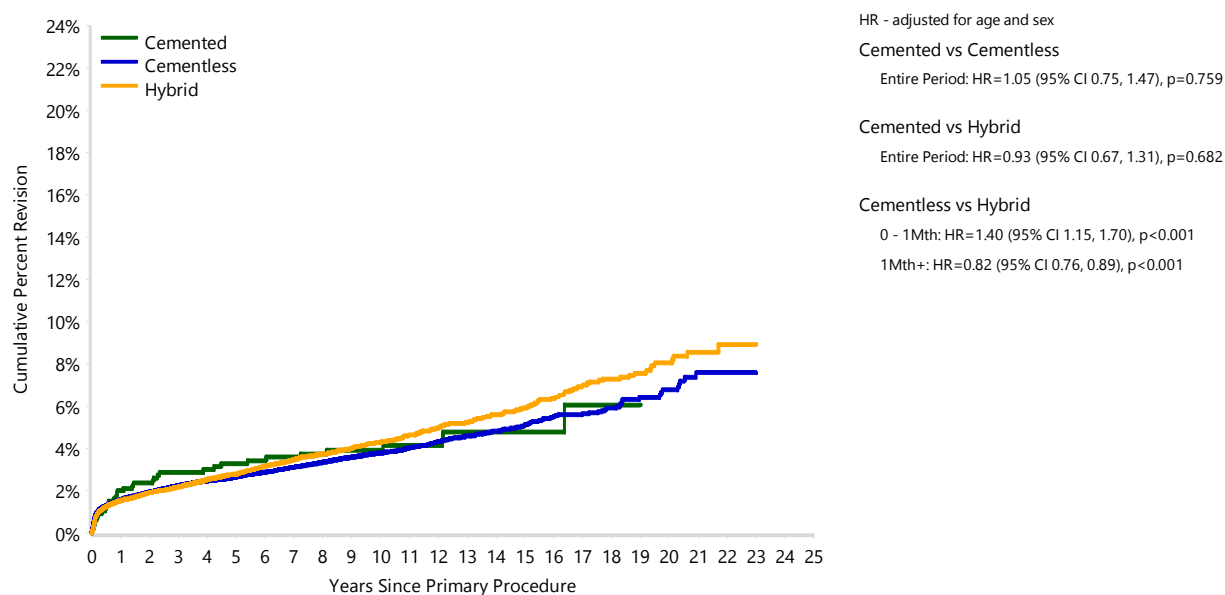


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	289	258	237	217	149	24	7
Cementless	38680	34488	27172	21076	9088	2500	397
Hybrid	8875	8095	6632	5368	2463	743	180

Note: Restricted to modern prostheses Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces.

Primary Total Hip Replacement

Figure HT27 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged 55–64 Years by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	866	819	729	669	451	88	32
Cementless	81681	72501	57041	43998	18691	5324	714
Hybrid	26638	24243	19868	15983	7714	2808	601

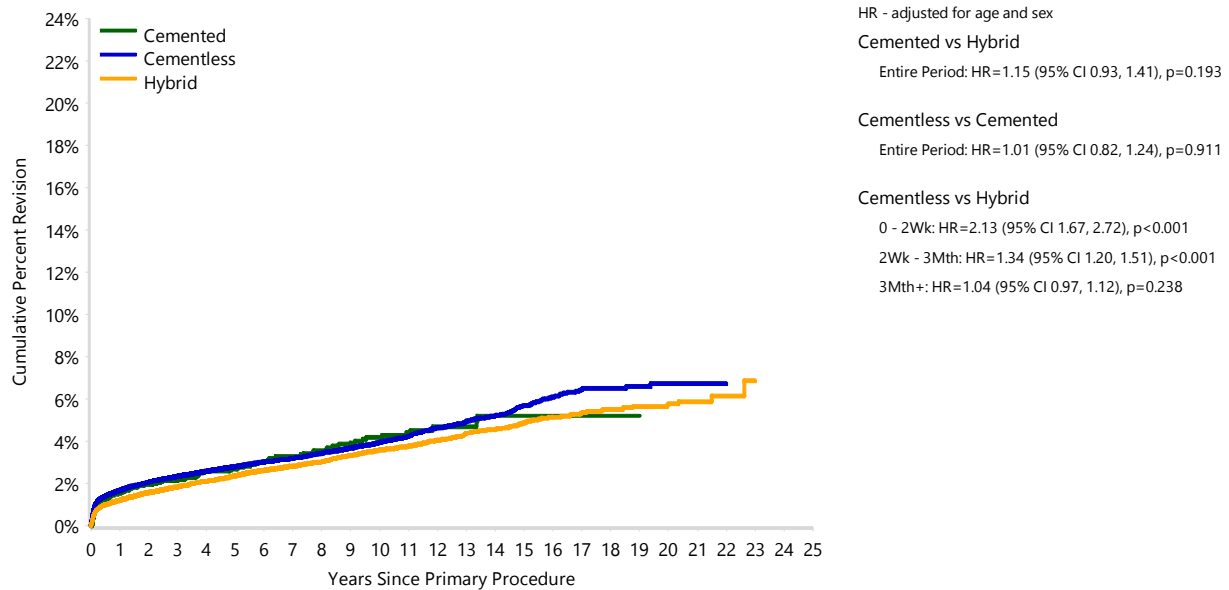
Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces



Primary Total Hip Replacement

Figure HT28 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged 65–74 Years by Fixation (Primary Diagnosis OA)



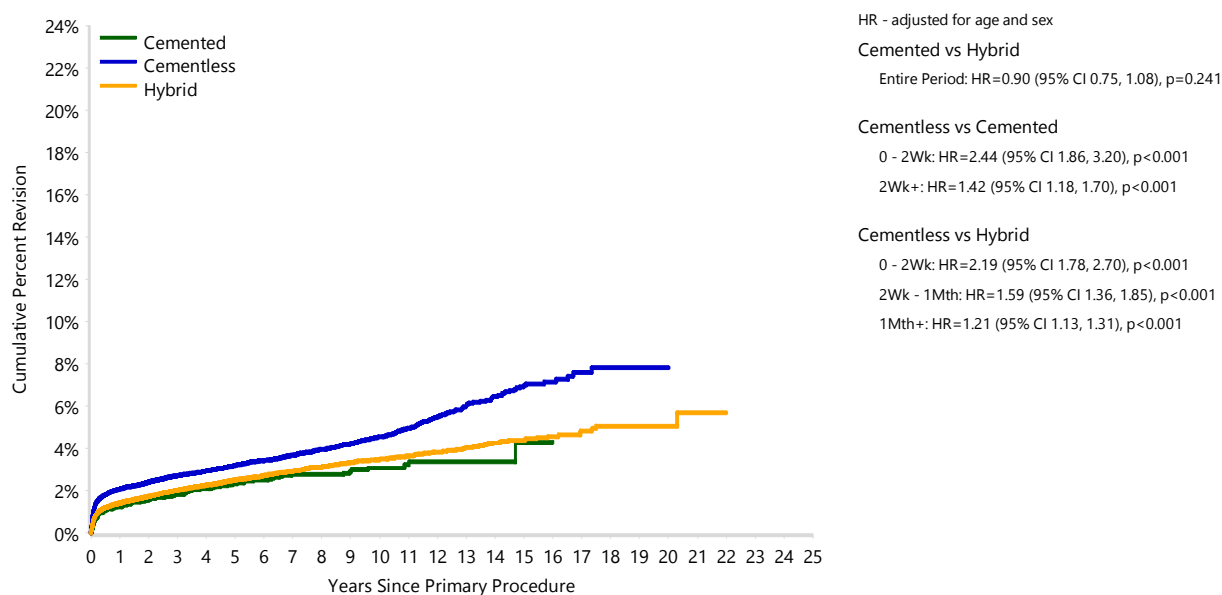
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	2560	2432	2184	1881	1010	171	36
Cementless	107244	94360	73093	55347	21369	5112	462
Hybrid	59307	53660	43397	34584	16023	5427	904

Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces

Primary Total Hip Replacement

Figure HT29 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged ≥75 Years by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	5131	4715	3844	2943	969	93	6
Cementless	62695	53901	40187	28671	8658	1378	60
Hybrid	75828	66511	50207	36651	12087	2352	184

Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and cross-linked polyethylene (XLPE) bearing surfaces



Primary Total Hip Replacement

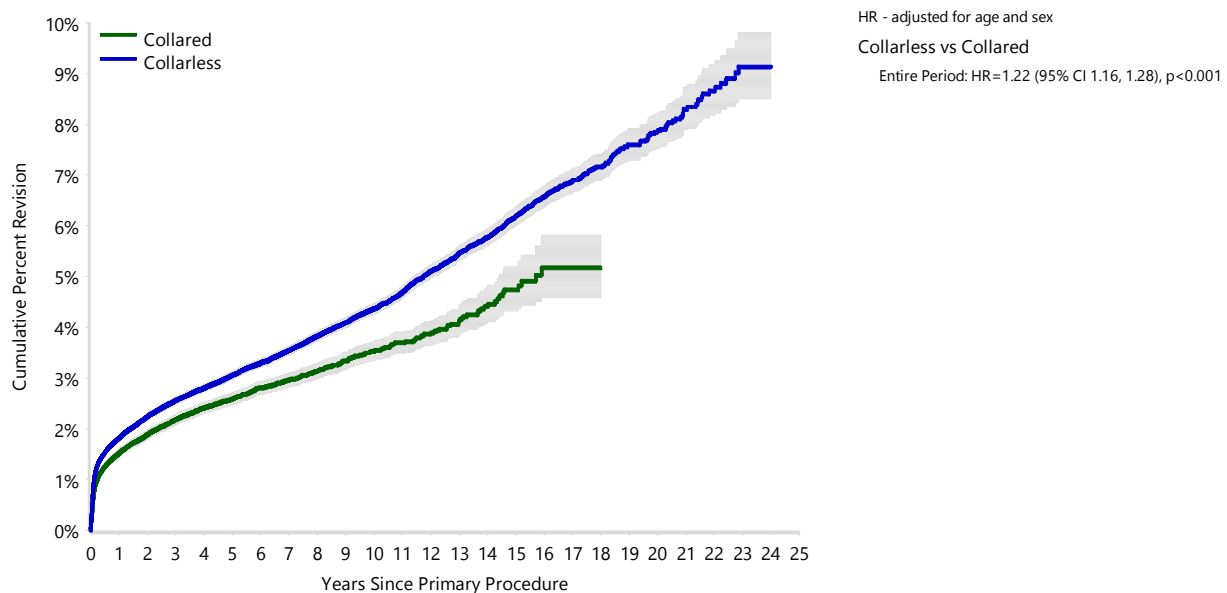
Table HT27 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Collar Use (Primary Diagnosis OA)

Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Collared	2159	91175	1.5 (1.4, 1.6)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	3.3 (3.2, 3.5)	4.7 (4.3, 5.2)	
Collarless	7896	212862	1.8 (1.8, 1.9)	2.6 (2.5, 2.6)	3.1 (3.0, 3.1)	4.1 (4.0, 4.2)	6.2 (6.0, 6.4)	7.9 (7.5, 8.2)
TOTAL	10055	304037						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT30 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Collar Use (Primary Diagnosis OA)

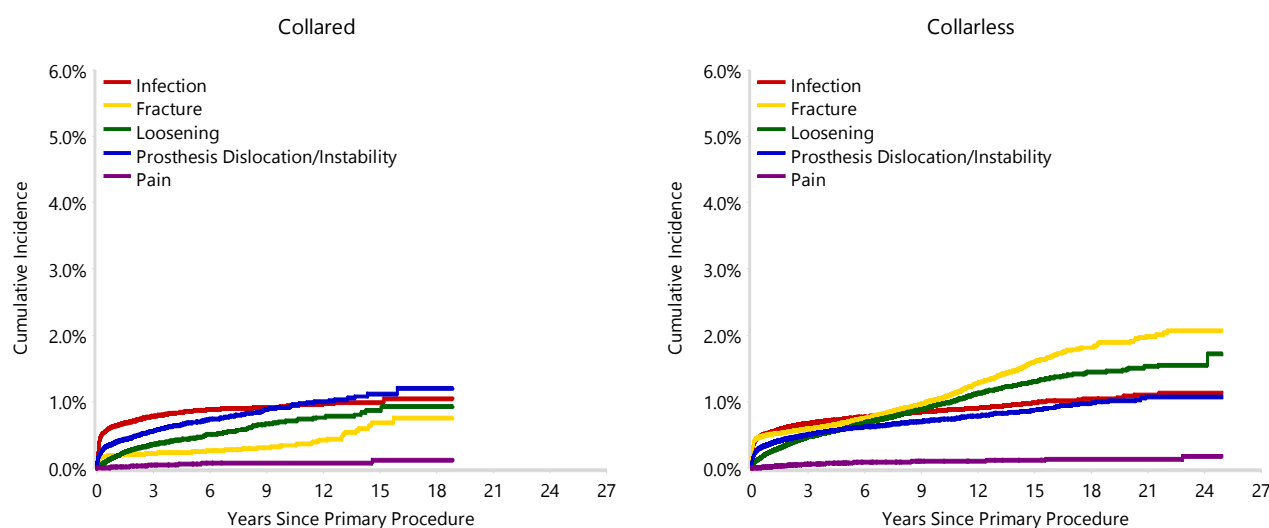


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Collared	91175	74492	49842	32651	11941	1209	12
Collarless	212862	193403	158427	125824	68613	17239	3254

Note: Restricted to modern prostheses

Primary Total Hip Replacement

Figure HT31 Cumulative Incidence Revision Diagnosis of Cementless Primary Total Conventional Hip Replacement by Stem Collar Use (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table HT28 Cementless Primary Total Conventional Hip Replacement by Type of Revision and Stem Collar Use (Primary Diagnosis OA)

Type of Revision	Number	Collared		Number	Collarless	
		% Primaries Revised	% Revisions		% Primaries Revised	% Revisions
Femoral Component	498	0.5	23.1	3145	1.5	39.8
Head/Insert	850	0.9	39.4	1829	0.9	23.2
Acetabular Component	370	0.4	17.1	1335	0.6	16.9
THR (Femoral/Acetabular)	222	0.2	10.3	704	0.3	8.9
Head Only	99	0.1	4.6	435	0.2	5.5
Cement Spacer	63	0.1	2.9	229	0.1	2.9
Minor Components	22	0.0	1.0	125	0.1	1.6
Insert Only	22	0.0	1.0	55	0.0	0.7
Removal of Prostheses	7	0.0	0.3	25	0.0	0.3
Reinsertion of Components	3	0.0	0.1	8	0.0	0.1
Bipolar Head and Femoral	3	0.0	0.1	3	0.0	0.0
Total Femoral				2	0.0	0.0
Bipolar Only				1	0.0	0.0
N Revision	2159	2.4	100.0	7896	3.7	100.0
N Primary	91175			212862		

Note: Restricted to modern prostheses



Primary Total Hip Replacement

Table HT29 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Lateral Approach and Stem Collar Use (Primary Diagnosis OA)

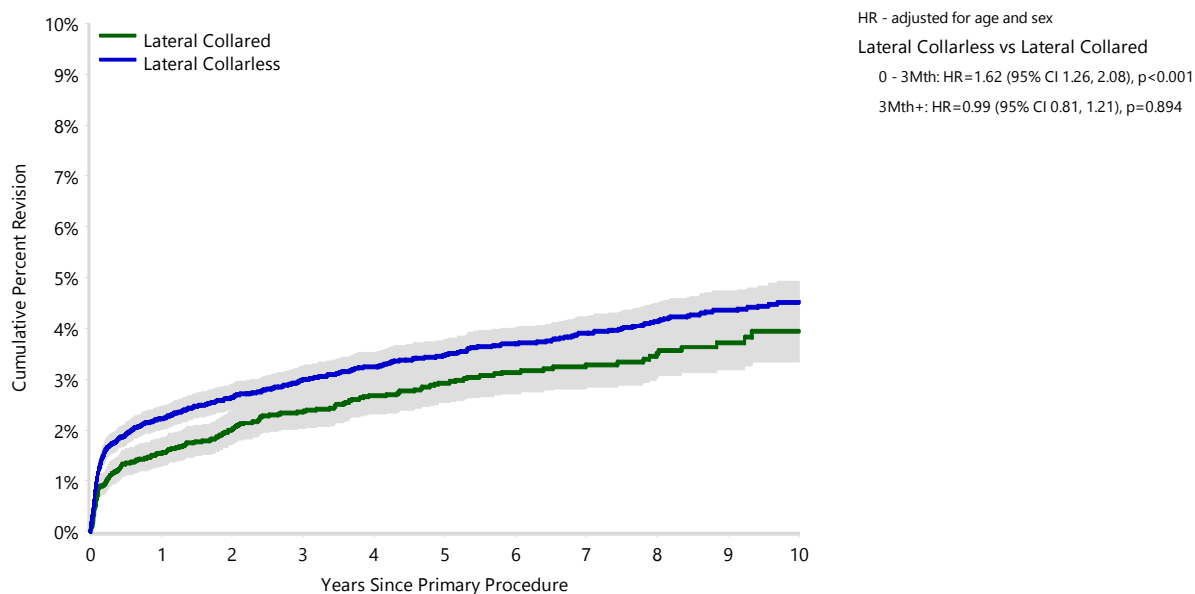
Surgical Approach	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Lateral	Collared	214	7924	1.5 (1.3, 1.8)	2.4 (2.0, 2.7)	2.9 (2.5, 3.4)	3.3 (2.8, 3.8)	3.5 (3.0, 4.1)
	Collarless	605	16779	2.2 (2.0, 2.5)	3.0 (2.7, 3.3)	3.5 (3.2, 3.8)	3.9 (3.6, 4.2)	4.1 (3.8, 4.5)
TOTAL		819	24703					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only procedures with a known surgical approach have been included

Figure HT32 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Lateral Approach and Stem Collar Use (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Lateral	Collared	7924	6764	4985	3518	2273	1643
	Collarless	16779	15338	12632	9890	7116	5487

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only procedures with a known surgical approach have been included

Primary Total Hip Replacement

Table HT30 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Posterior Approach and Stem Collar Use (Primary Diagnosis OA)

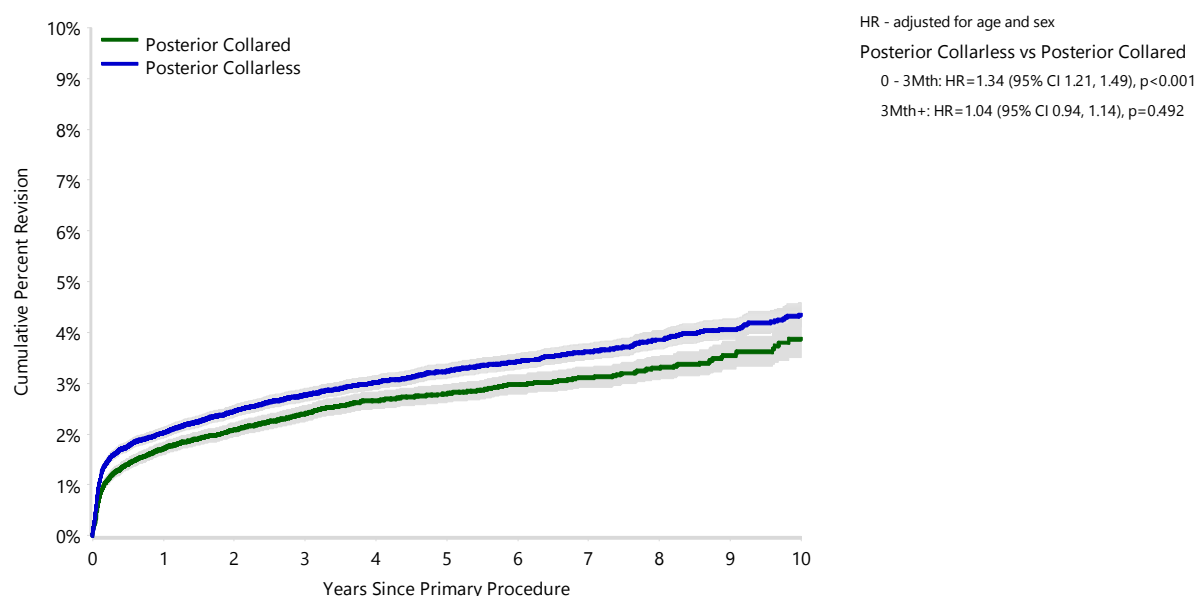
Surgical Approach	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Posterior	Collared	1098	44978	1.7 (1.6, 1.8)	2.4 (2.3, 2.6)	2.8 (2.6, 3.0)	3.1 (2.9, 3.3)	3.3 (3.1, 3.5)
	Collarless	2253	73937	2.0 (1.9, 2.1)	2.8 (2.6, 2.9)	3.2 (3.1, 3.4)	3.6 (3.5, 3.8)	3.9 (3.7, 4.0)
TOTAL		3351	118915					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only procedures with a known surgical approach have been included

Figure HT33 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Posterior Approach and Stem Collar Use (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Posterior	Collared	44978	36623	23909	14478	7954	5230
	Collarless	73937	64072	45942	30685	18179	12666

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only procedures with a known surgical approach have been included



Primary Total Hip Replacement

Table HT31 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Anterior Approach and Stem Collar Use (Primary Diagnosis OA)

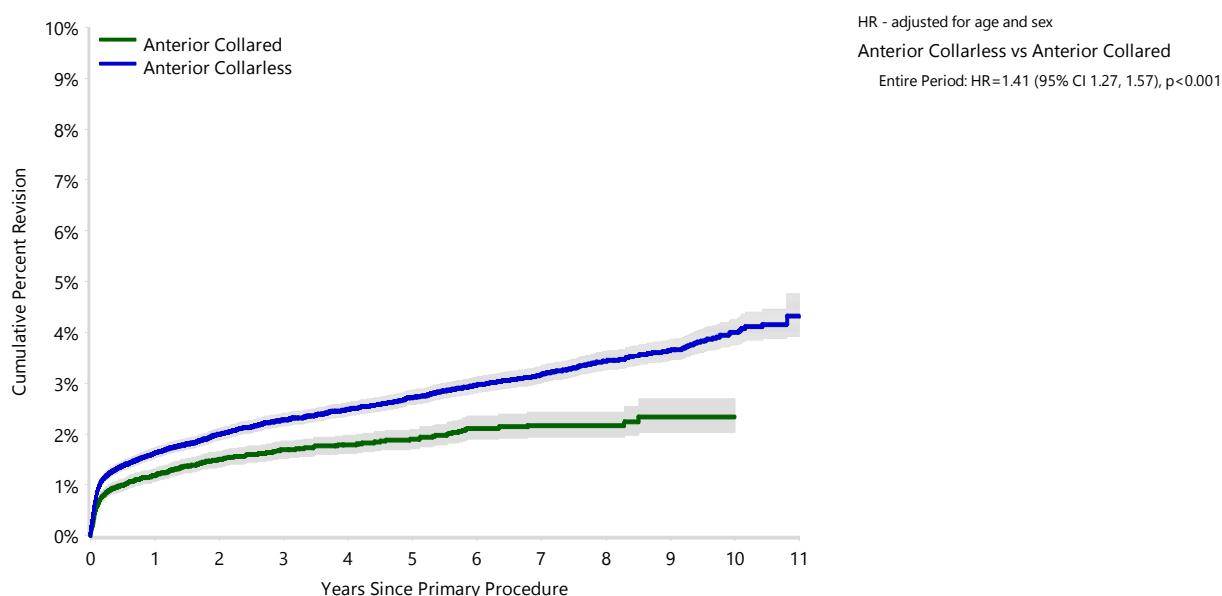
Surgical Approach	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Anterior	Collared	449	28933	1.2 (1.1, 1.3)	1.7 (1.5, 1.9)	1.9 (1.7, 2.1)	2.2 (1.9, 2.4)	2.2 (1.9, 2.4)
	Collarless	1695	62023	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.7 (2.6, 2.9)	3.2 (3.0, 3.3)	3.4 (3.3, 3.6)
TOTAL		2144	90956					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only procedures with a known surgical approach have been included

Figure HT34 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Anterior Approach and Stem Collar Use (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Anterior	Collared	28933	22000	12166	6299	2930	1595
	Collarless	62023	55273	42991	30523	19022	13570

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only procedures with a known surgical approach have been included

Primary Total Hip Replacement

Table HT32 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Cementless Femoral Component and Stem Collar Use (Primary Diagnosis OA)

Femoral Component	Stem Collar Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	10 Yrs
AMiStem H	Collared	54	2742	1.4 (1.0, 1.9)	2.1 (1.6, 2.7)	2.2 (1.6, 2.8)	2.8 (1.7, 4.5)		
	Collarless	216	6829	1.5 (1.2, 1.8)	2.0 (1.7, 2.4)	2.9 (2.5, 3.3)	3.5 (3.1, 4.1)	3.8 (3.3, 4.4)	4.6 (3.9, 5.5)
AMiStem-P	Collared	23	2292	1.2 (0.8, 1.8)					
	Collarless	16	1148	1.3 (0.8, 2.3)					
CORAIL	Collared	1367	47420	1.6 (1.4, 1.7)	2.3 (2.1, 2.4)	2.7 (2.6, 2.9)	3.1 (2.9, 3.3)	3.3 (3.1, 3.4)	3.6 (3.4, 3.9)
	Collarless	1455	23761	1.7 (1.5, 1.9)	2.6 (2.4, 2.8)	3.3 (3.1, 3.5)	4.0 (3.7, 4.2)	4.4 (4.1, 4.7)	5.2 (4.9, 5.5)
EVOK	Collared	46	1293	3.0 (2.2, 4.1)	4.2 (3.1, 5.7)				
	Collarless	42	1023	2.3 (1.5, 3.4)	3.9 (2.8, 5.3)	4.3 (3.2, 5.8)	4.5 (3.3, 6.0)	4.5 (3.3, 6.0)	
HACTIV	Collared	80	1794	2.7 (2.1, 3.6)	4.1 (3.2, 5.2)	4.7 (3.7, 5.9)	6.2 (4.9, 8.0)	6.7 (5.1, 8.8)	
	Collarless	55	1371	2.3 (1.6, 3.2)	2.9 (2.1, 3.9)	3.4 (2.6, 4.6)	3.9 (2.9, 5.1)	4.3 (3.3, 5.7)	5.1 (3.8, 6.9)
Metafix	Collared	288	16663	1.2 (1.1, 1.4)	1.8 (1.6, 2.0)	2.0 (1.8, 2.3)	2.3 (2.0, 2.7)	2.3 (2.0, 2.7)	
	Collarless	259	7970	1.8 (1.5, 2.1)	2.7 (2.3, 3.0)	3.0 (2.6, 3.4)	3.5 (3.0, 3.9)	3.7 (3.3, 4.3)	4.0 (3.5, 4.6)
Origin	Collared	50	2512	1.8 (1.3, 2.4)	2.2 (1.6, 3.0)	2.8 (2.0, 4.0)			
	Collarless	135	3121	2.6 (2.1, 3.3)	3.6 (3.0, 4.3)	4.2 (3.6, 5.1)	4.6 (3.9, 5.5)	5.2 (4.3, 6.2)	6.2 (4.9, 7.9)
Paragon	Collared	69	4533	1.4 (1.1, 1.8)	1.8 (1.4, 2.3)	2.1 (1.5, 3.0)			
	Collarless	77	3783	1.7 (1.3, 2.1)	2.0 (1.5, 2.5)	2.0 (1.5, 2.5)	3.0 (1.8, 4.9)	3.0 (1.8, 4.9)	5.5 (3.3, 9.1)
Polarstem	Collared	65	4216	1.5 (1.1, 1.9)	1.8 (1.4, 2.3)	1.9 (1.4, 2.5)			
	Collarless	652	23247	1.8 (1.7, 2.0)	2.3 (2.1, 2.5)	2.7 (2.5, 2.9)	2.9 (2.7, 3.2)	3.1 (2.9, 3.4)	3.5 (3.2, 3.8)
Quadra-P	Collared	31	1730	1.5 (1.0, 2.3)	2.6 (1.7, 3.9)				
	Collarless	22	1492	1.2 (0.8, 2.0)	2.1 (1.3, 3.4)	2.7 (1.6, 4.7)			
TOTAL		5002	158940						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only prostheses with >500 procedures each have been included

Table HT33 Comparisons of Revision Rates of Primary Total Conventional Hip Replacement by Cementless Femoral Component and Stem Collar Use (Primary Diagnosis OA)

Outcome	Comparison	Hazard Ratio - adjusted for age and sex
All Cause Revision	AMiStem H Collarless vs AMiStem H Collared	Entire Period: HR=1.08 (95% CI 0.79, 1.46), p=0.643
All Cause Revision	AMiStem-P Collarless vs AMiStem-P Collared	Entire Period: HR=1.29 (95% CI 0.68, 2.47), p=0.432
All Cause Revision	CORAIL Collarless vs CORAIL Collared	0 - 6Mth: HR=1.00 (95% CI 0.87, 1.15), p=0.988 6Mth - 1.5Yr: HR=1.33 (95% CI 1.09, 1.63), p=0.005 1.5Yr - 5.5Yr: HR=1.49 (95% CI 1.28, 1.73), p<0.001 5.5Yr+: HR=2.20 (95% CI 1.87, 2.59), p<0.001
All Cause Revision	HACTIV Collarless vs HACTIV Collared	Entire Period: HR=0.69 (95% CI 0.48, 0.98), p=0.038
All Cause Revision	Metafix Collarless vs Metafix Collared	Entire Period: HR=1.52 (95% CI 1.28, 1.80), p<0.001
All Cause Revision	Origin Collarless vs Origin Collared	Entire Period: HR=1.63 (95% CI 1.17, 2.28), p=0.004
All Cause Revision	Paragon Collarless vs Paragon Collared	Entire Period: HR=1.14 (95% CI 0.82, 1.60), p=0.429
All Cause Revision	Polarstem Collarless vs Polarstem Collared	Entire Period: HR=1.34 (95% CI 1.03, 1.73), p=0.026
All Cause Revision	Quadra-P Collarless vs Quadra-P Collared	Entire Period: HR=0.65 (95% CI 0.37, 1.15), p=0.141

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only prostheses with >500 procedures each have been included



Primary Total Hip Replacement

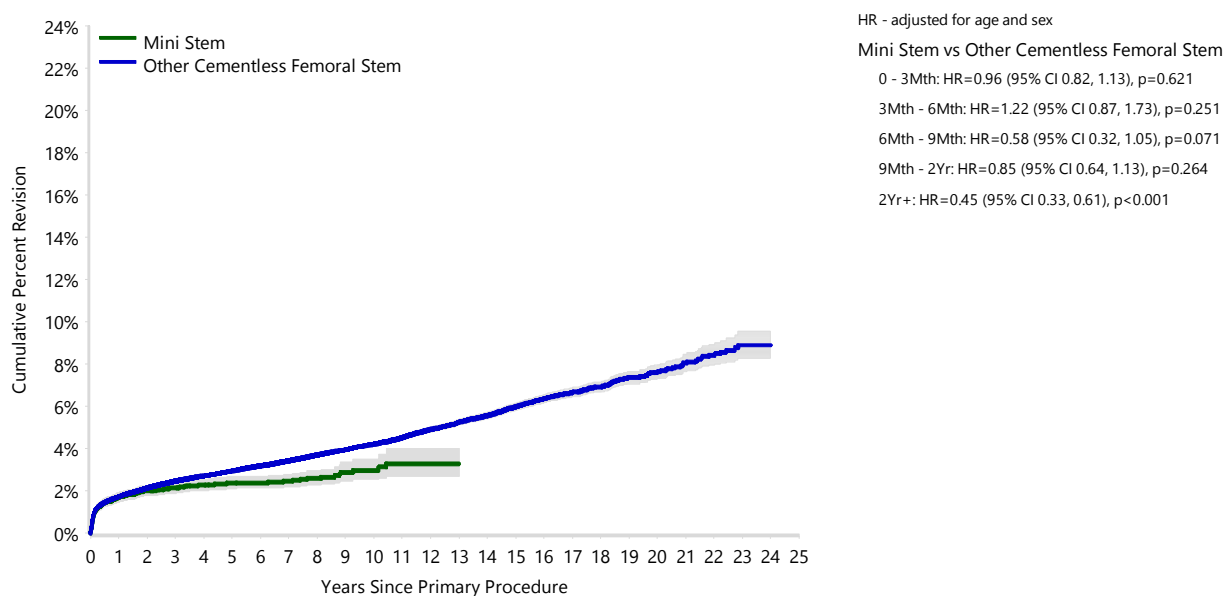
Table HT34 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	294	13593	1.7 (1.5, 1.9)	2.1 (1.9, 2.4)	2.4 (2.1, 2.7)	2.9 (2.5, 3.4)		
Other Cementless Femoral Stem	9787	291013	1.7 (1.7, 1.8)	2.5 (2.4, 2.5)	2.9 (2.9, 3.0)	4.0 (3.9, 4.0)	6.0 (5.8, 6.2)	7.6 (7.3, 8.0)
TOTAL	10081	304606						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT35 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	13593	11201	7634	4688	1118	0	0
Other Cementless Femoral Stem	291013	257204	201034	154106	79587	18471	3267

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

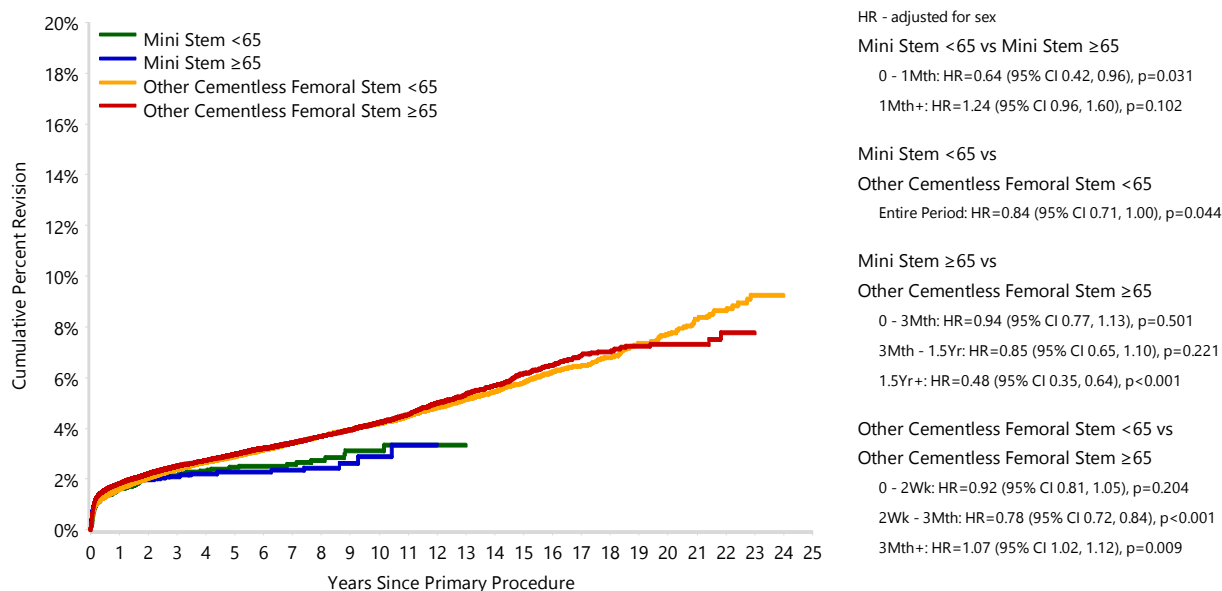
Table HT35 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and Age (Primary Diagnosis OA)

Stem Type	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	<65	134	5963	1.6 (1.3, 2.0)	2.1 (1.8, 2.6)	2.5 (2.1, 2.9)	3.1 (2.5, 3.8)		
	≥65	160	7630	1.8 (1.5, 2.1)	2.1 (1.8, 2.5)	2.3 (1.9, 2.7)	2.6 (2.1, 3.2)		
Other Cementless Femoral Stem	<65	4203	121053	1.6 (1.5, 1.7)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.9 (3.8, 4.1)	5.8 (5.6, 6.1)	7.7 (7.3, 8.2)
	≥65	5584	169960	1.8 (1.8, 1.9)	2.5 (2.4, 2.6)	3.0 (2.9, 3.1)	3.9 (3.8, 4.1)	6.2 (5.9, 6.4)	7.3 (6.9, 7.8)
TOTAL		10081	304606						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT36 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	9 Yrs	15 Yrs	20 Yrs
Mini Stem	<65	5963	4986	3565	2337	689	0	0
	≥65	7630	6215	4069	2351	429	0	0
Other Cementless Femoral Stem	<65	121053	108326	86401	67966	38120	10603	2319
	≥65	169960	148878	114633	86140	41467	7868	948

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

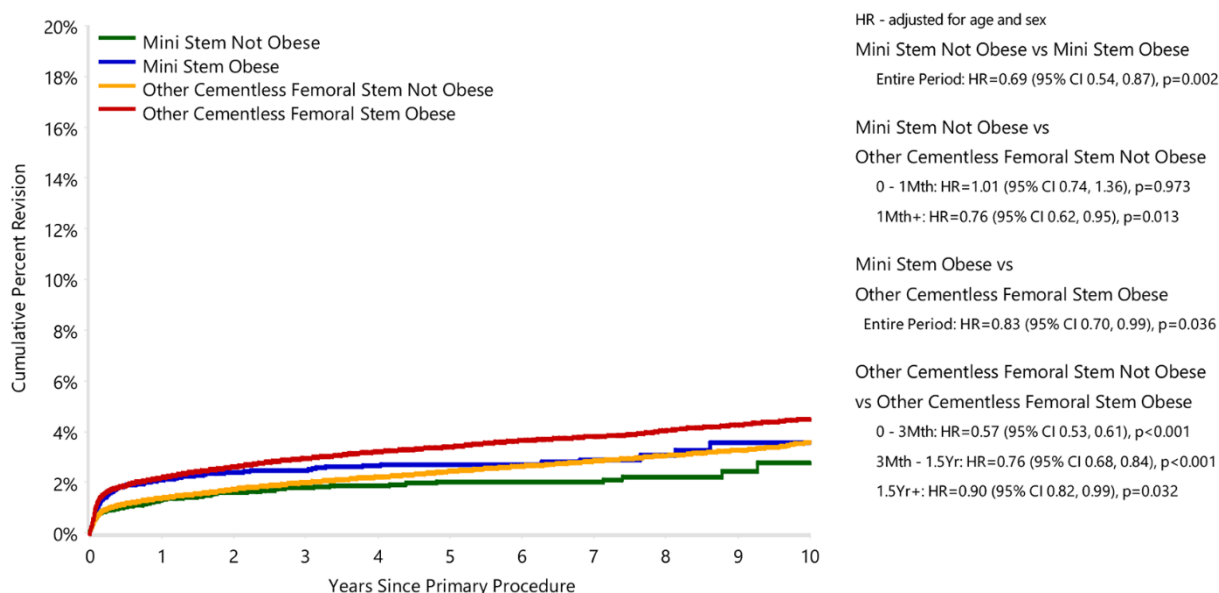
Table HT36 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and BMI Category (Primary Diagnosis OA)

Stem Type	BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Mini Stem	Not Obese	131	7423	1.3 (1.1, 1.6)	1.8 (1.5, 2.2)	2.0 (1.7, 2.4)	2.0 (1.7, 2.4)	2.4 (1.9, 3.2)
	Obese	137	5421	2.1 (1.8, 2.5)	2.5 (2.1, 3.0)	2.7 (2.3, 3.2)	2.9 (2.4, 3.5)	3.6 (2.7, 4.7)
Other Cementless Femoral Stem	Not Obese	2848	123669	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	2.9 (2.8, 3.0)	3.3 (3.1, 3.4)
	Obese	3065	94907	2.2 (2.1, 2.3)	3.0 (2.9, 3.1)	3.5 (3.3, 3.6)	3.9 (3.7, 4.0)	4.3 (4.1, 4.5)
TOTAL		6181	231420					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT37 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type and BMI Category (Primary Diagnosis OA)



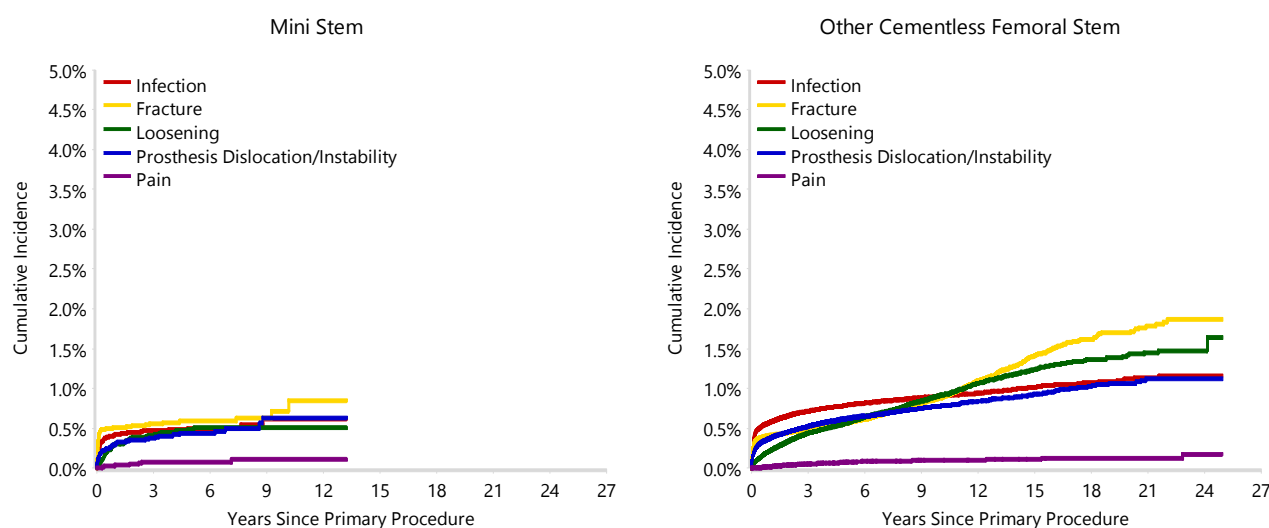
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Mini Stem	Not Obese	7423	6122	4065	2373	1165	361
	Obese	5421	4371	2907	1697	832	230
Other Cementless Femoral Stem	Not Obese	123669	106136	76093	51265	31016	13447
	Obese	94907	80539	56988	37831	22599	9587

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT38 Cumulative Incidence Revision Diagnosis of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT37 Cementless Primary Total Conventional Hip Replacement by Type of Revision and Stem Type (Primary Diagnosis OA)

Type of Revision	Number	Mini Stem		Other Cementless Femoral Stem		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Femoral Component	119	0.9	40.5	3530	1.2	36.1
Head/Insert	54	0.4	18.4	2630	0.9	26.9
Acetabular Component	49	0.4	16.7	1661	0.6	17.0
THR (Femoral/Acetabular)	30	0.2	10.2	904	0.3	9.2
Head Only	33	0.2	11.2	503	0.2	5.1
Cement Spacer	6	0.0	2.0	286	0.1	2.9
Minor Components	2	0.0	0.7	145	0.0	1.5
Other	1	0.0	0.3	128	0.0	1.3
N Revision	294	2.2	100.0	9787	3.4	100.0
N Primary	13593			291013		

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

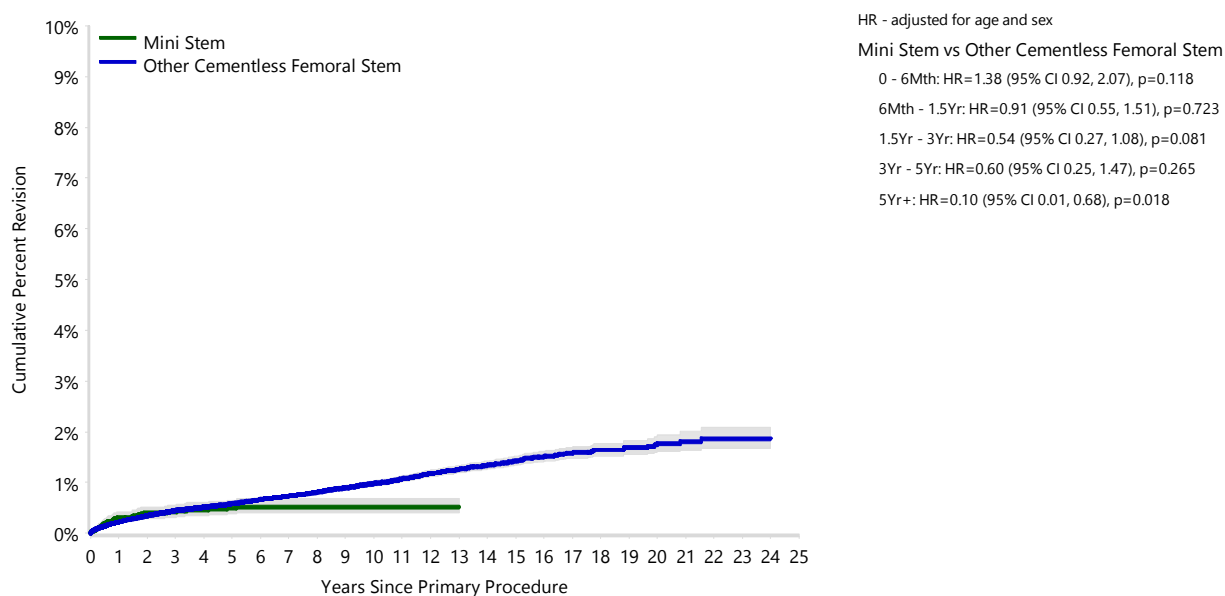
Table HT38 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Loosening)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	55	13593	0.3 (0.2, 0.4)	0.4 (0.3, 0.6)	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)		
Other Cementless Femoral Stem	2001	291013	0.2 (0.2, 0.2)	0.5 (0.4, 0.5)	0.6 (0.6, 0.6)	1.0 (0.9, 1.0)	1.4 (1.3, 1.5)	1.8 (1.6, 1.9)
TOTAL	2056	304606						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT39 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	13593	11201	7634	4688	711	0	0
Other Cementless Femoral Stem	291013	257204	201034	154106	63799	18471	3267

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

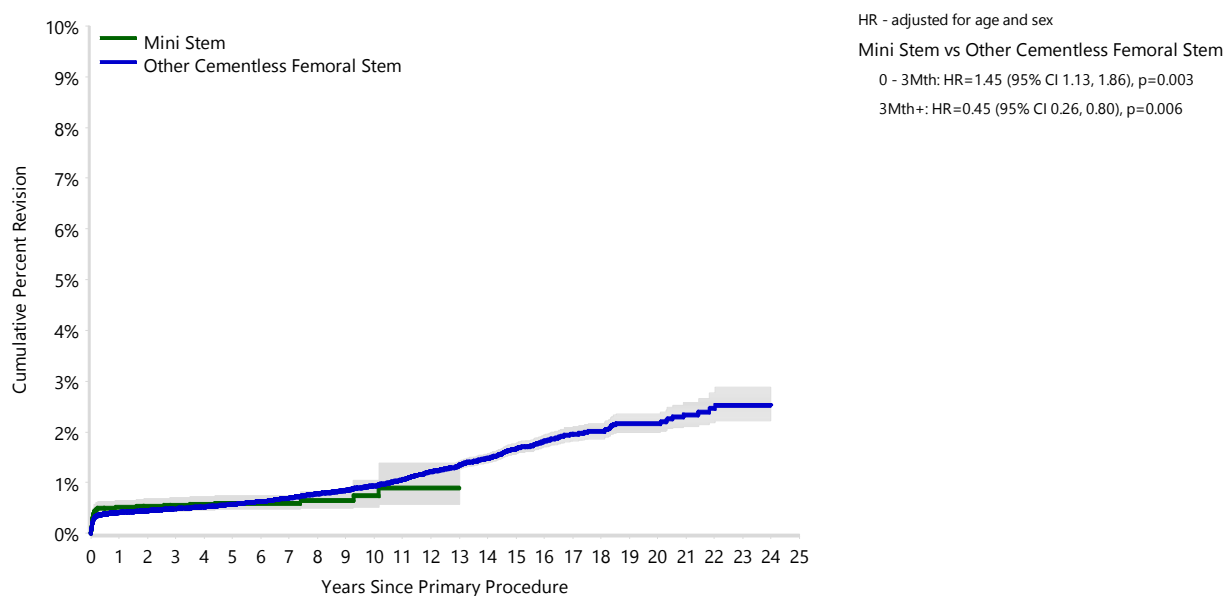
Table HT39 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Fracture)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	78	13593	0.5 (0.4, 0.6)	0.6 (0.4, 0.7)	0.6 (0.5, 0.7)	0.7 (0.5, 1.0)		
Other Cementless Femoral Stem	2206	291013	0.4 (0.4, 0.4)	0.5 (0.5, 0.5)	0.6 (0.5, 0.6)	0.9 (0.9, 1.0)	1.7 (1.6, 1.8)	2.2 (2.0, 2.3)
TOTAL	2284	304606						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT40 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Stem Type (Primary Diagnosis OA, Revision for Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Mini Stem	13593	11201	7634	4688	711	0	0
Other Cementless Femoral Stem	291013	257204	201034	154106	63799	18471	3267

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT40 Cumulative Percent Revision of Cementless Primary Total Conventional Hip Replacement by Mini Stem Femoral Component (Primary Diagnosis OA)

Femoral Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
MiniHip	50	1489	2.3 (1.7, 3.2)	2.9 (2.1, 3.9)	3.2 (2.4, 4.3)	3.4 (2.6, 4.6)		
Optimys	85	3855	1.7 (1.4, 2.2)	2.2 (1.7, 2.7)	2.5 (2.0, 3.1)	3.2 (2.3, 4.4)		
Taperloc Microplasty	158	8195	1.6 (1.3, 1.9)	2.0 (1.7, 2.3)	2.1 (1.8, 2.5)	3.2 (2.3, 4.5)		
Other (3)	1	54	0.0 (0.0, 0.0)					
TOTAL	294	13593						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Only prostheses with over 1000 procedures have been listed

Primary Total Hip Replacement

Bearing Surface

Bearing surface is a combination of the material used for the femoral head and the acetabular insert or cup. Historically, there are 3 femoral head materials (metal, ceramic, and ceramicised metal) and 4 acetabular articular surface materials (XLPE, non XLPE, ceramic, and metal). XLPE is classified as ultra-high molecular weight polyethylene that has been irradiated by a high dose ($\geq 50\text{kGy}$) gamma or electron beam radiation. Metal/metal bearing surfaces are no longer used, and non XLPE has little use in 2025 (only 2.3% of all polyethylene inserts), so these bearing surfaces are no longer included in these analyses. During the last 13 years, there has been an increase in the use of ceramic/XLPE bearing surfaces, while both ceramic/ceramic and metal/XLPE have decreased. The proportional use of bearing surfaces over time is shown in Figure HT41.

The change in use of head sizes with the 3 most common bearing surfaces (ceramic/ceramic, ceramic/XLPE and metal/XLPE) is shown in Figure HT41, Figure HT43 and Figure HT44. In 2025, head sizes $>32\text{mm}$ are the most frequently used for all bearing couples.

Comparison of Bearing Surfaces

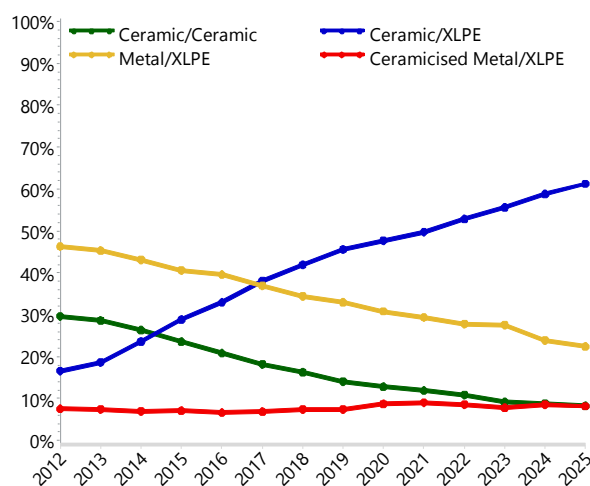
The 4 modern bearing surfaces are ceramic/ceramic and metal, ceramic and ceramicised metal against XLPE. After 9

years, ceramic/ceramic has the highest rate of revision among the modern bearing surfaces. Compared to ceramic/XLPE, ceramic/ceramic has an early lower rate of revision from 2 weeks to 9 months but a higher rate of revision after that time. Metal/XLPE, compared to ceramic/XLPE, has a higher rate of revision after 6 months. When compared to ceramic/XLPE, ceramicised metal/XLPE has an initially higher rate of revision for the first 3 months, and after 1 year has a lower rate of revision. However, the results when using ceramicised metal should be interpreted with caution, as this bearing is a single company product, used with a small number of femoral stem and acetabular component combinations. This may have a confounding effect, making it unclear if the later lower rate of revision is an effect of the bearing surface or reflects the limited combinations of femoral and acetabular prostheses (Table HT41 and Figure HT45). Comparisons of modular and monoblock dual mobility designs with other modern bearings are shown in Table HT42 and Figure HT46.

Detailed information on the analysis of metal/metal and metal/ceramic bearing surfaces is available in the supplementary reports 'Metal/Metal Bearing Surface in Total Conventional Hip Arthroplasty' and 'Prosthesis Types with No or Minimal Use' on the AOANJRR website:

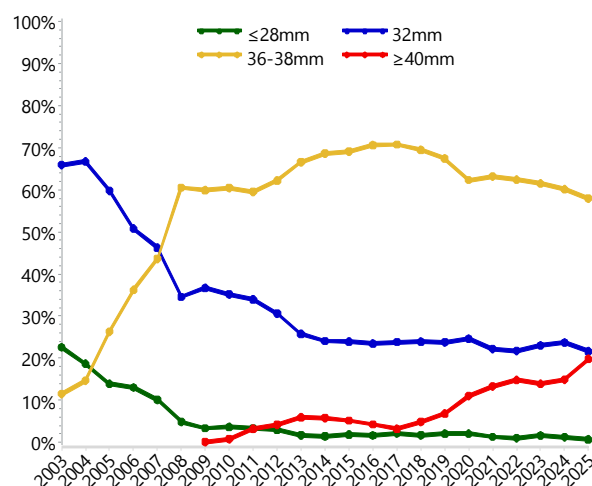
<https://registry.aoa.org.au/annual-reports-2026>

Figure HT41 Proportion of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure HT42 Ceramic/Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)

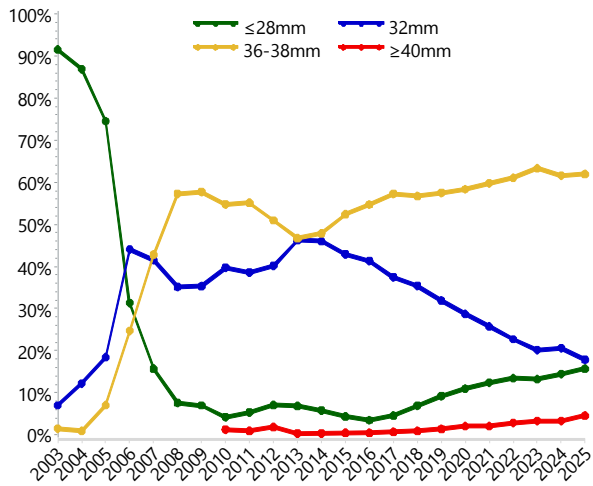


Note: Restricted to modern prostheses



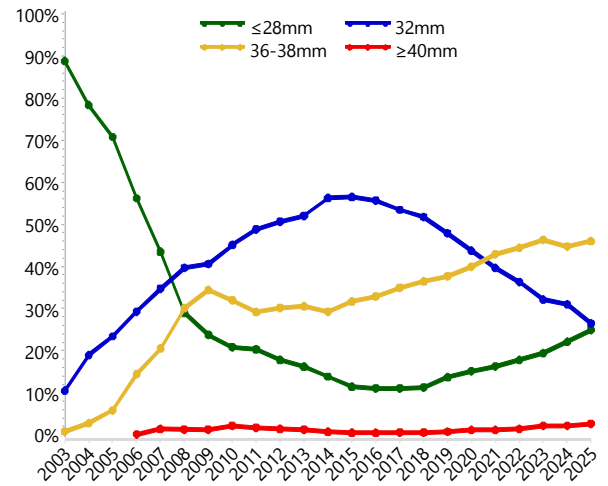
Primary Total Hip Replacement

Figure HT43 Ceramic/XPLE Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure HT44 Metal/XPLE Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Hip Replacement

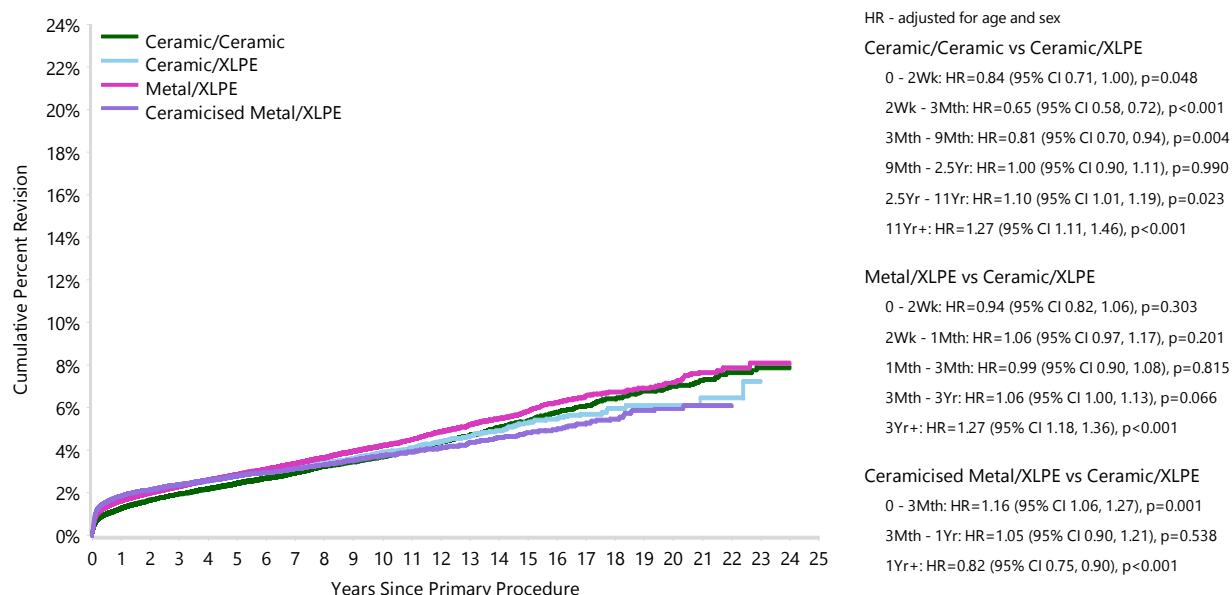
Table HT41 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)

Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic/Ceramic	2725	76232	1.3 (1.2, 1.4)	2.0 (1.9, 2.1)	2.5 (2.3, 2.6)	3.7 (3.6, 3.9)	5.4 (5.1, 5.6)	7.0 (6.6, 7.4)
Ceramic/XLPE	5049	190280	1.6 (1.6, 1.7)	2.3 (2.3, 2.4)	2.8 (2.7, 2.9)	3.9 (3.8, 4.0)	5.3 (5.0, 5.6)	6.1 (5.6, 6.7)
Metal/XLPE	6180	173843	1.6 (1.6, 1.7)	2.3 (2.2, 2.4)	2.8 (2.8, 2.9)	4.2 (4.1, 4.3)	5.8 (5.7, 6.0)	7.2 (6.9, 7.6)
Ceramicised Metal/XLPE	1389	43793	1.9 (1.7, 2.0)	2.4 (2.2, 2.5)	2.8 (2.6, 3.0)	3.7 (3.5, 4.0)	4.8 (4.5, 5.2)	5.9 (5.4, 6.5)
TOTAL	15343	484148						

Note: Restricted to modern prostheses

Excludes 240 procedures with unknown bearing surface, 1 procedure with Ceramicised Metal/Ceramic Bearing Surface, 5 procedures with Metal/Ceramic bearing surface.

Figure HT45 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic/Ceramic	76232	71456	62817	53840	29968	11129	2336
Ceramic/XLPE	190280	160050	111197	74706	18504	3479	378
Metal/XLPE	173843	159317	132498	107258	49007	13925	2232
Ceramicised Metal/XLPE	43793	39262	31800	24850	11789	3914	809

Note: Restricted to modern prostheses

Only bearing surfaces with >5,000 procedures have been listed



Primary Total Hip Replacement

Table HT42 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)

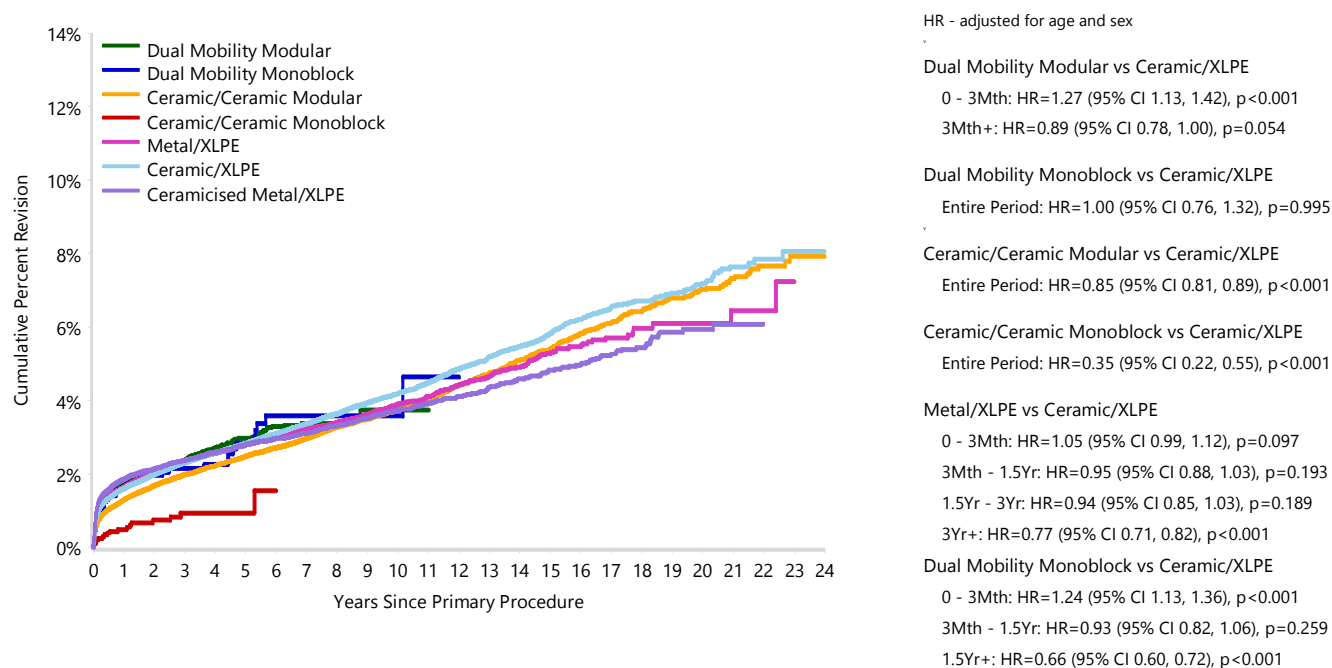
Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Modular	641	27751	1.7 (1.6, 1.9)	2.4 (2.2, 2.6)	3.0 (2.7, 3.2)	3.7 (3.2, 4.4)		
Dual Mobility Monoblock	50	2159	1.6 (1.2, 2.3)	2.1 (1.6, 2.9)	2.8 (2.1, 3.9)	3.6 (2.6, 4.9)		
Ceramic/Ceramic Modular	2707	73805	1.3 (1.2, 1.4)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.7 (3.6, 3.9)	5.4 (5.2, 5.7)	7.0 (6.6, 7.4)
Ceramic/Ceramic Monoblock	18	2427	0.5 (0.3, 0.9)	0.9 (0.6, 1.5)	0.9 (0.6, 1.5)			
Metal/XLPE	4699	173733	1.6 (1.6, 1.7)	2.3 (2.3, 2.4)	2.8 (2.7, 2.9)	3.9 (3.8, 4.0)	5.3 (5.0, 5.6)	6.1 (5.6, 6.7)
Ceramic/XLPE	5864	161555	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.8 (2.7, 2.9)	4.2 (4.1, 4.3)	5.8 (5.6, 6.0)	7.2 (6.8, 7.6)
Ceramicised Metal/XLPE	1364	42718	1.9 (1.7, 2.0)	2.4 (2.2, 2.5)	2.8 (2.6, 3.0)	3.7 (3.5, 4.0)	4.8 (4.5, 5.2)	5.9 (5.4, 6.5)
TOTAL	15343	484148						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Dual mobility prostheses were excluded from Metal/XLPE, Ceramic/XLPE, and Ceramicised Metal/XLPE

Figure HT46 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Modular	27751	21104	11577	5371	237	0	0
Dual Mobility Monoblock	2159	1611	941	585	99	0	0
Ceramic/Ceramic Modular	73805	69693	61893	53601	29968	11129	2336
Ceramic/Ceramic Monoblock	2427	1763	924	239	0	0	0
Metal/XLPE	173733	147678	104662	71903	18467	3479	378
Ceramic/XLPE	161555	149650	126864	104281	48722	13925	2232
Ceramicised Metal/XLPE	42718	38586	31451	24674	11775	3914	809

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

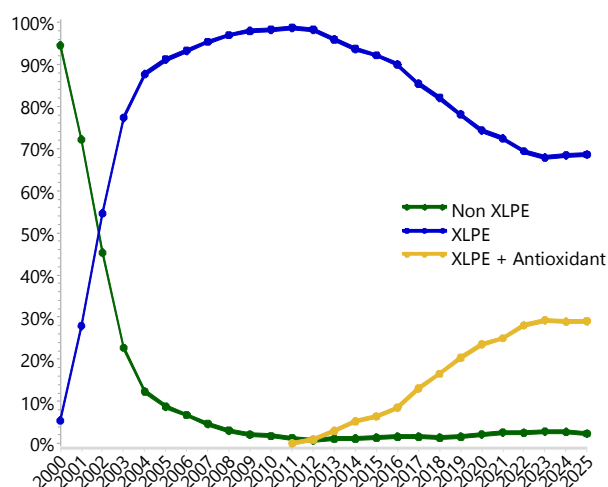
Dual mobility prostheses were excluded from Metal/XLPE, Ceramic/XLPE, and Ceramicised Metal/XLPE

Primary Total Hip Replacement

Cross-linked Polyethylene (XLPE)

XLPE has been used in 407,916 procedures. This includes 74,076 procedures that have XLPE with the addition of an antioxidant. Over time, the use of non XLPE has decreased, and in 2025, only 2.3% of procedures using polyethylene used non XLPE, and so these have been excluded from the analyses (Figure HT47).

Figure HT47 Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



At 20 years, the cumulative rate of revision using XLPE is 6.8% (Table HT43 and Figure HT48). The most common reason for early revision using XLPE is infection, but this changes to fracture after 12 years. The cumulative incidences of loosening and prosthesis dislocation/instability at 20 years are 1.0% and 1.1%, respectively (Figure HT49).

For XLPE, head size 32mm has the lowest rate of revision. Compared to head size 32mm there is a higher rate of revision for head size >32mm and for head size <32mm, except for the period between 3 months and 1.5 years. (Table HT43 and Figure HT51). For head size <32mm dislocation/instability is the most common reason for revision, while it is fracture for head sizes 32mm and >32mm after 14 and 12 years, respectively (Figure HT50).

XLPE + Antioxidant

Acetabular components that have both XLPE and XLPE with antioxidant have been compared. In 2025, XLPE with antioxidant accounts for 29.1% of acetabular components using XLPE. XLPE has a higher rate of revision compared to XLPE + antioxidant after 9 months (Table HT44 and Figure HT52). The reasons for revision are shown in Table HT45 and Figure HT53.

When analysed by femoral head material, XLPE with antioxidant has a lower rate of revision after 9 months compared to XLPE without antioxidant when used with ceramic femoral heads. Metal heads generally show no difference with or without addition of antioxidant to polyethylene, but there is a small difference favouring XLPE for the first 3 months. When used with either XLPE or XLPE with antioxidant, ceramic heads have a lower revision rate than metal heads (Table HT46 and Figure HT54).

Reasons for revision for each head size and XLPE type are listed in Figure HT55.



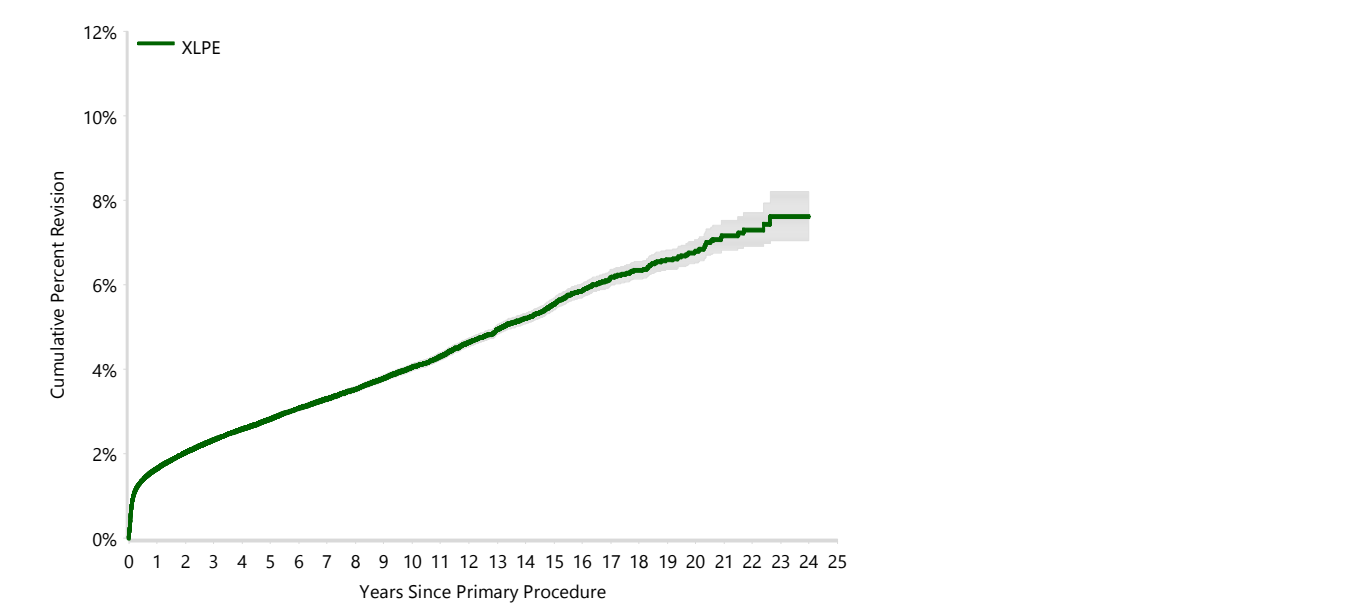
Primary Total Hip Replacement

Table HT43 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type and Head Size (Primary Diagnosis OA)

Polyethylene Type	Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE		12618	407916	1.7 (1.6, 1.7)	2.3 (2.3, 2.4)	2.8 (2.8, 2.9)	4.1 (4.0, 4.1)	5.5 (5.4, 5.7)	6.8 (6.5, 7.1)
	<32mm	2244	62768	1.7 (1.6, 1.8)	2.4 (2.2, 2.5)	3.0 (2.8, 3.1)	4.3 (4.1, 4.5)	5.9 (5.6, 6.2)	7.3 (6.9, 7.8)
	32mm	4487	142038	1.6 (1.5, 1.6)	2.2 (2.2, 2.3)	2.7 (2.6, 2.8)	3.8 (3.7, 3.9)	5.2 (5.0, 5.5)	6.1 (5.7, 6.5)
	>32mm	5887	203110	1.7 (1.6, 1.8)	2.4 (2.3, 2.4)	2.9 (2.8, 3.0)	4.2 (4.0, 4.3)	5.7 (5.4, 5.9)	6.9 (6.2, 7.7)
TOTAL		12618	407916						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT48 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)

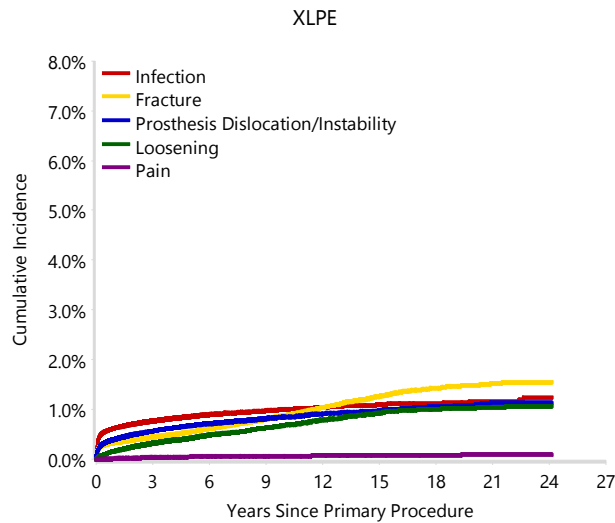


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	407916	358629	275495	206814	79300	21318	3419

Note: Restricted to modern prostheses

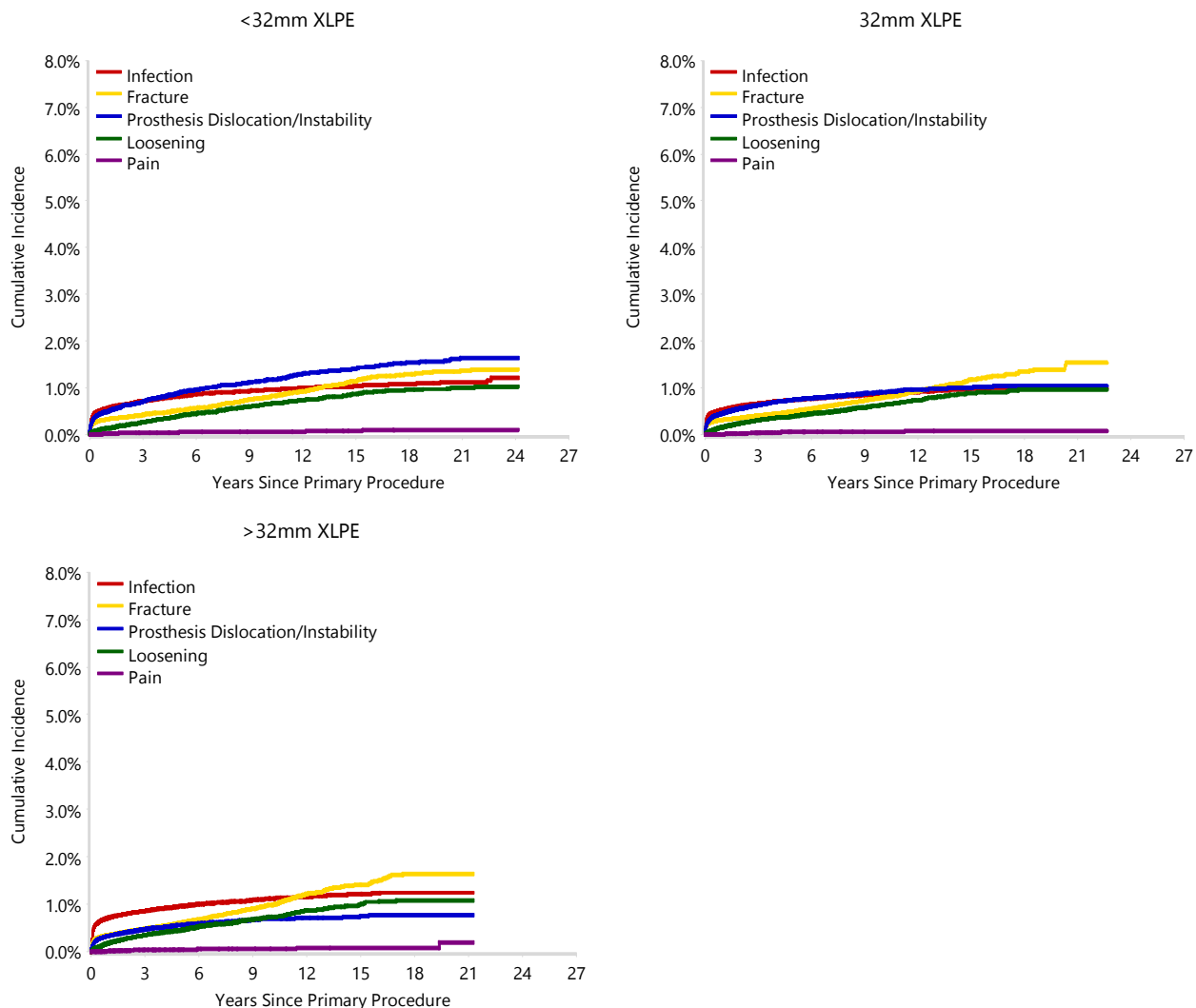
Primary Total Hip Replacement

Figure HT49 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure HT50 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement using XLPE by Head Size (Primary Diagnosis OA)

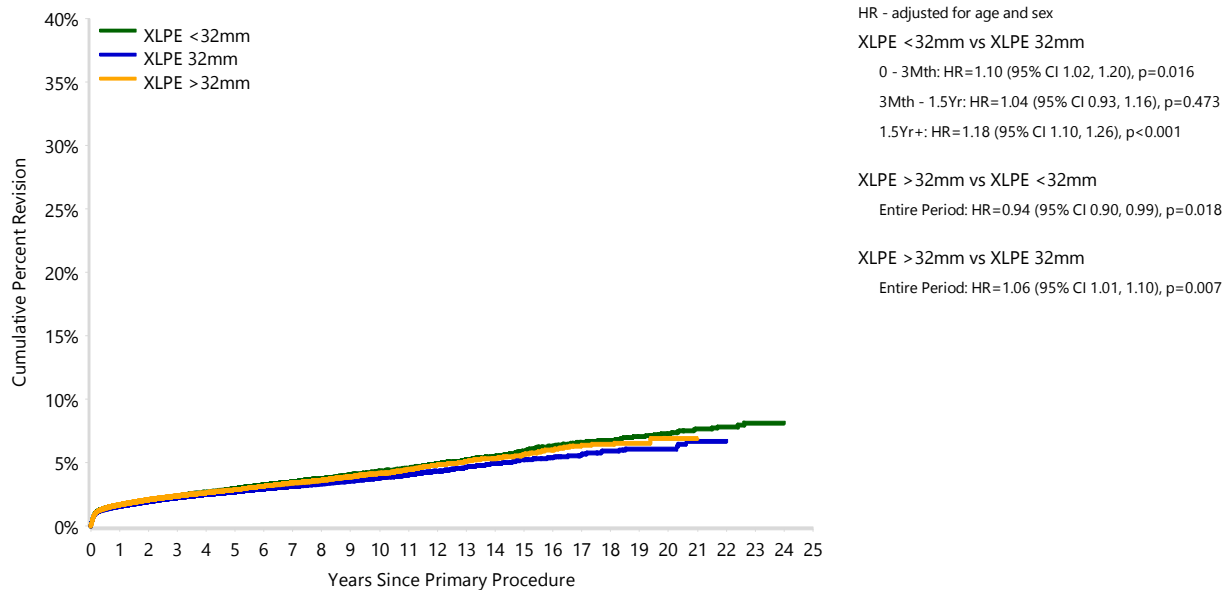


Note: Restricted to modern prostheses



Primary Total Hip Replacement

Figure HT51 Cumulative Percent Revision of Primary Total Conventional Hip Replacement using XLPE by Head Size (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	<32mm	62768	54203	41558	32041	18059	8589	2657
	32mm	142038	130887	109579	88272	34816	7217	598
	>32mm	203110	173539	124358	86501	26425	5512	164

Note: Restricted to modern prostheses

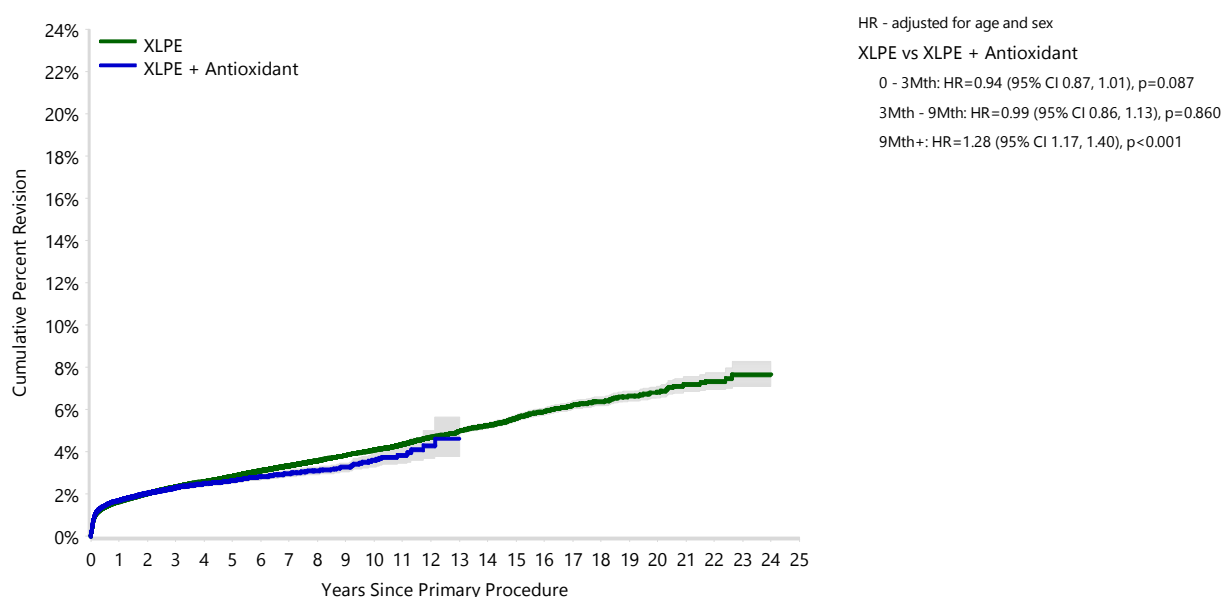
Primary Total Hip Replacement

Table HT44 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	10905	333840	1.6 (1.6, 1.7)	2.3 (2.3, 2.4)	2.8 (2.8, 2.9)	4.1 (4.0, 4.2)	5.6 (5.4, 5.7)	6.8 (6.6, 7.1)
XLPE + Antioxidant	1713	74076	1.7 (1.6, 1.8)	2.3 (2.2, 2.4)	2.6 (2.5, 2.8)	3.6 (3.3, 3.9)		
TOTAL	13512	420228						

Note: Restricted to modern prostheses

Figure HT52 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	333840	297920	237756	185840	77377	21318	3419
XLPE + Antioxidant	74076	60709	37739	20974	1923	0	0

Note: Restricted to modern prostheses



Primary Total Hip Replacement

**Table HT45 Revision Diagnosis of Primary Total Conventional Hip Replacement by Polyethylene Type
(Primary Diagnosis OA, Follow-up Limited to 14.3 Years)**

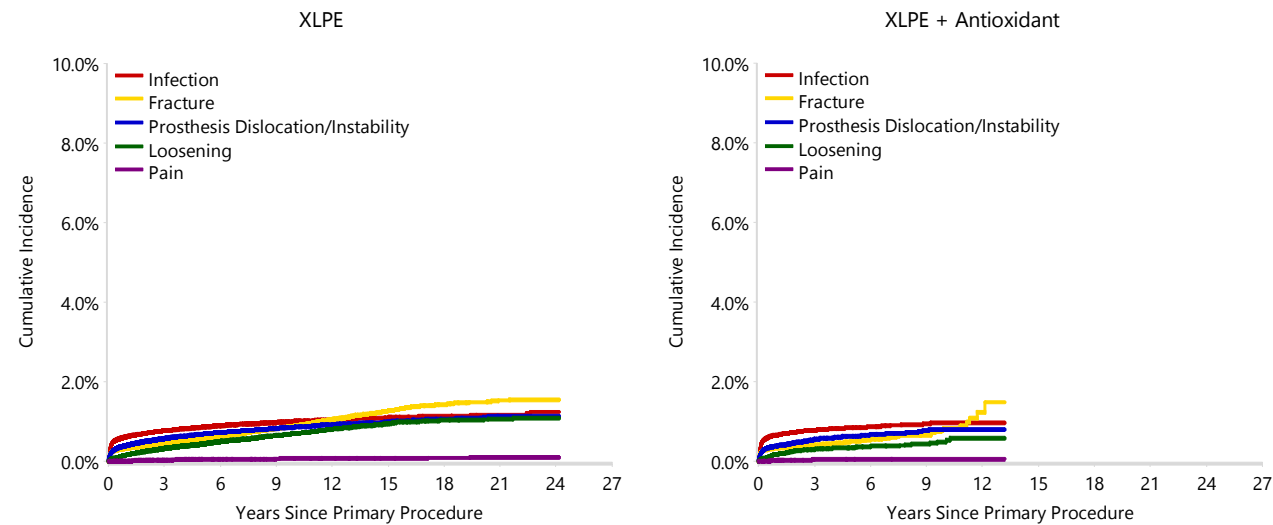
Revision Diagnosis	XLPE			XLPE + Antioxidant		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	2968	0.9	27.8	573	0.8	33.5
Fracture	2439	0.7	22.8	339	0.5	19.8
Prosthesis Dislocation/Instability	2425	0.7	22.7	404	0.5	23.6
Loosening	1820	0.5	17.0	219	0.3	12.8
Pain	176	0.1	1.6	30	0.0	1.8
Leg Length Discrepancy	162	0.0	1.5	43	0.1	2.5
Malposition	139	0.0	1.3	37	0.0	2.2
Implant Breakage Stem	104	0.0	1.0	6	0.0	0.4
Lysis	65	0.0	0.6	3	0.0	0.2
Incorrect Sizing	49	0.0	0.5	7	0.0	0.4
Implant Breakage Acetabular Insert	40	0.0	0.4	7	0.0	0.4
Metal Related Pathology	37	0.0	0.3	4	0.0	0.2
Wear Acetabular Insert	29	0.0	0.3	1	0.0	0.1
Implant Breakage Acetabular	23	0.0	0.2	3	0.0	0.2
Heterotopic Bone	16	0.0	0.1	3	0.0	0.2
Tumour	12	0.0	0.1	2	0.0	0.1
Implant Breakage Head	4	0.0	0.0			
Wear Acetabulum	2	0.0	0.0			
Wear Head	2	0.0	0.0			
Osteonecrosis	1	0.0	0.0			
Progression Of Disease				1	0.0	0.1
Synovitis	1	0.0	0.0			
Other	163	0.0	1.5	31	0.0	1.8
N Revision	10677	3.2	100.0	1713	2.3	100.0
N Primary	333840			74076		

Note: Restricted to modern prostheses

Restricted to revisions within 14.3 years for all groups to allow a time-matched comparison of revisions

Primary Total Hip Replacement

Figure HT53 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

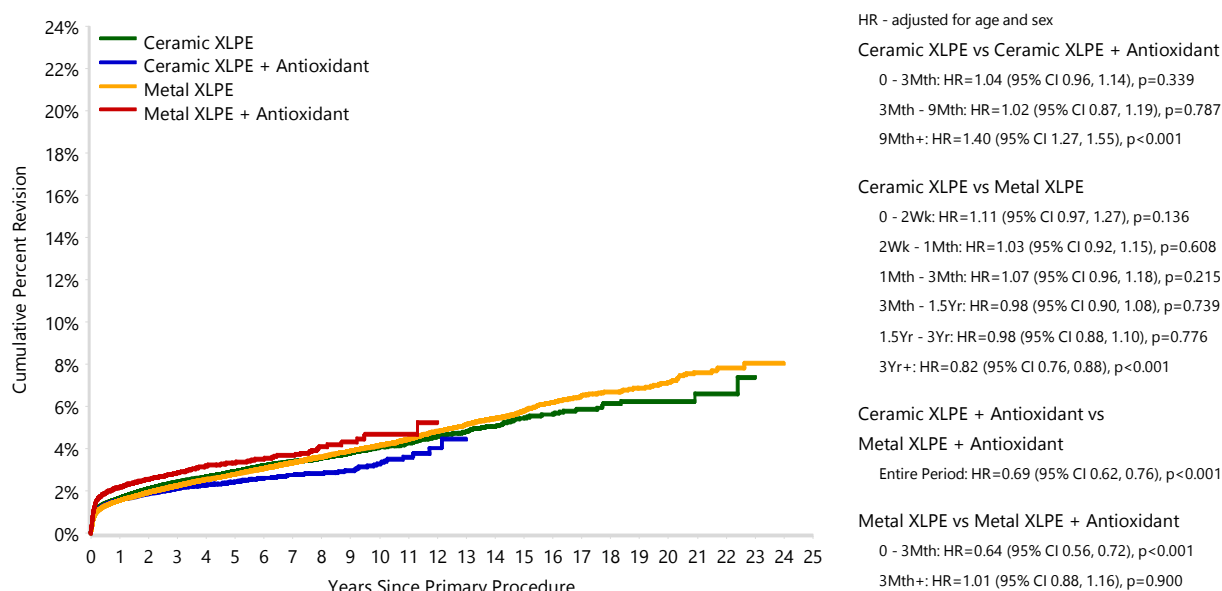
Primary Total Hip Replacement

Table HT46 Cumulative Percent Revision of Primary Total Conventional Hip Replacement using XLPE by Antioxidant Usage and Head Material (Primary Diagnosis OA)

Head Material	Antioxidant Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic	XLPE	3822	132805	1.7 (1.6, 1.7)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	4.1 (3.9, 4.2)	5.4 (5.1, 5.8)	6.3 (5.7, 6.8)
	XLPE + Antioxidant	1227	57475	1.6 (1.5, 1.7)	2.1 (2.0, 2.3)	2.4 (2.3, 2.6)	3.3 (3.0, 3.6)		
Metal	XLPE	5699	157375	1.6 (1.5, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.9)	4.2 (4.0, 4.3)	5.8 (5.6, 6.0)	7.2 (6.8, 7.5)
	XLPE + Antioxidant	481	16468	2.2 (2.0, 2.4)	2.9 (2.6, 3.1)	3.3 (3.0, 3.7)	4.7 (4.0, 5.5)		
TOTAL		11229	364123						

Note: Restricted to modern prostheses

Figure HT54 Cumulative Percent Revision of Primary Total Conventional Hip Replacement using XLPE by Antioxidant Usage and Head Material (Primary Diagnosis OA)



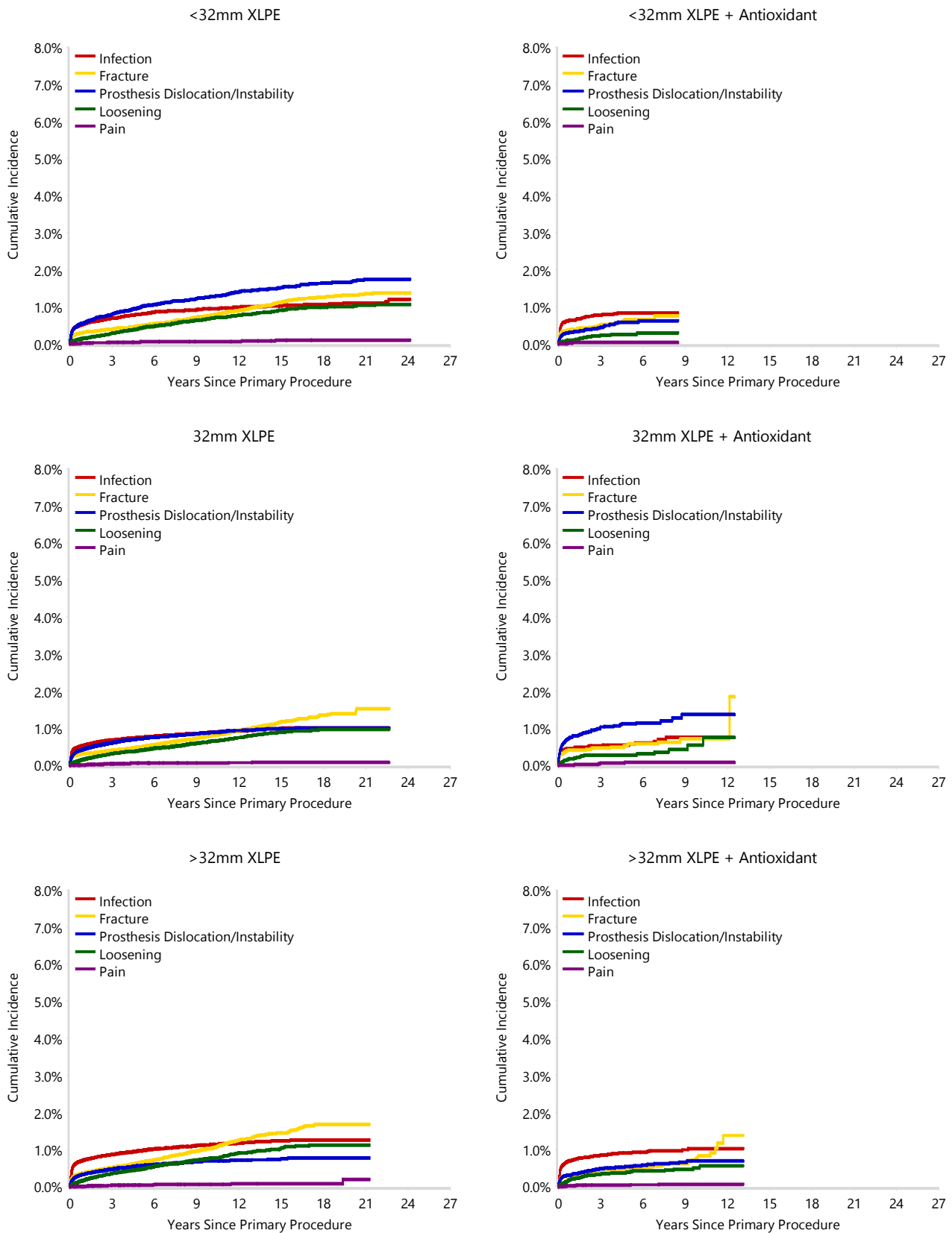
Number at risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic	XLPE	132805	112970	81720	58317	16966	3479	378
	XLPE + Antioxidant	57475	47080	29477	16389	1538	0	0
Metal	XLPE	157375	145794	124292	102714	48625	13925	2232
	XLPE + Antioxidant	16468	13523	8206	4544	382	0	0

Note: Restricted to modern prostheses



Primary Total Hip Replacement

Figure HT55 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement using XLPE by Head Size and Antioxidant Usage (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Primary Total Hip Replacement

Ceramic/Ceramic Bearings

Ceramic/ceramic bearings have been used in 76,232 primary total conventional hip replacement procedures undertaken for osteoarthritis. This is the third most common bearing. This analysis has been restricted to procedures with mixed ceramic femoral heads and mixed ceramic acetabular bearing surfaces. In 2025, mixed ceramic accounted for all procedures with a ceramic/ceramic bearing surface.

Head Size

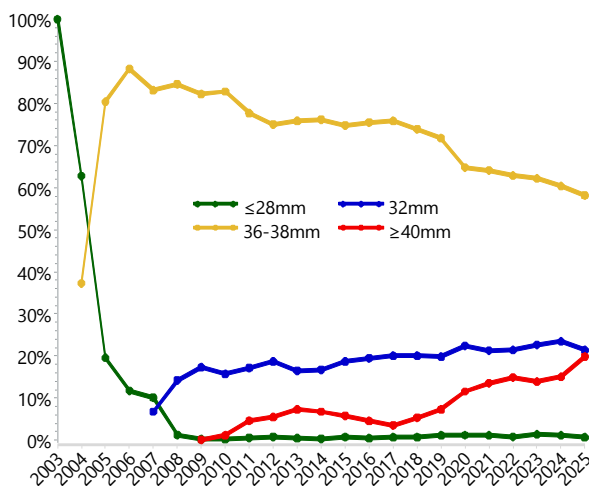
To evaluate the effect of head size, an analysis was undertaken comparing four head size groups (≤ 28 mm, 32mm, 36–38mm, and ≥ 40 mm). Head sizes 36mm and 38mm have been combined in this analysis. The proportional use of head sizes of mixed ceramic/mixed ceramic over time is shown in Figure HT56.

Ceramic heads with head sizes ≥ 40 mm have a lower rate of revision compared to head sizes 36–38mm and 32mm. There is no difference in revision rate between head sizes 32mm and 36–38mm, while head size ≤ 28 mm has an early higher rate of revision compared to 32mm for the first 3 months (Table HT47 and Figure HT57).

At 1 year, the cumulative incidence of revision for prosthesis dislocation/instability is 1.5% for head sizes ≤ 28 mm compared to 0.3% for 32mm, 0.3% for 36–38mm, and 0.1% for head sizes ≥ 40 mm (Figure HT58).

When ceramic/ceramic bearings are compared by modularity, monoblock components have a lower risk of revision compared to modular (Table HT48 and Figure HT59).

Figure HT56 Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



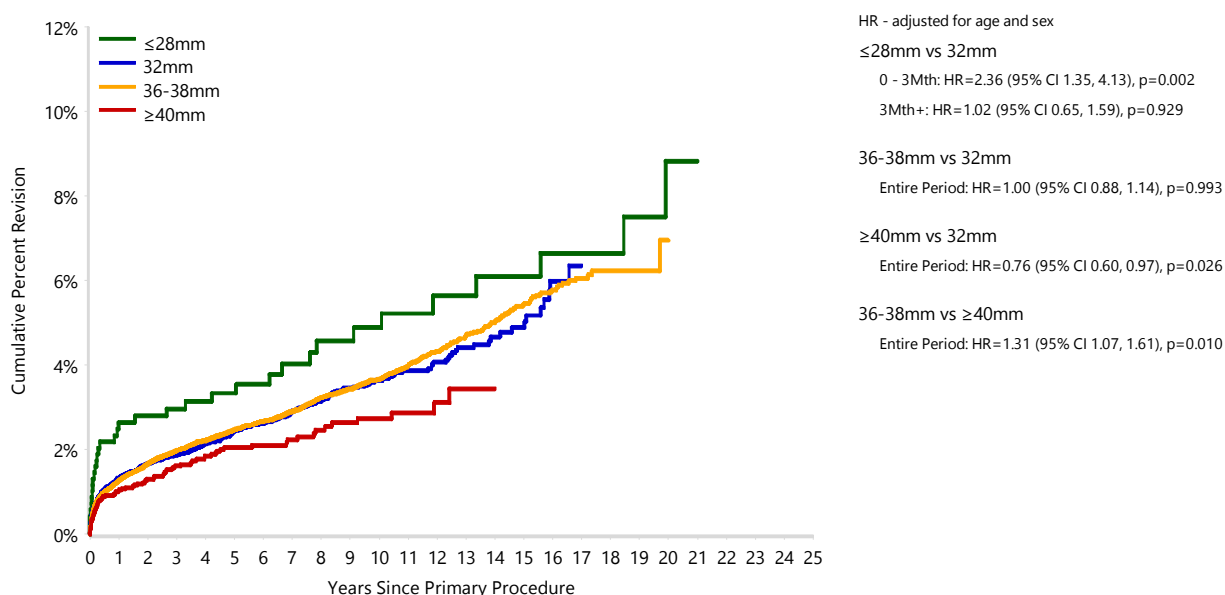
Primary Total Hip Replacement

Table HT47 Cumulative Percent Revision of Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)

Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤28mm	34	689	2.6 (1.7, 4.1)	3.0 (1.9, 4.6)	3.3 (2.2, 5.0)	4.9 (3.3, 7.1)	6.1 (4.2, 8.8)	8.8 (5.6, 13.7)
32mm	357	12005	1.3 (1.1, 1.6)	1.9 (1.6, 2.1)	2.4 (2.2, 2.8)	3.6 (3.2, 4.1)	4.9 (4.2, 5.6)	
36-38mm	1455	44043	1.3 (1.2, 1.4)	2.0 (1.9, 2.1)	2.5 (2.3, 2.6)	3.7 (3.5, 3.9)	5.4 (5.1, 5.8)	6.9 (5.6, 8.6)
≥40mm	98	5141	1.0 (0.8, 1.3)	1.6 (1.3, 2.0)	2.0 (1.6, 2.5)	2.7 (2.2, 3.4)		
TOTAL	1944	61878						

Note: Restricted to modern prostheses

Figure HT57 Cumulative Percent Revision of Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



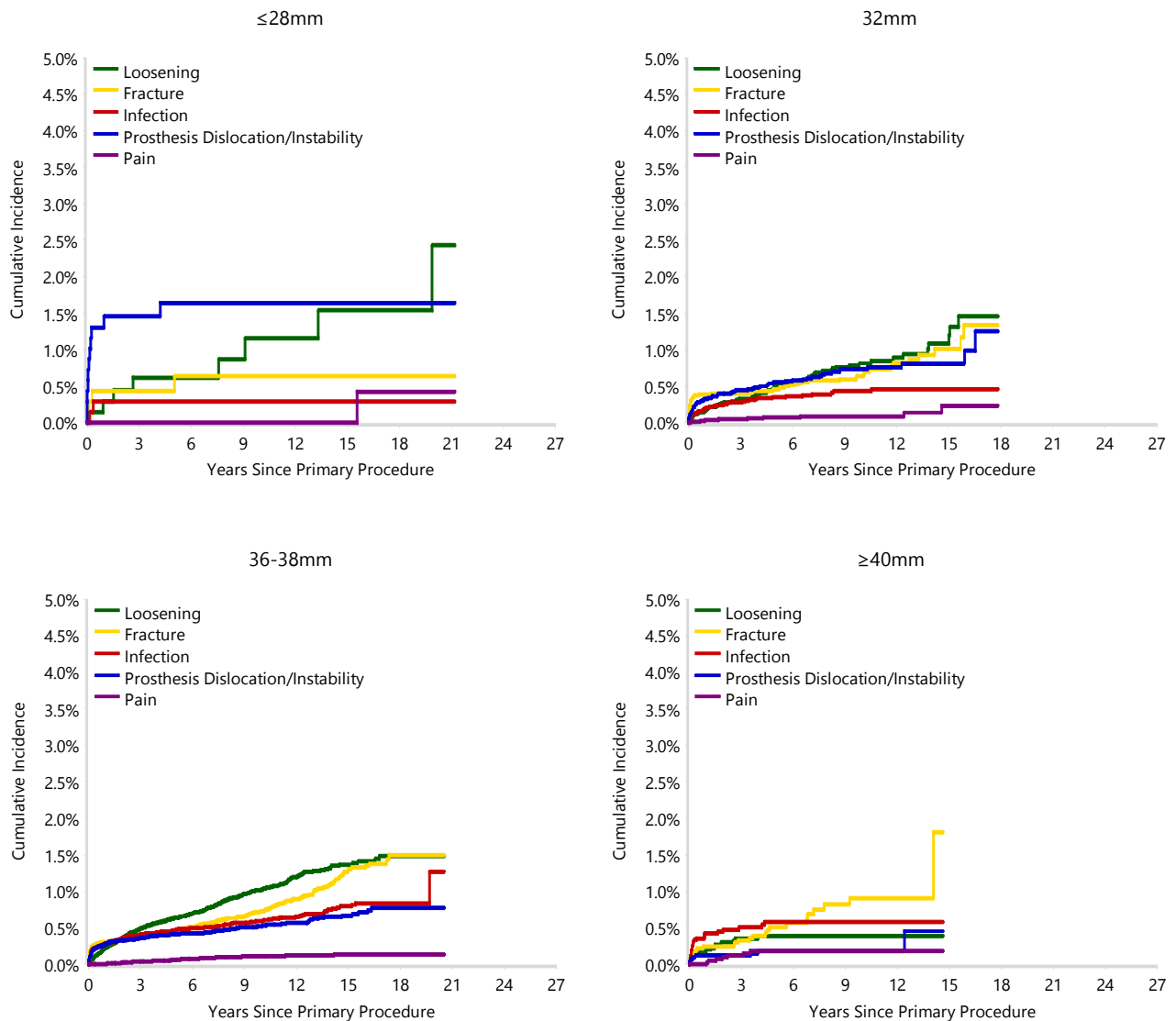
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤28mm	689	645	547	469	284	178	69
32mm	12005	11066	9252	7496	3279	676	0
36-38mm	44043	41281	36056	30501	14975	3828	95
≥40mm	5141	4362	3241	2108	834	20	0

Note: Restricted to modern prostheses



Primary Total Hip Replacement

Figure HT58 Cumulative Incidence Revision Diagnosis of Mixed Ceramic/Mixed Ceramic Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses



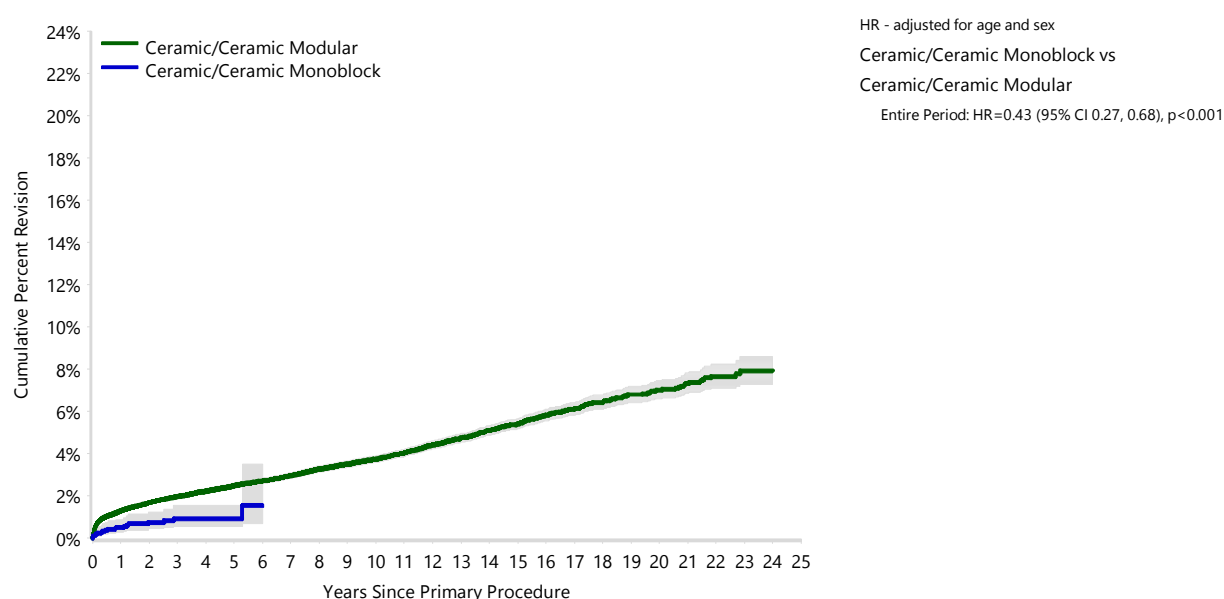
Primary Total Hip Replacement

Table HT48 Cumulative Percent Revision of Ceramic/Ceramic Primary Total Conventional Hip Replacement by Modularity (Primary Diagnosis OA)

Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic/Ceramic Modular	2707	73805	1.3 (1.2, 1.4)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.7 (3.6, 3.9)	5.4 (5.2, 5.7)	7.0 (6.6, 7.4)
Ceramic/Ceramic Monoblock	18	2427	0.5 (0.3, 0.9)	0.9 (0.6, 1.5)	0.9 (0.6, 1.5)			
TOTAL	2725	76232						

Note: Restricted to modern prostheses

Figure HT59 Cumulative Percent Revision of Ceramic/Ceramic Primary Total Conventional Hip Replacement by Modularity (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramic/Ceramic Modular	73805	69693	61893	53601	29968	11129	2336
Ceramic/Ceramic Monoblock	2427	1763	924	239	0	0	0

Note: Restricted to modern prostheses



Primary Total Hip Replacement

Acetabular Size and Femoral Head Size

An analysis of the combination of acetabular and femoral head size used in total conventional hip replacement has been included. In this analysis, all modern bearing surfaces are combined. Acetabular size has been categorised <52mm, 52mm or >52mm according to the outer diameter.

When an acetabular component with outer diameter of <52mm is used, the rate of revision decreases as head size increases (Table HT49 and Figure HT60).

For acetabular size 52mm there is a higher rate of revision for smaller heads size (<32mm) compared to both 32mm

(after 2.5 years) and head size >32mm (after 5.5 years). There is no revision rate difference between head sizes 32mm and >32mm with this acetabular size (Table HT49 and Figure HT61).

Where acetabular diameter is >52mm there is also a higher rate of revision when femoral heads <32mm are used compared to both 32mm and >32mm, but again there is no difference when head size 32mm is compared to >32mm (Table HT49 and Figure HT62).

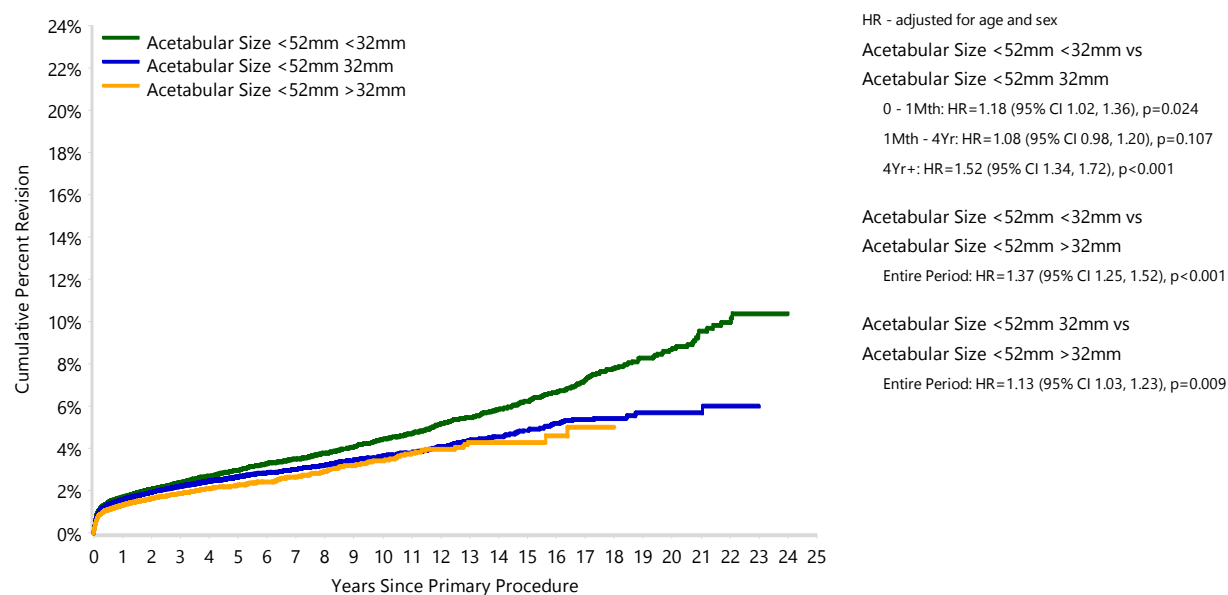
Table HT49 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size and Head Size (Primary Diagnosis OA)

Acetabular size	Head size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size <52mm	<32mm	1310	34222	1.7 (1.6, 1.8)	2.4 (2.2, 2.6)	3.0 (2.8, 3.2)	4.4 (4.2, 4.7)	6.2 (5.8, 6.7)	8.7 (8.0, 9.5)
	32mm	2286	80009	1.6 (1.5, 1.7)	2.2 (2.1, 2.3)	2.7 (2.5, 2.8)	3.6 (3.5, 3.8)	4.9 (4.5, 5.2)	5.7 (5.2, 6.2)
	>32mm	600	28074	1.3 (1.2, 1.5)	1.9 (1.7, 2.1)	2.3 (2.1, 2.5)	3.4 (3.1, 3.8)	4.3 (3.7, 4.9)	
Acetabular Size 52mm	<32mm	536	14521	1.3 (1.1, 1.5)	2.0 (1.8, 2.2)	2.6 (2.3, 2.9)	4.4 (4.0, 4.9)	6.5 (5.9, 7.2)	8.5 (7.6, 9.5)
	32mm	1106	34086	1.4 (1.3, 1.5)	2.0 (1.9, 2.2)	2.4 (2.3, 2.6)	3.6 (3.3, 3.8)	5.0 (4.6, 5.3)	6.1 (5.5, 6.8)
	>32mm	1814	64515	1.5 (1.4, 1.6)	2.1 (2.0, 2.3)	2.6 (2.5, 2.7)	3.8 (3.6, 4.0)	5.1 (4.8, 5.5)	5.9 (5.3, 6.6)
Acetabular Size >52mm	<32mm	1376	27836	1.8 (1.6, 2.0)	2.7 (2.5, 2.9)	3.4 (3.2, 3.7)	5.7 (5.3, 6.1)	8.7 (8.2, 9.3)	11.3 (10.5, 12.0)
	32mm	2017	50649	1.6 (1.5, 1.7)	2.3 (2.2, 2.4)	2.8 (2.7, 3.0)	4.2 (4.0, 4.4)	5.9 (5.6, 6.2)	7.1 (6.6, 7.7)
	>32mm	5216	161822	1.7 (1.6, 1.7)	2.4 (2.3, 2.5)	2.9 (2.9, 3.0)	4.3 (4.1, 4.4)	6.1 (5.8, 6.4)	7.7 (7.0, 8.4)
TOTAL		16261	495734						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT60 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size <52mm and Head Size (Primary Diagnosis OA)



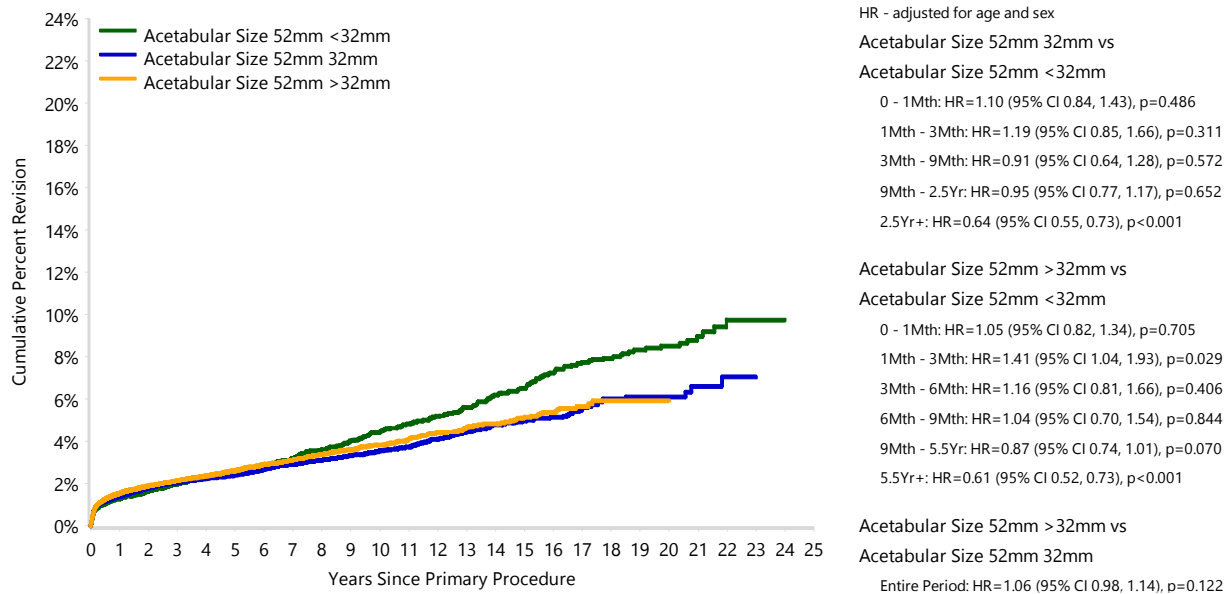
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size <52mm	<32mm	34222	30272	23762	18625	9992	4263	1223
	32mm	80009	72048	56782	43048	15036	3407	470
	>32mm	28074	22883	15053	10216	2622	413	2

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT61 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size 52mm by Head Size (Primary Diagnosis OA)

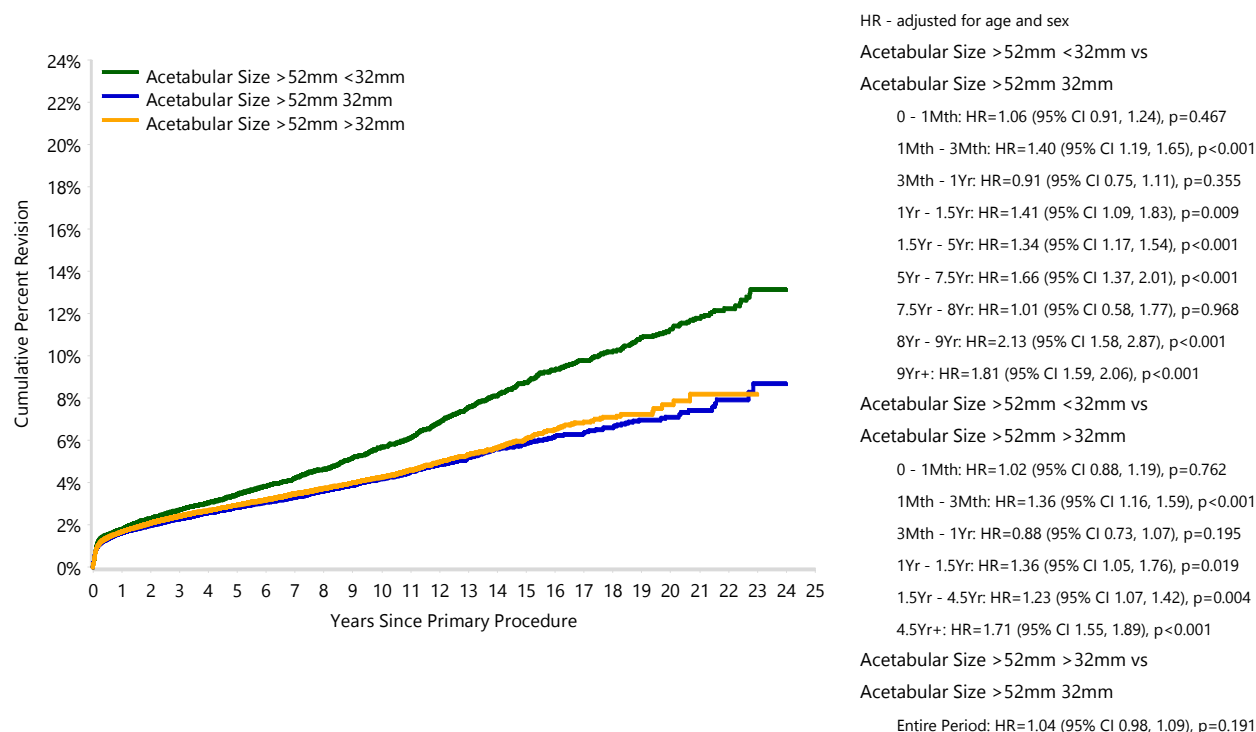


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size 52mm	<32mm	14521	12526	9606	7465	4430	2353	789
	32mm	34086	32202	28479	24149	11319	3243	519
	>32mm	64515	56361	42497	31299	11406	2662	40

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT62 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Size >52mm by Head Size (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Acetabular Size >52mm	<32mm	27836	23972	18176	13871	8296	4667	1880
	32mm	50649	48270	43812	38397	19433	5814	1094
	>32mm	161822	142781	108850	80218	30279	7465	469

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Constrained Acetabular Prostheses

Constrained acetabular prostheses have a mechanism to lock the femoral head into the acetabular component. Although often considered revision components, there have been 1,115 procedures using constrained acetabular prostheses for primary total conventional hip replacement. Of these, 874 procedures were constrained acetabular inserts and 241 procedures were constrained cups. There were 83 procedures reported in 2025. This is a decrease of 2.4% compared to 2024. The most commonly used constrained prostheses are presented in Table HT50.

Constrained acetabular prostheses are proportionally used more frequently for fractured neck of femur, tumour, failed internal fixation, and fracture/dislocation compared to all other acetabular components (Table HT51).

When all diagnoses are included (Table HT52 and Figure HT63), and when used only for osteoarthritis (Table HT53), constrained acetabular prostheses have a higher rate of revision compared to other acetabular prostheses (Table HT56). Sex and age are not risk factors for revision (Table HT54 to Table HT56). The small number of cemented acetabular constrained prostheses and the low number of revisions make it difficult to compare outcomes of these devices based on acetabular fixation. Reasons for revision for constrained acetabular prostheses are listed in Table HT57 and Figure HT64.

Table HT50 Cumulative Percent Revision of Constrained Primary Total Conventional Hip Replacement by Component (All Diagnoses)

Constrained Prosthesis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
G7/G7	15	226	6.1 (3.6, 10.4)	6.7 (4.0, 11.1)	6.7 (4.0, 11.1)			
PINNACLE/PINNACLE	10	151	4.8 (2.3, 9.8)	6.3 (3.3, 11.8)	7.5 (4.1, 13.8)			
Trabecular Metal (Shell)/Longevity	5	95	2.2 (0.6, 8.5)	4.5 (1.7, 11.6)	6.3 (2.6, 14.7)	6.3 (2.6, 14.7)		
Trident (Cup)	11	185	5.9 (3.2, 10.8)	5.9 (3.2, 10.8)	7.5 (4.0, 13.9)			
Trident (Shell)/Trident	16	200	5.3 (2.9, 9.7)	6.1 (3.4, 10.8)	7.8 (4.5, 13.2)			
Other Constrained Prosthesis	20	258	4.8 (2.7, 8.6)	8.8 (5.5, 14.0)	11.3 (7.3, 17.3)			
TOTAL	77	1115						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT51 Primary Total Conventional Hip Replacement by Primary Diagnosis and Acetabular Type

Primary Diagnosis	Constrained Prosthesis		Other Acetabular Prosthesis	
	N	Col%	N	Col%
Osteoarthritis	424	38.0	496540	87.5
Fractured Neck Of Femur	294	26.4	33144	5.8
Osteonecrosis	46	4.1	17977	3.2
Developmental Dysplasia	28	2.5	7889	1.4
Rheumatoid Arthritis	9	0.8	3821	0.7
Tumour	130	11.7	2789	0.5
Failed Internal Fixation	134	12.0	2028	0.4
Other Inflammatory Arthritis	4	0.4	2141	0.4
Fracture/Dislocation	38	3.4	832	0.1
Arthrodesis Takedown	4	0.4	71	0.0
Other	4	0.4	125	0.0
TOTAL	1115	100.0	567357	100.0

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

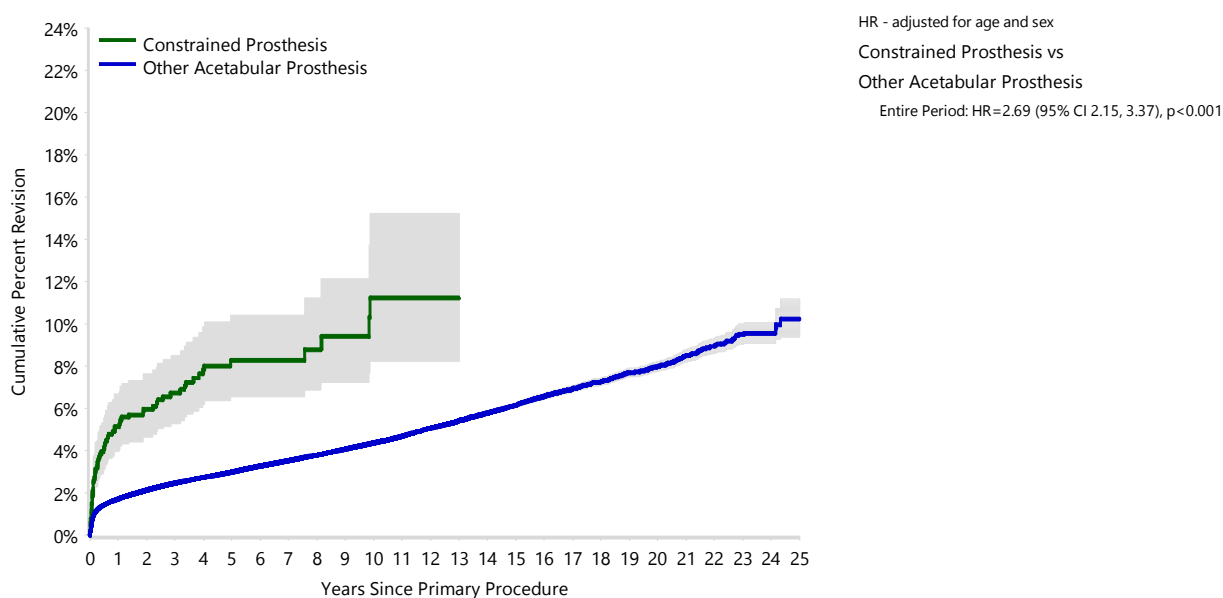
Table HT52 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (All Diagnoses)

Acetabular Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	77	1115	5.1 (3.9, 6.7)	6.7 (5.3, 8.5)	8.3 (6.6, 10.4)	11.2 (8.2, 15.2)		
Other Acetabular Prosthesis	19599	567357	1.7 (1.7, 1.8)	2.5 (2.4, 2.5)	3.0 (3.0, 3.0)	4.4 (4.3, 4.4)	6.2 (6.0, 6.3)	8.0 (7.8, 8.2)
TOTAL	19676	568472						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT63 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (All Diagnoses)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	1115	837	567	360	92	25	5
Other Acetabular Prosthesis	567357	500631	390868	298868	124638	37909	7337

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT53 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis OA)

Acetabular Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	19	424	2.4 (1.3, 4.5)	4.0 (2.4, 6.5)	4.8 (3.0, 7.7)	7.5 (4.1, 13.3)		
Other Acetabular Prosthesis	16261	496540	1.6 (1.6, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.8)	4.1 (4.0, 4.2)	5.9 (5.8, 6.0)	7.7 (7.4, 7.9)
TOTAL	16280	496964						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Table HT54 Cumulative Percent Revision of Constrained Primary Total Conventional Hip Replacement by Sex (Primary Diagnosis OA)

Acetabular Type	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	Male	9	153	3.4 (1.4, 8.0)	5.3 (2.5, 10.8)	6.5 (3.2, 12.9)			
	Female	10	271	1.9 (0.8, 4.5)	3.3 (1.6, 6.4)	3.9 (2.0, 7.4)	5.3 (2.6, 10.6)		
TOTAL		19	424						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Table HT55 Cumulative Percent Revision of Constrained Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)

Acetabular Type	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Constrained Prosthesis	<70	5	104	1.0 (0.1, 6.6)	4.8 (1.8, 12.5)	4.8 (1.8, 12.5)			
	≥70	14	320	2.9 (1.5, 5.5)	3.7 (2.1, 6.6)	4.9 (2.8, 8.5)			
TOTAL		19	424						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Table HT56 Comparisons of Primary Total Conventional Hip Replacement using Constrained Acetabular Components (Primary Diagnosis OA)

Comparison	HR - adjusted for age and sex
Constrained Prosthesis vs Other Acetabular Prosthesis	Entire Period: HR=1.65 (95% CI 1.05, 2.59), p=0.028
Constrained Prosthesis Female vs Constrained Prosthesis Male	Entire Period: HR=0.61 (95% CI 0.25, 1.51), p=0.288
Constrained Prosthesis ≥70 vs Constrained Prosthesis <70	Entire Period: HR=1.02 (95% CI 0.37, 2.85), p=0.969

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

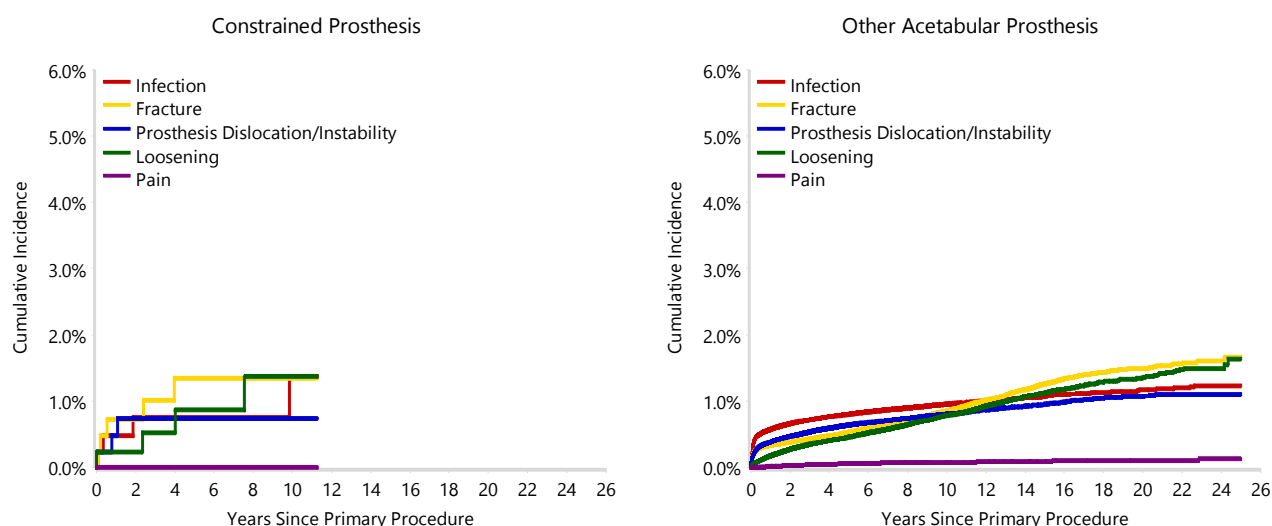
Table HT57 Revision Diagnosis of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis OA)

Revision Diagnosis	Constrained Prosthesis			Other Acetabular Prosthesis		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	4	0.9	21.1	4188	0.8	25.8
Fracture	5	1.2	26.3	3582	0.7	22.0
Prosthesis Dislocation/Instability	3	0.7	15.8	3418	0.7	21.0
Loosening	4	0.9	21.1	3079	0.6	18.9
Pain				302	0.1	1.9
Leg Length Discrepancy				272	0.1	1.7
Malposition				251	0.1	1.5
Implant Breakage Stem				182	0.0	1.1
Lysis				180	0.0	1.1
Implant Breakage Acetabular Insert	3	0.7	15.8	107	0.0	0.7
Wear Acetabular Insert				96	0.0	0.6
Incorrect Sizing				83	0.0	0.5
Metal Related Pathology				78	0.0	0.5
Implant Breakage Acetabular				52	0.0	0.3
Wear Head				44	0.0	0.3
Implant Breakage Head				23	0.0	0.1
Heterotopic Bone				22	0.0	0.1
Tumour				21	0.0	0.1
Wear Acetabulum				5	0.0	0.0
Synovitis				2	0.0	0.0
Osteonecrosis				1	0.0	0.0
Progression Of Disease				1	0.0	0.0
Other				272	0.1	1.7
N Revision	19	4.5	100.0	16261	3.3	100.0
N Primary	424			496540		

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT64 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Dual Mobility Acetabular Prostheses

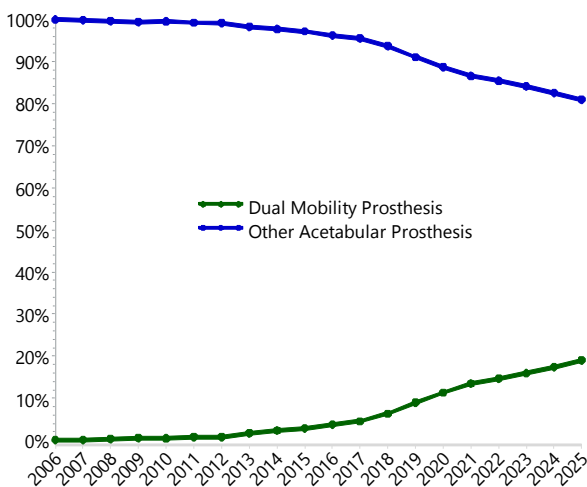
Dual mobility prostheses have a femoral head which moves within a polyethylene component, which also moves within a fixed acetabular shell.

There are 51,179 primary total conventional hip replacement procedures using dual mobility prostheses. This is an increase of 13.0% (n=9,698) since 2012. There has been an increase in annual use of dual mobility prostheses since 2012. In 2025, dual mobility prostheses are used for 19% of primary conventional hip procedures (Figure HT65).

The commonly used dual mobility prostheses are presented in Table HT58. Compared to other acetabular prostheses, dual mobility acetabular prostheses are proportionally used more frequently for fractured neck of femur, tumour, and failed internal fixation (Table HT59).

When all diagnoses are included, dual mobility prostheses have a higher rate of revision compared to other acetabular prostheses (Table HT60 and Figure HT66).

Figure HT65 Primary Total Conventional Hip Replacement by Dual Mobility (All Diagnoses)



Note: Restricted to modern prostheses

For the diagnosis of osteoarthritis, there is also a higher rate of revision when dual mobility prostheses are used (Table HT61 and Figure HT67). Dual mobility prostheses have a lower rate of revision for dislocation/instability compared to all other acetabular prostheses (Table HT62 and Figure HT68).

The reasons for revision for dual mobility and other acetabular components are shown in Figure HT72. Compared to other acetabular components, dual mobility prostheses have a higher incidence of revision for fracture.

Males have a higher risk of revision than females when dual mobility prostheses are used for a diagnosis of osteoarthritis (Table HT63 and Figure HT69). However, age is not a risk factor for revision (Table HT64 and Figure HT70).

The most common reasons for revision for males and females when dual mobility prostheses are used are fracture and infection (Figure HT73).

The majority of dual mobility prostheses are inserted with cementless acetabular fixation. Cemented dual mobility prostheses have a higher rate of revision than cementless components (Table HT65 and Figure HT71). While most dual mobility prostheses use XLPE, there remains a small number using non XLPE. There is no difference when dual mobility prostheses using XLPE are compared to non XLPE (Table HT66 and Figure HT74).

When dual mobility prostheses are compared by modularity, there is no significant difference between modular and monoblock (Table HT67 and Figure HT75).

There is no difference in the rate of revision when dual mobility prostheses are compared to other acetabular prostheses for the anterior or posterior surgical approaches, but there is a higher rate of revision for dual mobility components with the lateral approach (Table HT66 and Figure HT76 to Figure HT78).



Primary Total Hip Replacement

Table HT58 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Component (All Diagnoses)

Dual Mobility Insert	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
2M	37	582	2.8 (1.7, 4.5)	4.4 (2.9, 6.5)	4.6 (3.1, 6.8)	10.6 (6.8, 16.5)		
Active Articulation	281	9880	2.0 (1.8, 2.3)	2.8 (2.5, 3.2)	3.2 (2.9, 3.6)			
Avantage	24	503	4.1 (2.6, 6.3)	4.9 (3.2, 7.3)	5.9 (3.9, 8.9)			
BI-MENTUM	55	1800	2.6 (1.9, 3.5)	3.5 (2.6, 4.6)				
G7	61	3193	2.1 (1.7, 2.8)					
MDM (Dual Mobility)	298	11163	2.1 (1.8, 2.4)	2.8 (2.5, 3.2)	3.7 (3.2, 4.2)	5.2 (4.3, 6.3)		
MobiliT CUP	5	266	2.0 (0.8, 4.6)	2.0 (0.8, 4.6)				
Novae E	26	895	1.1 (0.6, 2.1)	1.9 (1.2, 3.1)	2.7 (1.7, 4.3)	5.6 (3.4, 9.2)		
OR30	11	538	2.3 (1.3, 4.2)					
Polarcup	66	1705	2.2 (1.6, 3.0)	3.5 (2.6, 4.5)	4.1 (3.1, 5.3)	5.7 (4.2, 7.6)	8.1 (5.1, 12.7)	
Restoration	250	5734	2.5 (2.1, 3.0)	3.4 (3.0, 3.9)	4.3 (3.8, 4.9)	5.7 (4.9, 6.7)		
Saturne	64	2281	1.4 (1.0, 2.0)	2.5 (1.9, 3.4)	3.3 (2.5, 4.3)	5.5 (3.9, 7.9)		
SignaSure	41	1597	2.4 (1.7, 3.4)	3.5 (2.5, 4.9)				
Trinity	167	7986	1.5 (1.2, 1.8)	2.2 (1.9, 2.6)	2.7 (2.3, 3.3)			
Versafit	93	2946	2.2 (1.7, 2.8)	3.1 (2.5, 3.9)	3.5 (2.9, 4.4)	4.6 (3.6, 5.9)		
Other (7)	4	110						
TOTAL	1483	51179						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Only prostheses with >50 procedures have been listed

Table HT59 Primary Total Conventional Hip Replacement by Primary Diagnosis and Acetabular Mobility

Primary Diagnosis	Dual Mobility Prosthesis		Other Acetabular Prosthesis	
	N	Col%	N	Col%
Osteoarthritis	36783	71.9	460181	89.0
Fractured Neck of Femur	9113	17.8	24325	4.7
Osteonecrosis	2064	4.0	15959	3.1
Developmental Dysplasia	1001	2.0	6916	1.3
Rheumatoid Arthritis	250	0.5	3580	0.7
Tumour	894	1.7	2025	0.4
Failed Internal Fixation	606	1.2	1556	0.3
Other Inflammatory Arthritis	173	0.3	1972	0.4
Fracture/Dislocation	252	0.5	618	0.1
Arthrodesis Takedown	17	0.0	58	0.0
Other	26	0.1	103	0.0
TOTAL	51179	100.0	517293	100.0

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



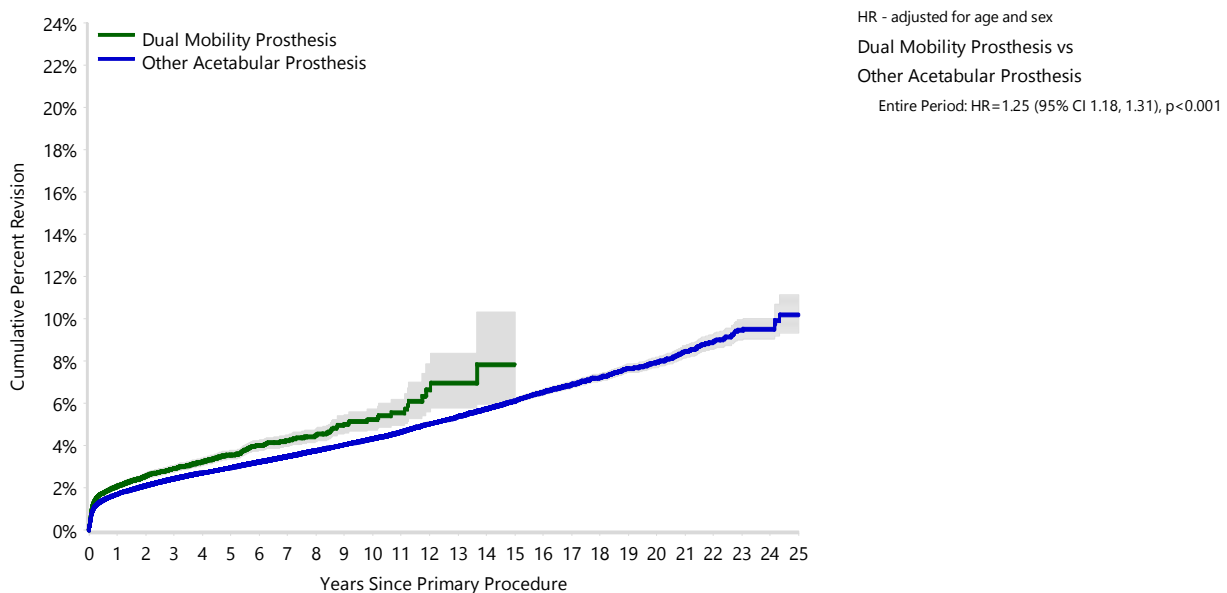
Primary Total Hip Replacement

Table HT60 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (All Diagnoses)

Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	1483	51179	2.1 (2.0, 2.2)	2.9 (2.7, 3.1)	3.6 (3.4, 3.8)	5.2 (4.8, 5.7)	7.8 (5.9, 10.3)	
Other Acetabular Prosthesis	18193	517293	1.7 (1.7, 1.7)	2.4 (2.4, 2.5)	3.0 (2.9, 3.0)	4.3 (4.3, 4.4)	6.1 (6.0, 6.2)	7.9 (7.7, 8.2)
TOTAL	19676	568472						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT66 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (All Diagnoses)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	51179	39427	22490	11078	1048	45	0
Other Acetabular Prosthesis	517293	462041	368945	288150	123682	37889	7342

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

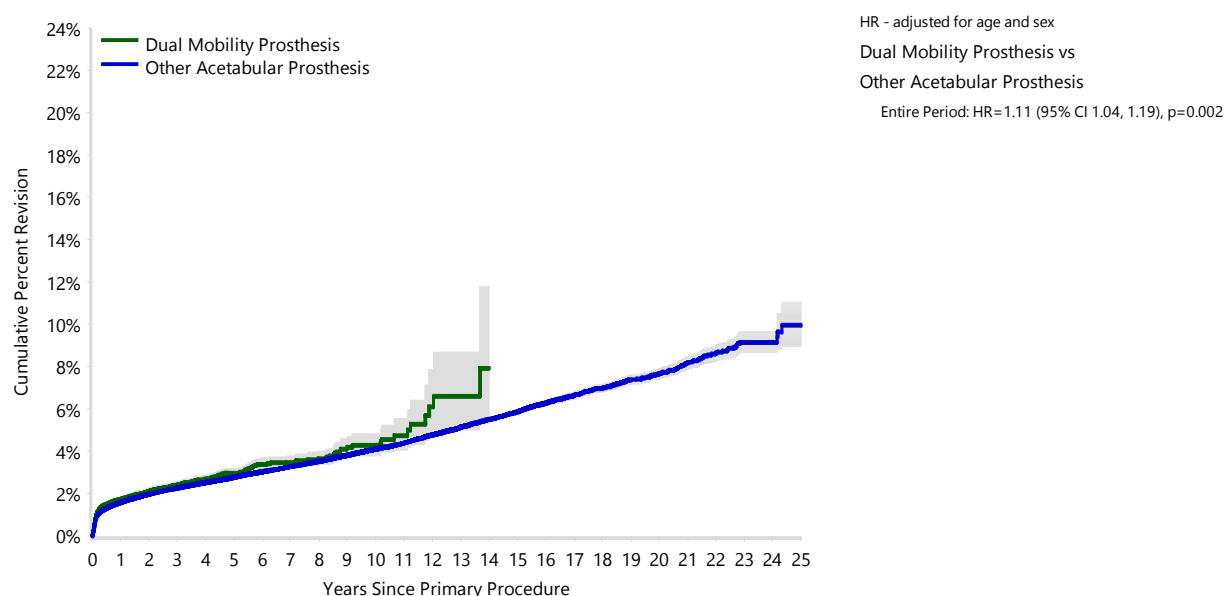
Table HT61 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA)

Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	889	36783	1.7 (1.6, 1.9)	2.4 (2.2, 2.6)	3.0 (2.8, 3.2)	4.3 (3.8, 4.8)		
Other Acetabular Prosthesis	15391	460181	1.6 (1.5, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.8)	4.1 (4.0, 4.2)	5.9 (5.7, 6.0)	7.7 (7.4, 7.9)
TOTAL	16280	496964						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT67 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	36783	28487	16120	7976	725	27	0
Other Acetabular Prosthesis	460181	413035	331012	259406	112137	34274	6491

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

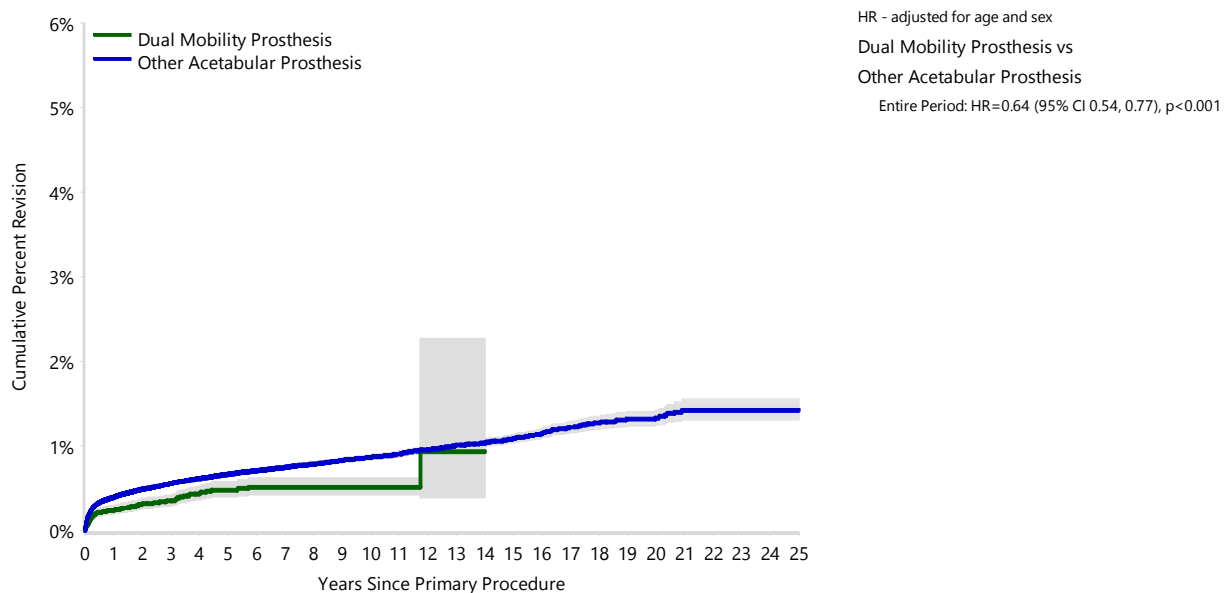
Table HT62 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA, Revision for Prosthesis Dislocation/Instability)

Acetabular Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	130	36783	0.2 (0.2, 0.3)	0.4 (0.3, 0.4)	0.5 (0.4, 0.6)	0.5 (0.4, 0.6)		
Other Acetabular Prosthesis	3291	460181	0.4 (0.4, 0.4)	0.6 (0.5, 0.6)	0.7 (0.6, 0.7)	0.9 (0.8, 0.9)	1.1 (1.0, 1.1)	1.3 (1.2, 1.4)
TOTAL	3421	496964						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT68 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA, Revision for Prosthesis Dislocation/Instability)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Dual Mobility Prosthesis	36783	28487	16120	7976	725	27	0
Other Acetabular Prosthesis	460181	413035	331012	259406	112137	34274	6491

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

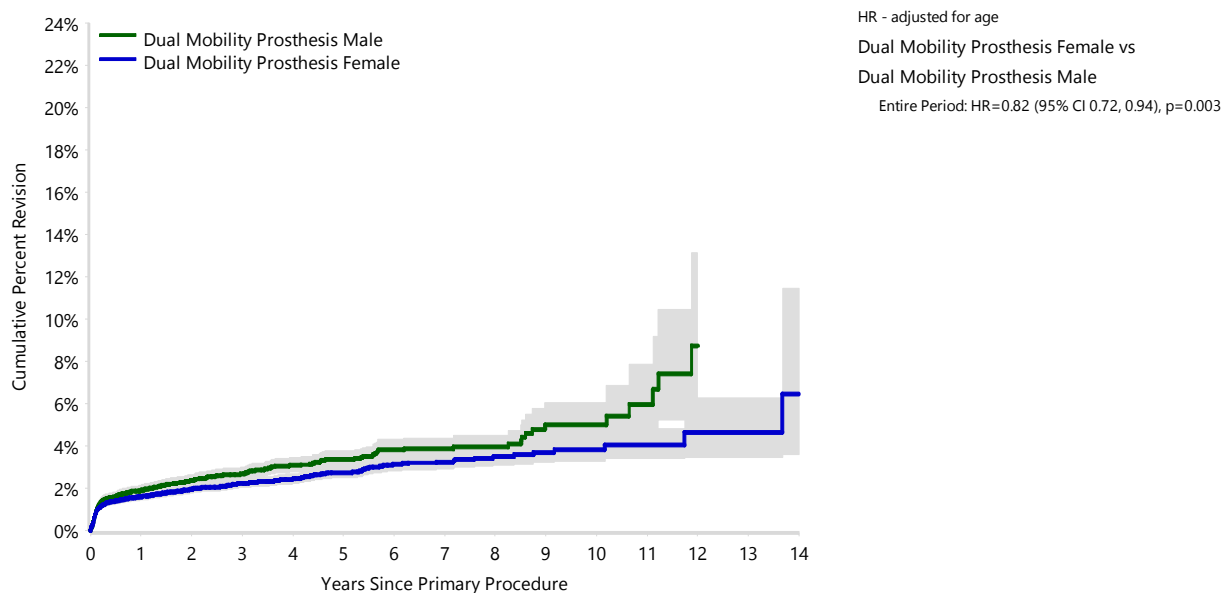
Table HT63 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Sex (Primary Diagnosis OA)

Acetabular Mobility	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	Male	370	13612	1.9 (1.7, 2.2)	2.7 (2.4, 3.0)	3.4 (3.0, 3.8)	4.0 (3.5, 4.5)	5.0 (4.1, 6.1)
	Female	519	23171	1.6 (1.4, 1.8)	2.2 (2.0, 2.5)	2.8 (2.5, 3.0)	3.5 (3.1, 3.9)	3.8 (3.3, 4.4)
TOTAL		889	36783					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT69 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	Male	13612	10422	5833	2812	737	250
	Female	23171	18065	10287	5164	1275	475

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

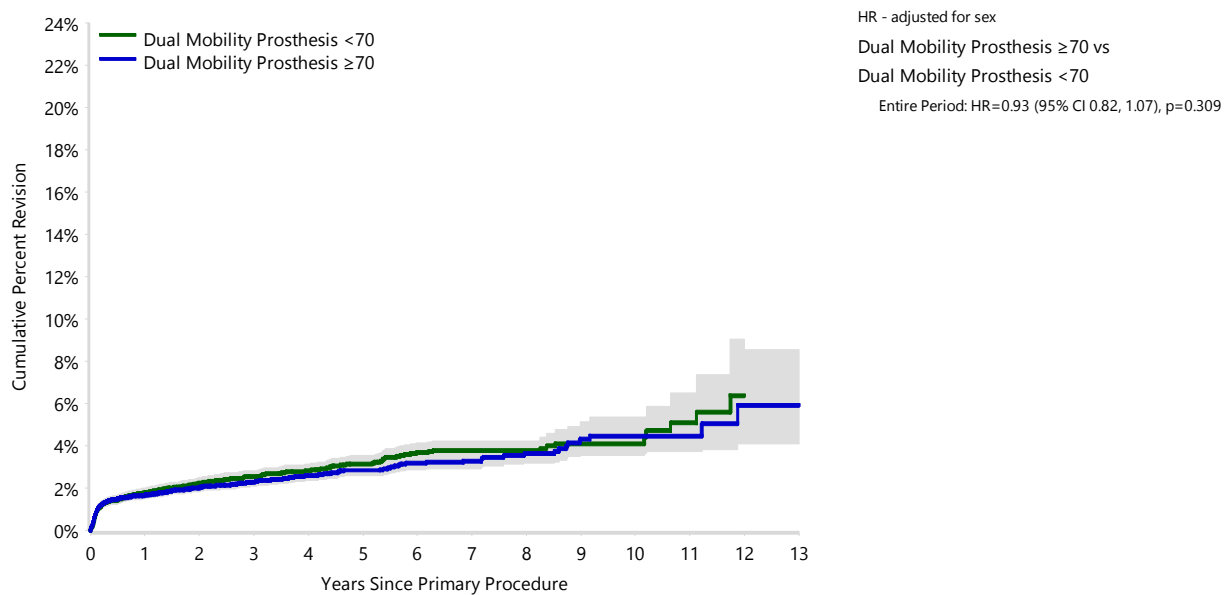
Table HT64 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)

Acetabular Mobility	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	<70	374	14386	1.8 (1.6, 2.0)	2.5 (2.3, 2.8)	3.2 (2.8, 3.5)	3.8 (3.3, 4.2)	4.1 (3.6, 4.8)
	≥70	515	22397	1.7 (1.5, 1.9)	2.3 (2.1, 2.5)	2.8 (2.6, 3.1)	3.6 (3.2, 4.1)	4.5 (3.7, 5.4)
TOTAL		889	36783					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT70 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis <70	14386	11266	6635	3508	982	357
≥70	22397	17221	9485	4468	1030	368

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

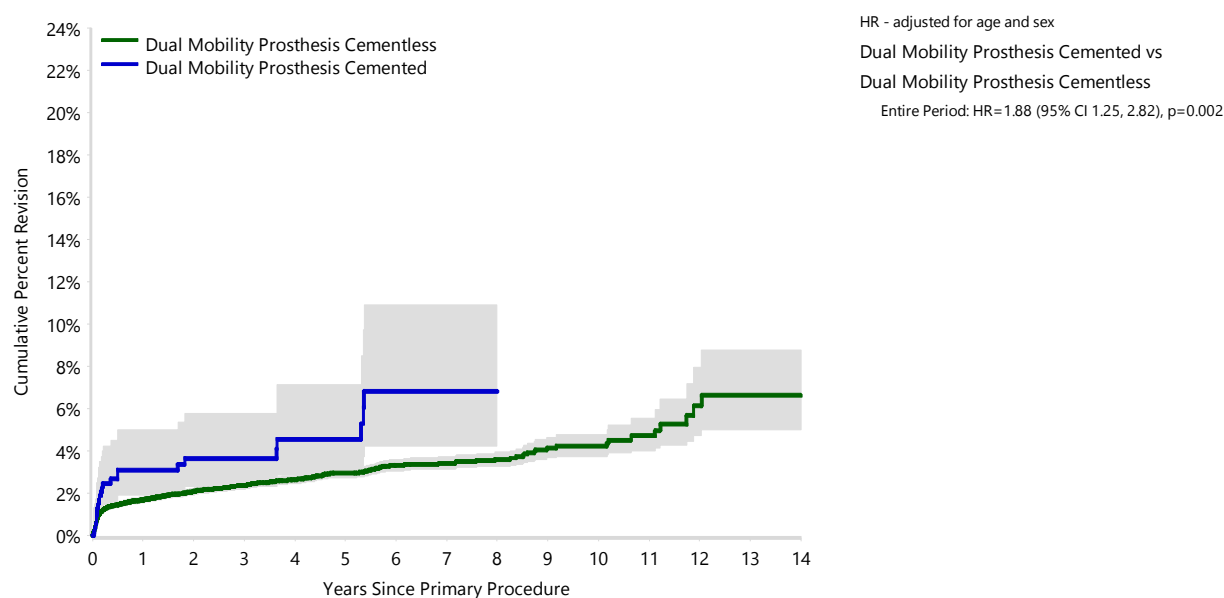
Table HT65 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Acetabular Fixation (Primary Diagnosis OA)

Acetabular Mobility	Acetabular Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	Cementless	865	36251	1.7 (1.6, 1.8)	2.4 (2.2, 2.6)	3.0 (2.7, 3.2)	3.6 (3.3, 4.0)	4.2 (3.7, 4.8)
	Cemented	24	532	3.1 (1.9, 5.0)	3.7 (2.3, 5.8)	4.6 (2.9, 7.2)	6.8 (4.2, 10.9)	
TOTAL		889	36783					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT71 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Acetabular Fixation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	Cementless	36251	28062	15872	7842	1963	711
	Cemented	532	425	248	134	49	14

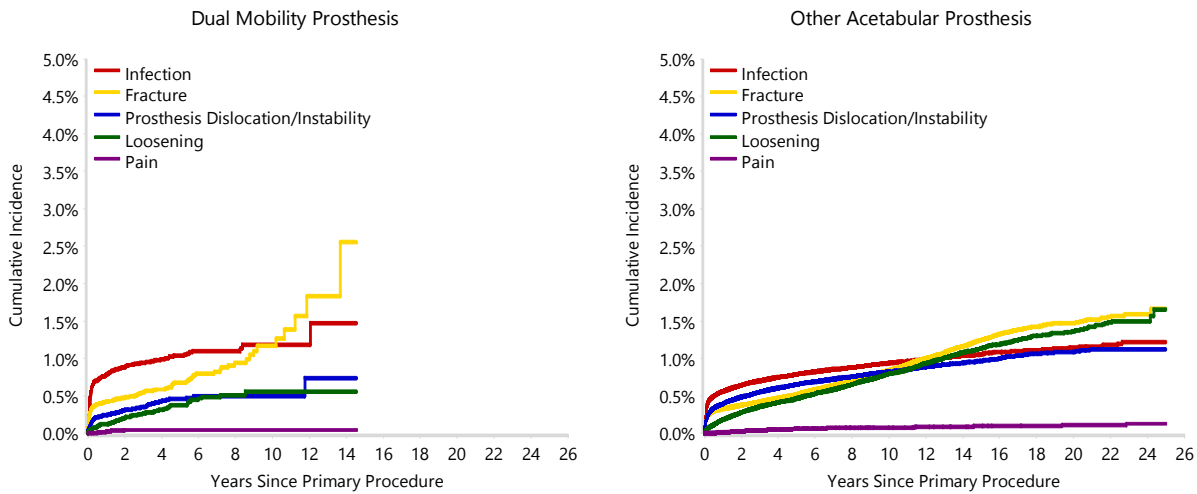
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



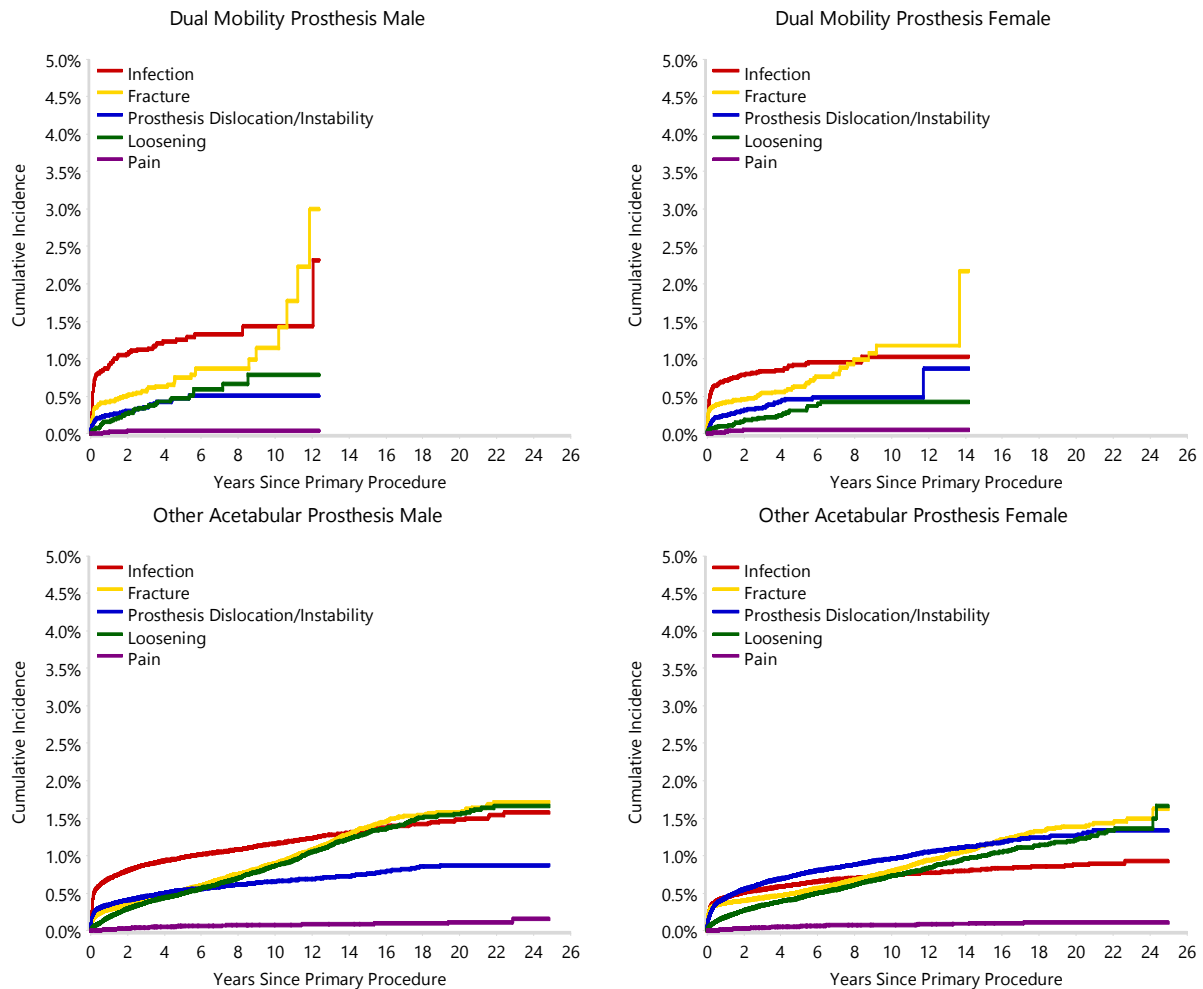
Primary Total Hip Replacement

Figure HT72 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT73 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Acetabular Mobility and Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

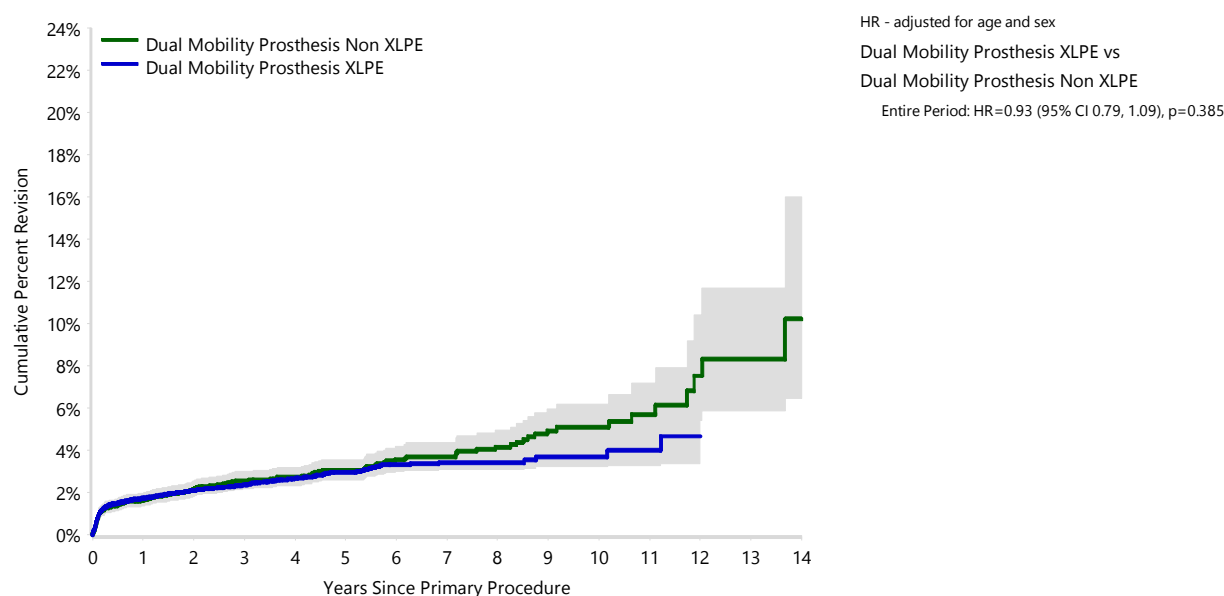
Table HT66 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)

Acetabular Mobility	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs
Dual Mobility Prosthesis	Non XLPE	197	6803	1.6 (1.4, 2.0)	2.6 (2.2, 3.0)	3.0 (2.6, 3.6)	5.1 (4.2, 6.2)
	XLPE	691	29910	1.7 (1.6, 1.9)	2.4 (2.2, 2.6)	3.0 (2.7, 3.2)	3.7 (3.2, 4.2)
TOTAL		888	36713				

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT74 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs
Dual Mobility Prosthesis	Non XLPE	6803	5724	3589	2018	388
	XLPE	29910	22715	12518	5956	336

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



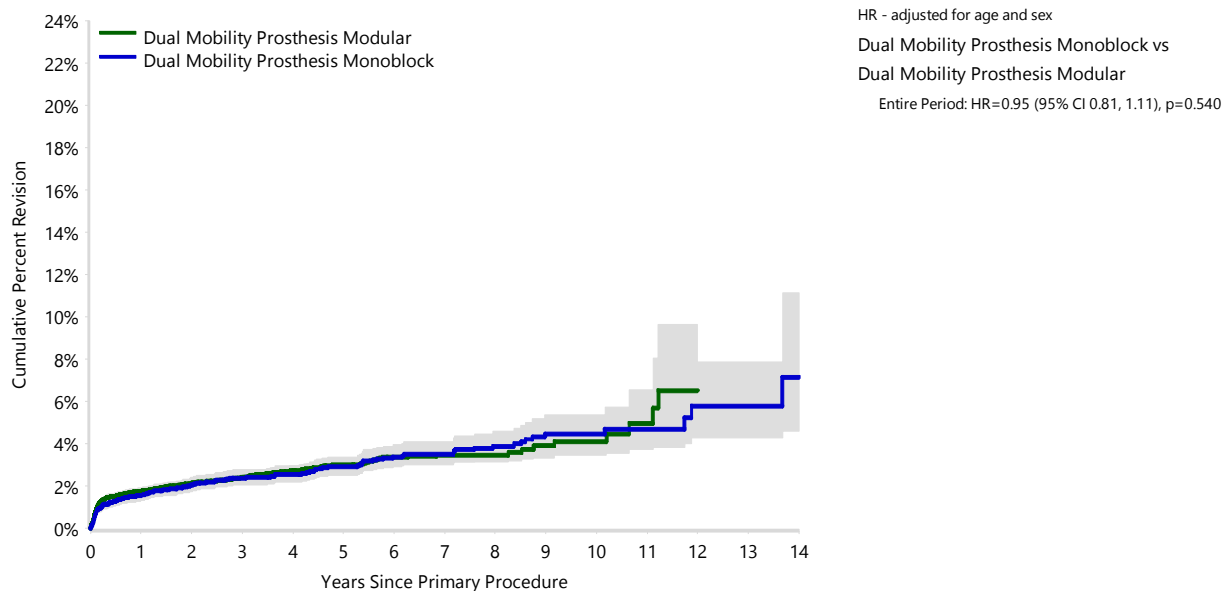
Primary Total Hip Replacement

Table HT67 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Modularity (Primary Diagnosis OA)

Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Modular	678	28675	1.8 (1.6, 1.9)	2.4 (2.2, 2.6)	3.0 (2.8, 3.3)	3.5 (3.1, 3.8)	4.1 (3.4, 4.9)
Dual Mobility Monoblock	211	8108	1.6 (1.3, 1.9)	2.4 (2.0, 2.8)	2.9 (2.5, 3.4)	3.9 (3.3, 4.6)	4.5 (3.7, 5.3)
TOTAL	889	36783					

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT75 Cumulative Percent Revision of Dual Mobility Primary Total Conventional Hip Replacement by Modularity (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Modular	28675	21865	11994	5624	973	285
Dual Mobility Monoblock	8108	6622	4126	2352	1039	440

Note: Restricted to modern prostheses

Primary Total Hip Replacement

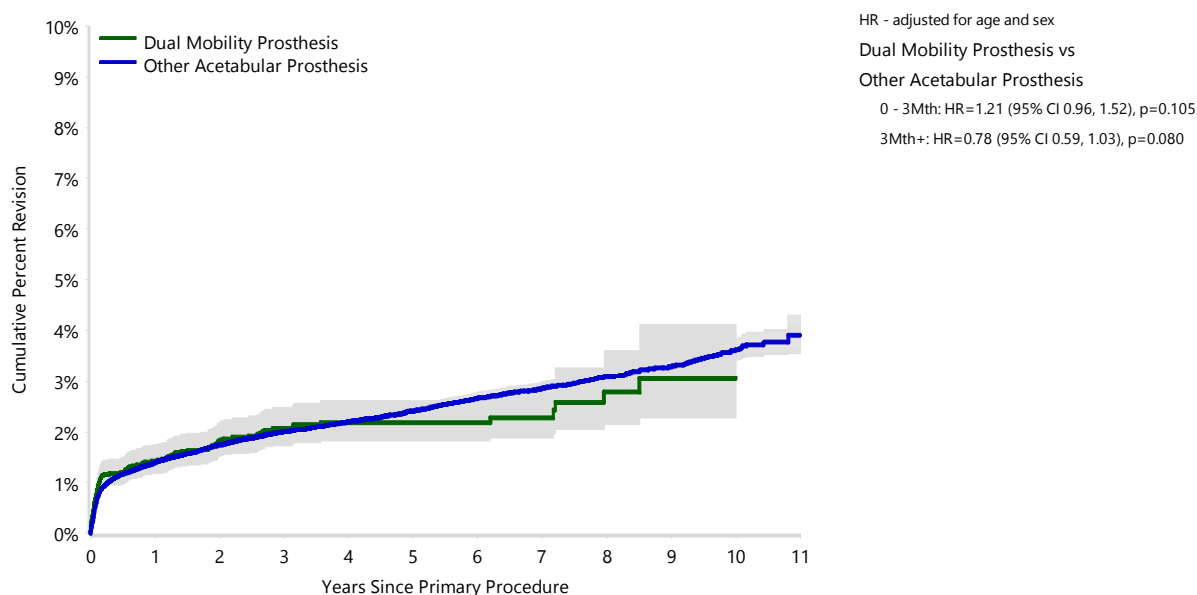
Table HT68 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)

Surgical approach	Dual mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Anterior	Dual Mobility Prosthesis	130	6901	1.4 (1.2, 1.7)	2.1 (1.7, 2.5)	2.2 (1.8, 2.6)	2.8 (2.1, 3.6)	3.1 (2.3, 4.1)
	Other Acetabular Prosthesis	2423	107469	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.4 (2.3, 2.5)	3.1 (2.9, 3.2)	3.6 (3.4, 3.8)
Lateral	Dual Mobility Prosthesis	96	2824	2.5 (1.9, 3.1)	3.1 (2.5, 3.9)	3.9 (3.1, 4.8)	4.8 (3.8, 6.0)	5.6 (4.0, 7.9)
	Other Acetabular Prosthesis	1300	40697	1.9 (1.8, 2.0)	2.6 (2.5, 2.8)	3.1 (2.9, 3.3)	3.8 (3.6, 4.0)	4.2 (4.0, 4.5)
Posterior	Dual Mobility Prosthesis	612	26212	1.7 (1.5, 1.9)	2.4 (2.2, 2.6)	3.0 (2.8, 3.3)	3.7 (3.3, 4.2)	3.9 (3.4, 4.5)
	Other Acetabular Prosthesis	4905	178465	1.8 (1.7, 1.8)	2.4 (2.4, 2.5)	2.9 (2.8, 3.0)	3.6 (3.4, 3.7)	4.1 (3.9, 4.2)
TOTAL		9466	362568					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT76 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using the Anterior Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	6901	5300	2955	1539	473	98
Other Acetabular Prosthesis	107469	91530	64637	42573	16717	4349

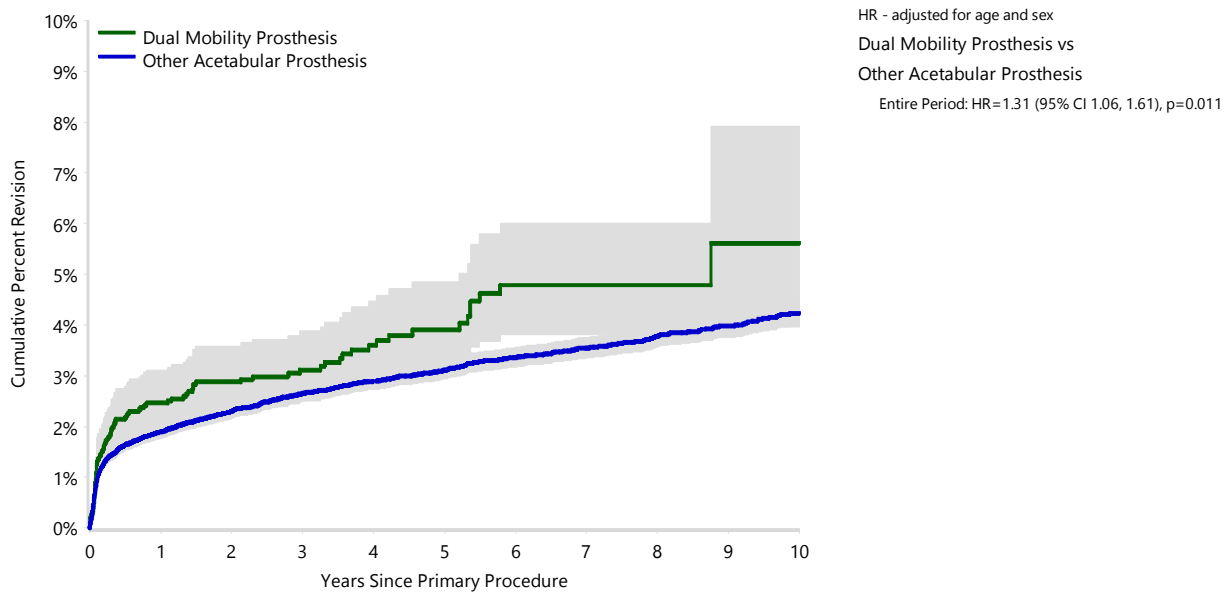
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

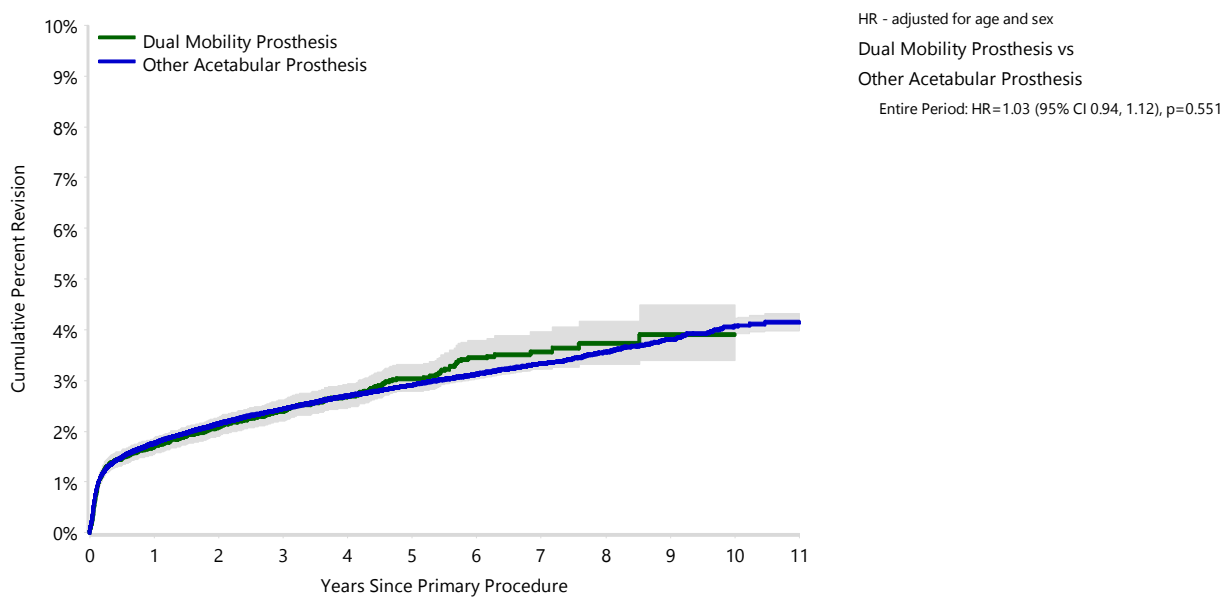
Figure HT77 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using the Lateral Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	2824	2255	1425	773	186	49
Other Acetabular Prosthesis	40697	36856	29684	22711	11724	3637

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded

Figure HT78 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using the Posterior Surgical Approach and Acetabular Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Dual Mobility Prosthesis	26212	20137	11018	5017	821	135
Other Acetabular Prosthesis	178465	154405	111560	75342	30538	7751

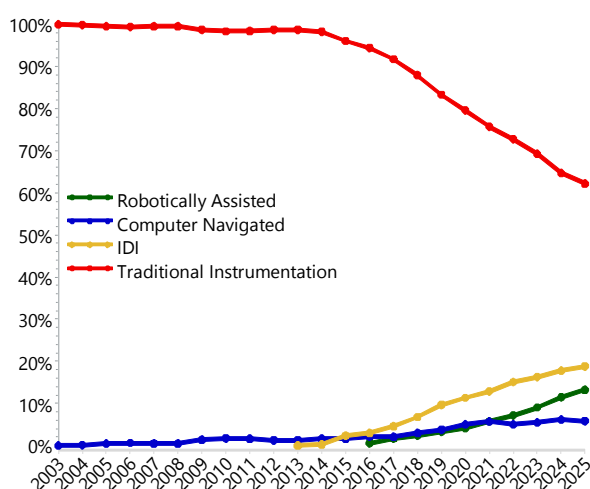
Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

SURGEON ASSISTIVE TOOLS

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of hip replacements, have been labelled as 'surgeon assistive tools'. Procedures using traditional instrumentation have decreased to 62.1% of primary hip procedures in 2025. The increase in use of each assistive tool is shown in Figure HT79. Results for primary total hip replacement for osteoarthritis with the use of these techniques are presented, followed by a comparison of the assistive tools used with XLPE since 2016. Revision outcomes are analysed using each of these methods compared to traditional instrumentation.

Figure HT79 Primary Total Conventional Hip Replacement by Surgeon Assistive Tools (Primary Diagnosis OA)



Computer Navigation

There have been 17,758 primary total hip replacement procedures using computer navigation. In 2025, computer navigation is used in 5.8% of all primary total hip replacement procedures.

When adjusted for age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume, there is no difference in the rate of revision when procedures using computer navigation are compared to procedures using traditional instrumentation (Table HT69, Figure HT80 and Figure HT81).

Using the same adjustments, there is no difference in the rate of revision for patients aged <65 years or ≥65 years when computer navigation is used compared to traditional instrumentation (Table HT70 and Figure HT82).

The outcomes of five prosthesis combinations used with computer navigation and traditional instrumentation with >1,000 procedures in each group are shown in Table HT71 and Table HT72.

IMAGE DERIVED INSTRUMENTATION (IDI)

IDI is the use of custom-made preparation and/or alignment guides derived from images by 3D printing specifically for each patient, to facilitate accurate placement of acetabular and femoral components.

There are 43,691 primary total hip replacement procedures undertaken using IDI since 2013. In 2025, IDI is used in 18.8% of all primary total hip replacement procedures. There are limited prosthesis types that are used with IDI.

When procedures using IDI are compared to procedures using traditional instrumentation, adjusting for age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume, IDI usage has a lower rate of revision (Table HT73 and Figure HT83). There is a lower proportion of revision for dislocation/instability when IDI is used (Figure HT84).

Using the same adjustments, for patients aged ≥65 years where IDI is used, there is a lower rate of revision compared to traditional instrumentation, while a lower rate of revision is only for the first 3 months with IDI for patients aged <65 years (Table HT74 and Figure HT85).

The outcomes of 4 prosthesis combinations used with IDI and with traditional instrumentation, and with >2,000 procedures in each group, are shown in Table HT75 and Table HT76.

Robotic Assistance

Robotic assistance has been recorded for 22,704 total hip replacements since 2016. In 2025, robotic assistance is used in 13.2% of all primary total hip replacement procedures. There are 4 robotic systems that are used with a small number of prostheses.

When adjusted for age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation until 1.5 years, after which time robotic assistance has a higher rate of revision (Table HT77 and Figure HT86). There are increased proportions of revisions for infection and fracture using robotic assistance (Figure HT87). Using the same adjustments, there is no difference in the rate of revision for patients aged <65 years or for patients aged ≥65 years when robotic assistance is used compared to traditional instrumentation (Table HT78 and Figure HT88).

The outcomes of six prosthesis combinations used with robotic assistance and traditional instrumentation with >1,000 procedures in each group are shown in Table HT79 and Table HT80.



Primary Total Hip Replacement

Surgeon Assistive Tools Compared

Total conventional hip procedures since 2016 for osteoarthritis using XLPE with the use of assistive tools and adjusted for age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume are compared in Table HT81 and Figure HT89.

Procedures using robotic assistance have a higher rate of revision compared to where IDI is used and when compared to traditional instrumentation after 1.5 years. Compared to IDI, computer navigation has a higher rate of revision, while traditional instrumentation has a higher rate of revision only for the first 3 months.

Prosthesis-Specific Analysis

There are two prosthesis combinations using XLPE that have used at least three different assistive methods with over 1,000 procedures in each group. The analyses for these two prostheses have been adjusted for age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

There is no difference in the rate of revision when comparing computer navigation, robotic assistance or traditional instrumentation using the Accolade II/Trident (Shell) combination (Table HT82 and Figure HT90).

The Exeter V40/Trident (Shell) combination also shows no difference when procedures using any of the three types of assistive tools are compared (Table HT83 and Figure HT91).

Table HT69 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)

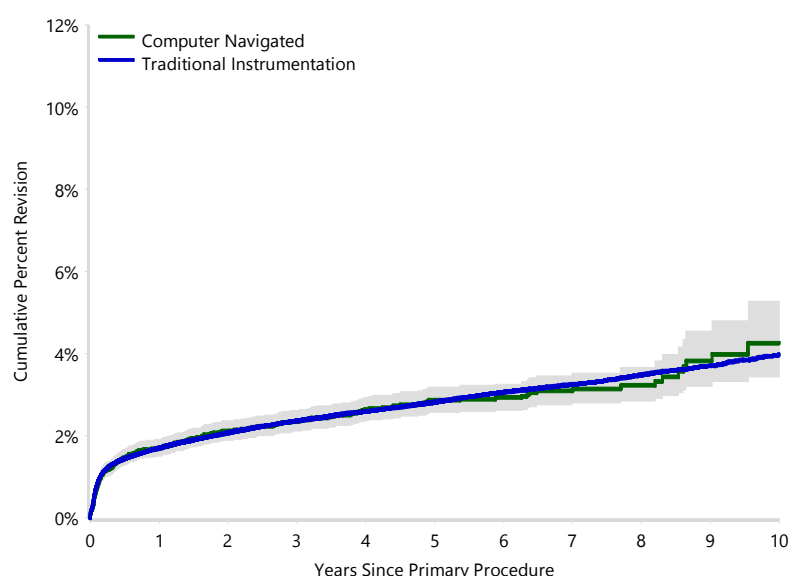
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Computer Navigated	379	15851	1.7 (1.5, 1.9)	2.4 (2.1, 2.6)	2.9 (2.6, 3.2)	3.2 (2.8, 3.7)	4.3 (3.4, 5.3)
Traditional Instrumentation	7316	268079	1.7 (1.7, 1.8)	2.4 (2.3, 2.4)	2.8 (2.7, 2.9)	3.5 (3.4, 3.6)	4.0 (3.9, 4.1)
TOTAL	7695	283930					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Figure HT80 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)



HR - adjusted for age, sex, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Traditional Instrumentation vs Computer Navigated

Entire Period: HR=1.03 (95% CI 0.93, 1.14), p=0.557

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Computer Navigated	15851	12976	8015	4281	1052	214
Traditional Instrumentation	268079	235125	175746	121969	51410	13412

Note: Restricted to modern prostheses

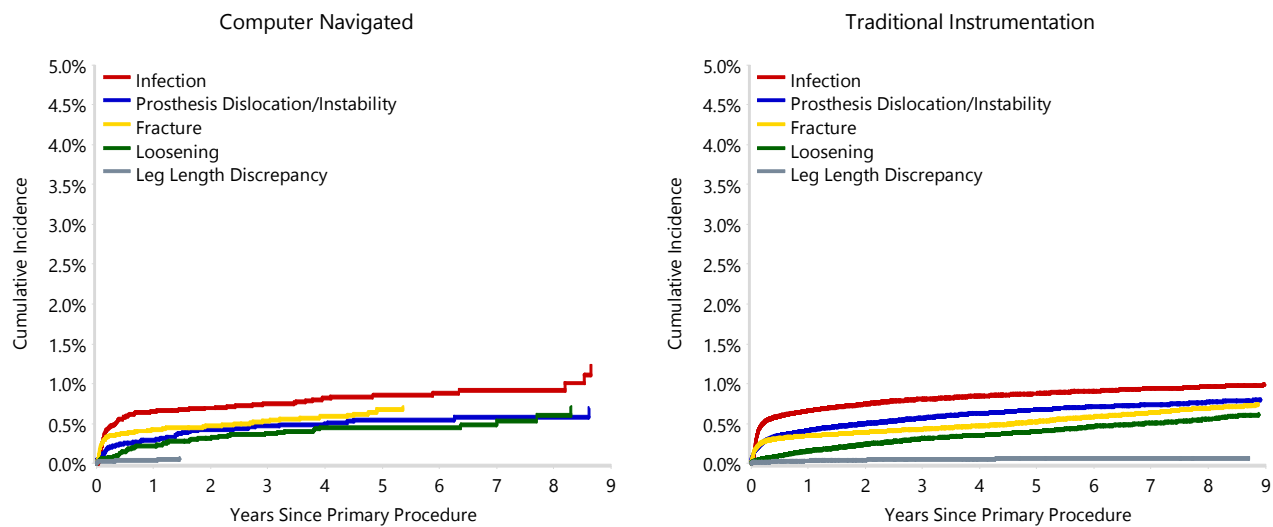
All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.



Primary Total Hip Replacement

Figure HT81 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation (Primary Diagnoses OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT70 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)

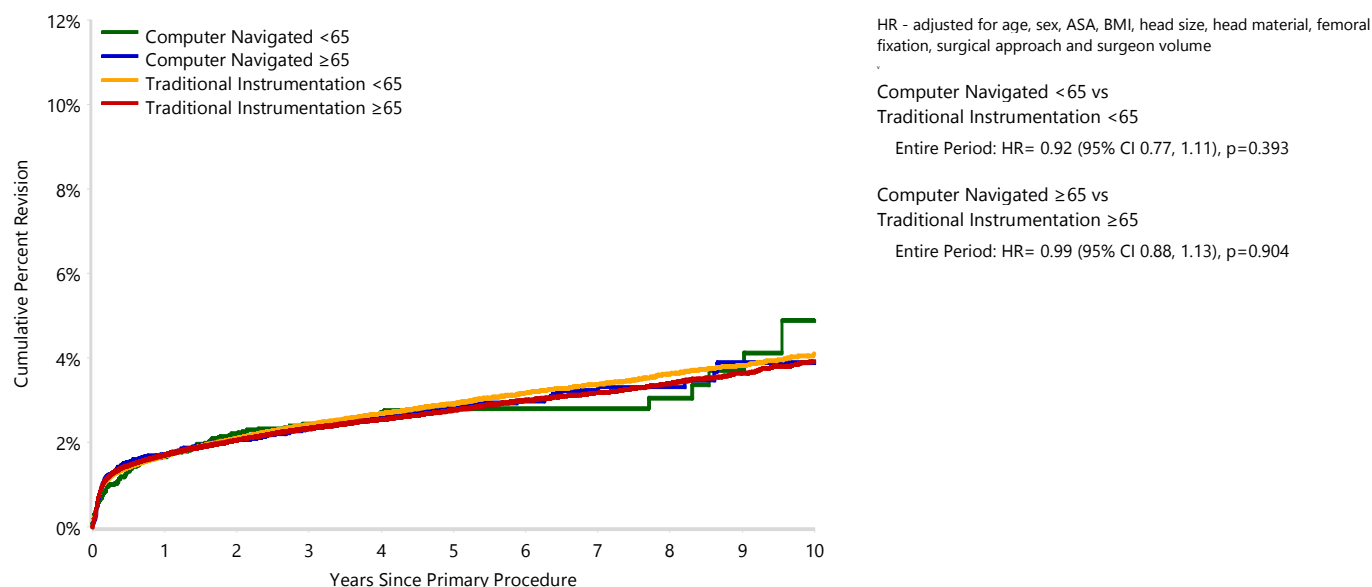
Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Computer Navigated	<65	120	4986	1.7 (1.3, 2.1)	2.4 (2.0, 2.9)	2.8 (2.3, 3.4)	3.0 (2.4, 3.8)	4.9 (3.2, 7.4)
	≥65	259	10865	1.7 (1.5, 2.0)	2.3 (2.0, 2.6)	2.9 (2.5, 3.3)	3.3 (2.9, 3.8)	3.9 (3.1, 4.8)
Traditional Instrumentation	<65	2596	89846	1.7 (1.6, 1.8)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.6 (3.5, 3.8)	4.1 (3.9, 4.3)
	≥65	4720	178233	1.7 (1.6, 1.8)	2.3 (2.3, 2.4)	2.8 (2.7, 2.8)	3.4 (3.3, 3.5)	3.9 (3.8, 4.1)
TOTAL		7695	283930					

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Figure HT82 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	8 Yrs	10 Yrs
Computer Navigated	<65	4986	4120	2582	1432	365	74
	≥65	10865	8856	5433	2849	687	140
Traditional Instrumentation	<65	89846	79907	61599	44466	20589	5743
	≥65	178233	155218	114147	77503	30821	7669

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT71 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Accolade II/Trident (Shell)	Computer Navigated	60	2018	2.2 (1.7, 3.0)	2.7 (2.0, 3.5)	2.9 (2.3, 3.8)	3.2 (2.5, 4.2)	3.2 (2.5, 4.2)	3.7 (2.6, 5.3)
	Traditional Instrumentation	343	12561	1.9 (1.6, 2.1)	2.2 (2.0, 2.5)	2.5 (2.2, 2.8)	2.8 (2.6, 3.2)	3.2 (2.8, 3.5)	3.4 (3.0, 3.8)
CORAIL/PINNACLE	Computer Navigated	38	1651	1.2 (0.8, 1.9)	1.5 (1.0, 2.2)	1.8 (1.2, 2.6)	2.6 (1.8, 3.7)	3.3 (2.2, 4.9)	4.5 (2.8, 7.2)
	Traditional Instrumentation	1191	39617	1.7 (1.5, 1.8)	2.1 (1.9, 2.2)	2.4 (2.3, 2.6)	2.9 (2.7, 3.1)	3.3 (3.1, 3.5)	3.8 (3.6, 4.0)
Exeter V40/Trident (Shell)	Computer Navigated	41	1738	1.3 (0.8, 1.9)	1.6 (1.1, 2.3)	1.8 (1.3, 2.6)	2.3 (1.7, 3.1)	2.6 (1.9, 3.6)	2.6 (1.9, 3.6)
	Traditional Instrumentation	1046	43244	1.3 (1.2, 1.4)	1.6 (1.5, 1.8)	1.9 (1.8, 2.0)	2.3 (2.2, 2.5)	2.8 (2.6, 3.0)	3.2 (3.0, 3.5)
Polarstem/R3	Computer Navigated	15	1079	1.5 (0.9, 2.5)	1.5 (0.9, 2.5)	1.5 (0.9, 2.5)	1.5 (0.9, 2.5)	1.5 (0.9, 2.5)	3.3 (1.1, 9.6)
	Traditional Instrumentation	555	21049	1.9 (1.8, 2.1)	2.2 (2.0, 2.4)	2.4 (2.2, 2.6)	2.8 (2.6, 3.1)	3.1 (2.8, 3.4)	3.4 (3.1, 3.8)
Taperloc/G7	Computer Navigated	32	1243	2.1 (1.4, 3.0)	2.7 (1.9, 3.8)	2.7 (1.9, 3.8)	2.8 (2.0, 4.0)	2.8 (2.0, 4.0)	
	Traditional Instrumentation	156	5861	2.0 (1.7, 2.4)	2.2 (1.9, 2.7)	2.6 (2.2, 3.0)	2.8 (2.4, 3.3)	3.1 (2.6, 3.6)	3.2 (2.7, 3.7)
TOTAL		3477	130061						

Note: Restricted to modern prostheses

Only prosthesis combinations with >1,000 procedures in both groups have been listed

Table HT72 Comparisons of Revision Rates for Primary Total Conventional Hip Replacement Since 2015 by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Prosthesis Combination	Comparison	HR – adjusted for age, sex, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume.
Accolade II/Trident (Shell)	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=1.20 (95% CI 0.89, 1.64), p=0.234
CORAIL/PINNACLE	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=1.04 (95% CI 0.74, 1.46), p=0.835
Exeter V40/Trident (Shell)	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=0.90 (95% CI 0.60, 1.35), p=0.613
Polarstem/R3	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=0.58 (95% CI 0.35, 0.98), p=0.042
Taperloc/G7	Computer Navigated vs Traditional Instrumentation	Entire Period: HR=1.07 (95% CI 0.72, 1.58), p=0.753

Note: Restricted to modern prostheses

Only prosthesis combinations with >1,000 procedures in both groups have been listed



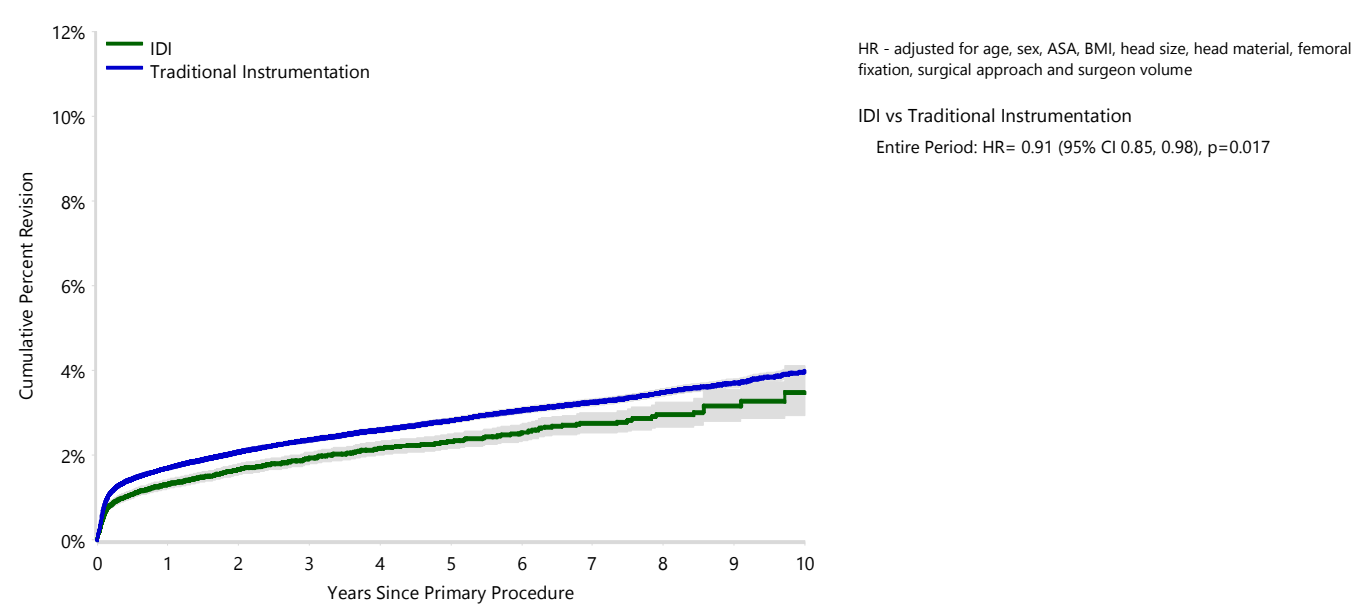
Primary Total Hip Replacement

Table HT73 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
IDI	804	42842	1.3 (1.2, 1.4)	1.9 (1.8, 2.1)	2.3 (2.2, 2.5)	2.8 (2.5, 3.0)	3.2 (2.8, 3.6)	3.5 (2.9, 4.1)
Traditional Instrumentation	7316	268079	1.7 (1.7, 1.8)	2.4 (2.3, 2.4)	2.8 (2.7, 2.9)	3.2 (3.2, 3.3)	3.7 (3.6, 3.8)	4.0 (3.9, 4.1)
TOTAL	8120	310921						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Figure HT83 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



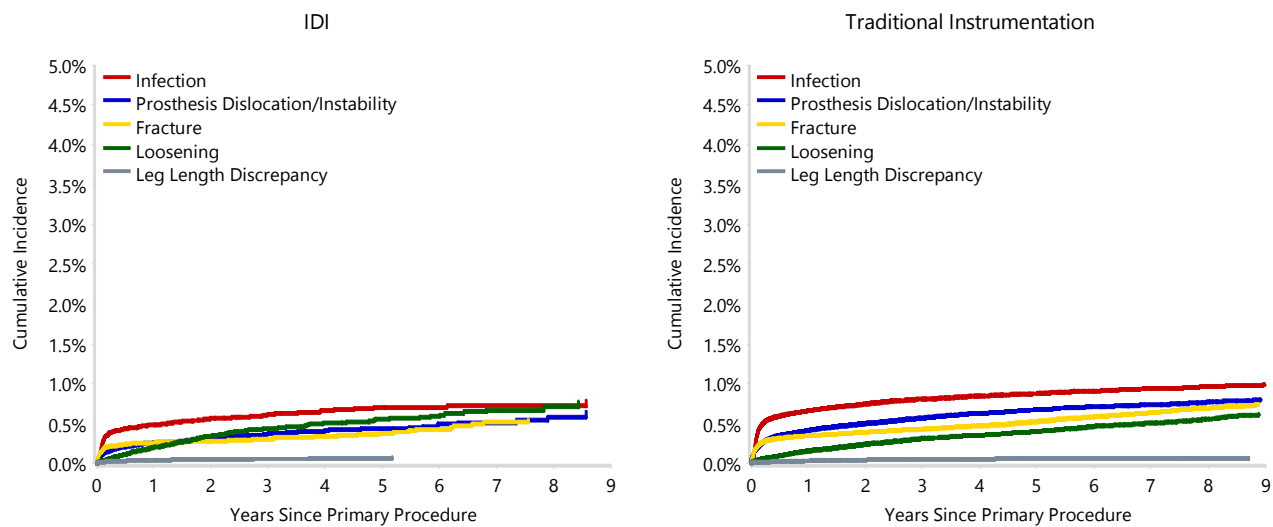
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
IDI	42842	33980	19622	9863	3778	937	361
Traditional Instrumentation	268079	235125	175746	121969	73727	30940	13412

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT84 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT74 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)

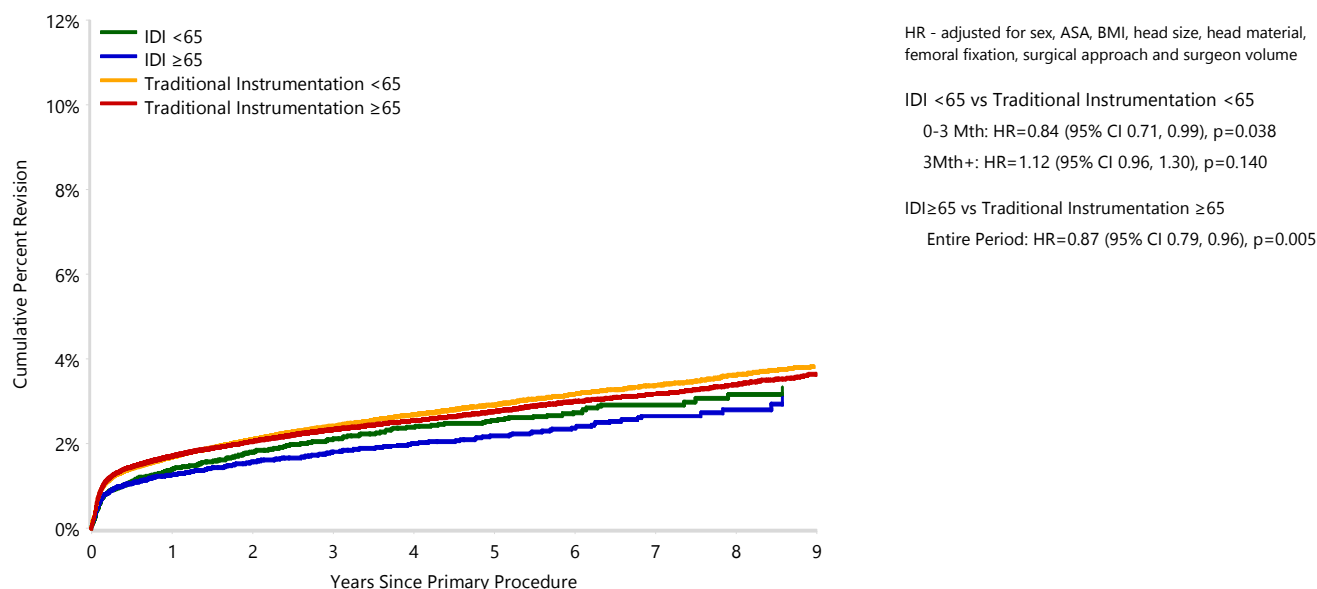
Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
IDI	<65	346	16642	1.4 (1.2, 1.6)	2.1 (1.9, 2.4)	2.5 (2.3, 2.8)	2.9 (2.6, 3.3)	3.3 (2.8, 3.9)	3.6 (2.9, 4.3)
	≥65	458	26200	1.3 (1.1, 1.4)	1.8 (1.6, 2.0)	2.2 (2.0, 2.4)	2.7 (2.3, 3.0)	3.1 (2.6, 3.6)	3.5 (2.6, 4.6)
Traditional Instrumentation	<65	2596	89846	1.7 (1.6, 1.8)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.4 (3.2, 3.5)	3.8 (3.7, 4.0)	4.1 (3.9, 4.3)
	≥65	4720	178233	1.7 (1.6, 1.8)	2.3 (2.3, 2.4)	2.8 (2.7, 2.8)	3.2 (3.1, 3.3)	3.6 (3.5, 3.8)	3.9 (3.8, 4.1)
TOTAL		8120	310921						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Figure HT85 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
IDI	<65	16642	13504	8198	4273	1771	452	186
	≥65	26200	20476	11424	5590	2007	485	175
Traditional Instrumentation	<65	89846	79907	61599	44466	28543	12894	5743
	≥65	178233	155218	114147	77503	45184	18046	7669

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT75 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	8 Yrs	10 Yrs
AMiStem H/Mpact	IDI	38	2014	1.1 (0.7, 1.7)	1.5 (1.0, 2.1)	1.9 (1.3, 2.7)	2.1 (1.5, 3.0)		
	Traditional Instrumentation	80	2540	1.7 (1.3, 2.3)	2.1 (1.6, 2.7)	2.5 (1.9, 3.2)	3.3 (2.7, 4.2)	4.2 (3.3, 5.4)	
Metafix/Trinity	IDI	263	13582	1.3 (1.1, 1.5)	1.7 (1.5, 1.9)	2.0 (1.7, 2.3)	2.3 (2.0, 2.6)	2.8 (2.4, 3.2)	2.8 (2.4, 3.2)
	Traditional Instrumentation	198	8339	1.5 (1.3, 1.8)	1.9 (1.6, 2.2)	2.2 (1.9, 2.5)	2.4 (2.0, 2.7)	2.9 (2.5, 3.4)	3.3 (2.7, 4.0)
Paragon/Trinity	IDI	30	2765	1.1 (0.7, 1.5)	1.2 (0.8, 1.7)	1.4 (0.9, 2.1)			
	Traditional Instrumentation	73	3619	1.8 (1.4, 2.3)	2.1 (1.7, 2.6)	2.1 (1.7, 2.7)	2.1 (1.7, 2.7)		
Taper Fit/Trinity	IDI	65	3088	1.5 (1.1, 2.0)	1.8 (1.4, 2.3)	2.1 (1.6, 2.7)	2.6 (2.0, 3.4)	3.3 (2.2, 4.9)	
	Traditional Instrumentation	66	2688	1.6 (1.1, 2.1)	2.0 (1.6, 2.7)	2.2 (1.7, 2.9)	2.8 (2.2, 3.6)	3.1 (2.4, 4.0)	3.1 (2.4, 4.0)
TOTAL		813	38635						

Note: Restricted to modern prostheses

Only prosthesis combinations with >2,000 procedures in both groups have been listed

Restricted to procedures with known sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Table HT76 Comparisons of Revision Rates for Primary Total Conventional Hip Replacement Since 2015 by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Prosthesis Combination	Comparison	HR – adjusted for age, sex, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume.
AMiStem H/Mpact	IDI vs Traditional Instrumentation	Entire Period: HR=0.75 (95% CI 0.51, 1.12), p=0.158
Metafix/Trinity	IDI vs Traditional Instrumentation	Entire Period: HR=0.92 (95% CI 0.76, 1.11), p=0.386
Paragon/Trinity	IDI vs Traditional Instrumentation	Entire Period: HR=0.61 (95% CI 0.39, 0.96), p=0.034
Taper Fit/Trinity	IDI vs Traditional Instrumentation	Entire Period: HR=0.79 (95% CI 0.56, 1.13), p=0.203

Note: Restricted to modern prostheses

Only prosthesis combinations with >2,000 procedures in both groups have been listed



Primary Total Hip Replacement

Table HT77 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)

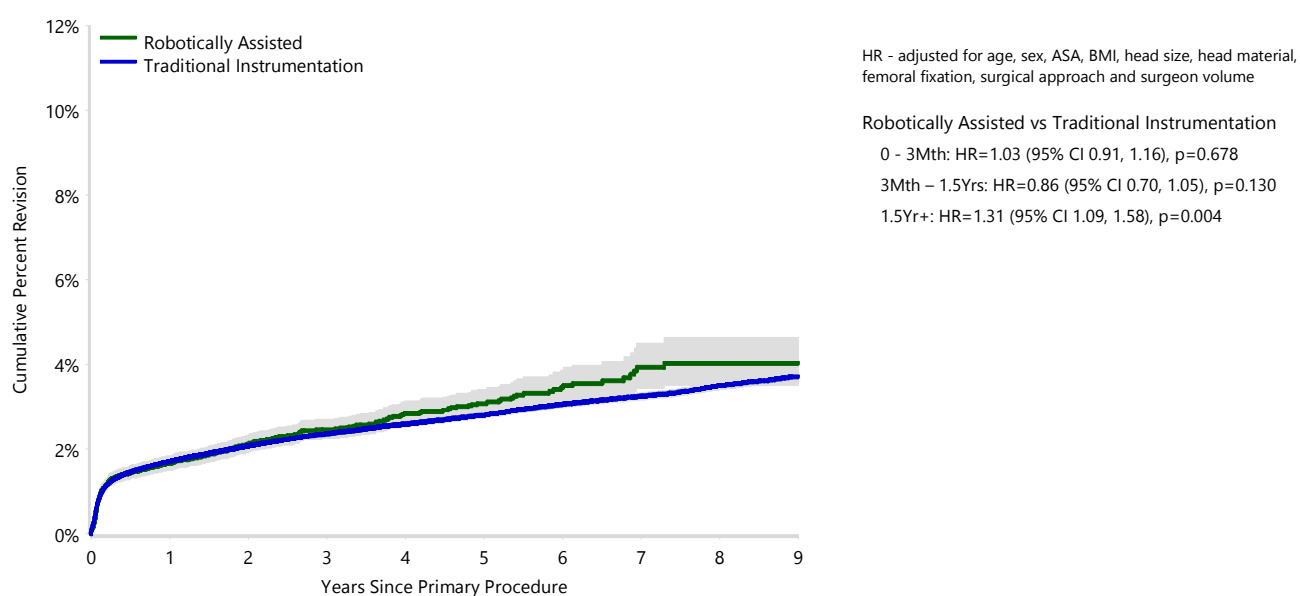
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	505	22511	1.7 (1.5, 1.9)	2.5 (2.2, 2.7)	3.1 (2.8, 3.4)	3.9 (3.4, 4.5)	4.0 (3.5, 4.6)	4.0 (3.5, 4.6)
Traditional Instrumentation	6669	250784	1.7 (1.7, 1.8)	2.4 (2.3, 2.4)	2.8 (2.7, 2.9)	3.2 (3.2, 3.3)	3.5 (3.4, 3.6)	3.7 (3.6, 3.8)
TOTAL	7174	273295						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Figure HT86 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)



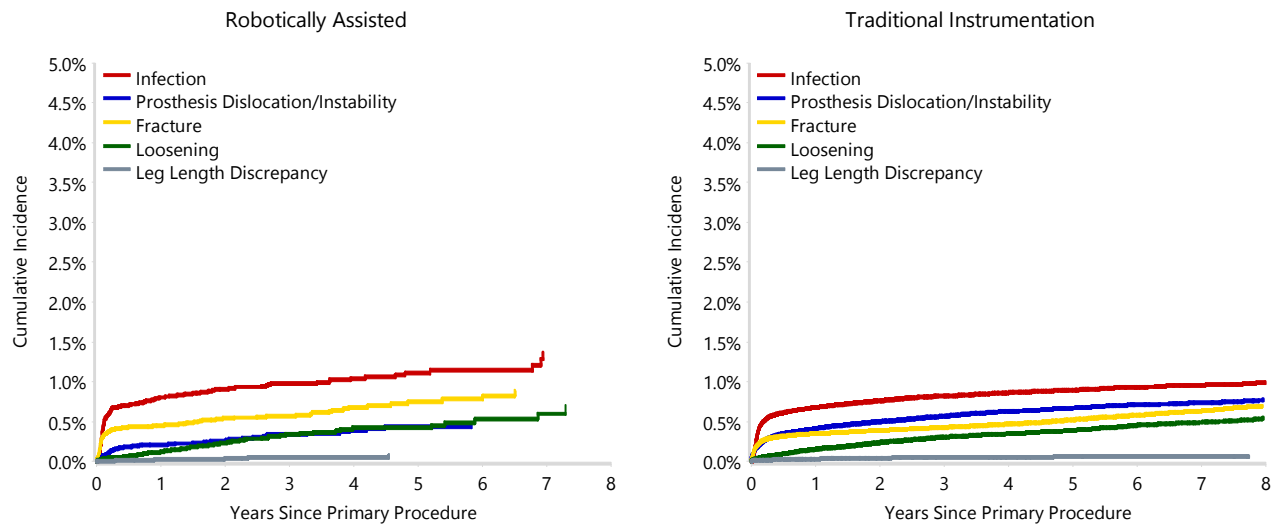
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	22511	16308	7690	3248	1127	505	112
Traditional Instrumentation	250784	218232	159387	106279	58849	36989	17007

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT87 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance (Primary Diagnoses OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT78 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)

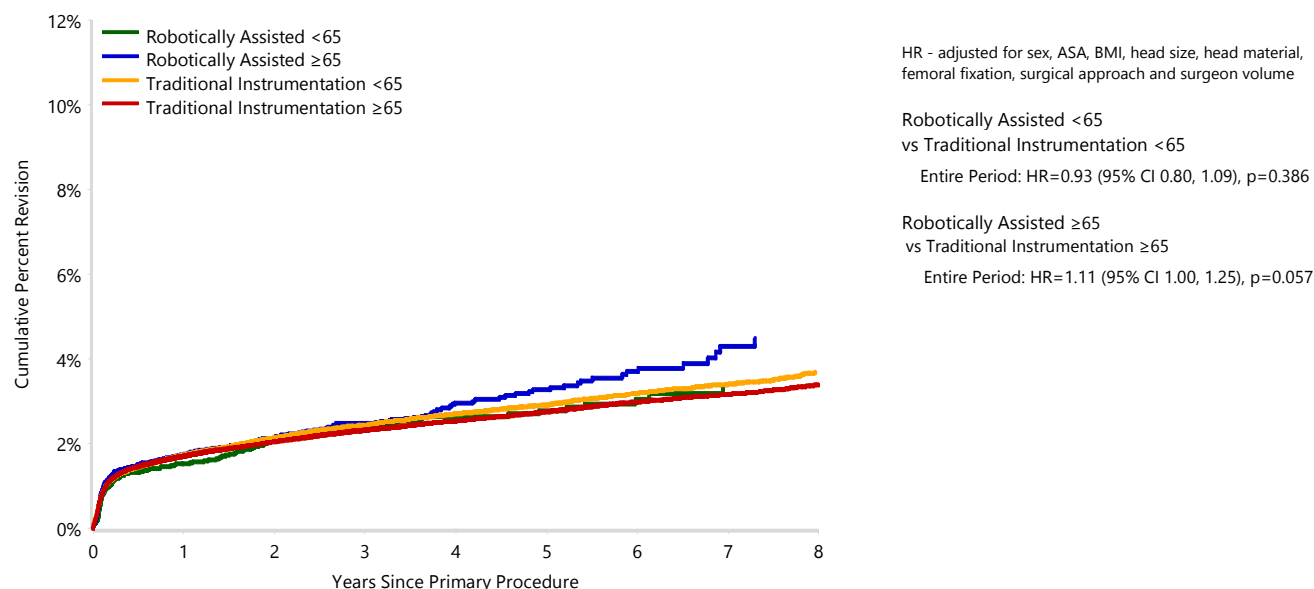
Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	<65	166	7809	1.5 (1.3, 1.8)	2.4 (2.1, 2.9)	2.8 (2.3, 3.3)	3.4 (2.7, 4.2)	3.4 (2.7, 4.2)	3.4 (2.7, 4.2)
	≥65	339	14702	1.7 (1.5, 2.0)	2.5 (2.2, 2.8)	3.3 (2.9, 3.7)	4.3 (3.6, 5.1)	4.5 (3.7, 5.4)	4.5 (3.7, 5.4)
Traditional Instrumentation	<65	2366	83548	1.7 (1.6, 1.8)	2.4 (2.3, 2.6)	2.9 (2.8, 3.0)	3.4 (3.3, 3.6)	3.7 (3.5, 3.9)	3.9 (3.7, 4.1)
	≥65	4303	167236	1.7 (1.6, 1.8)	2.3 (2.2, 2.4)	2.8 (2.7, 2.8)	3.2 (3.1, 3.3)	3.4 (3.3, 3.5)	3.6 (3.5, 3.8)
TOTAL		7174	273295						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume.

Figure HT88 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	<65	7809	5817	2917	1307	496	234	51
	≥65	14702	10491	4773	1941	631	271	61
Traditional Instrumentation	<65	83548	73697	55497	38478	22641	14741	7099
	≥65	167236	144535	103890	67801	36208	22248	9908

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT79 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Accolade II/ Trident (Shell)	Robotically Assisted	142	5317	1.8 (1.5, 2.2)	2.7 (2.2, 3.2)	3.2 (2.7, 3.8)	3.8 (3.0, 4.8)	3.8 (3.0, 4.8)	
	Traditional Instrumentation	330	11743	1.9 (1.7, 2.2)	2.6 (2.3, 2.9)	2.9 (2.6, 3.3)	3.3 (2.9, 3.7)	3.6 (3.2, 4.0)	3.6 (3.2, 4.0)
Accolade II/ Trident II/ Tritanium (Shell)	Robotically Assisted	104	5038	1.9 (1.6, 2.4)	2.8 (2.2, 3.6)				
	Traditional Instrumentation	32	1714	1.8 (1.2, 2.6)	2.4 (1.7, 3.6)				
Accolade II/ Trident/ Tritanium (Shell)	Robotically Assisted	82	2012	2.5 (1.9, 3.3)	3.6 (2.9, 4.5)	4.0 (3.2, 4.9)	4.6 (3.6, 5.8)	4.6 (3.6, 5.8)	4.6 (3.6, 5.8)
	Traditional Instrumentation	62	1751	1.9 (1.4, 2.7)	3.0 (2.3, 3.9)	3.4 (2.6, 4.4)	4.0 (3.1, 5.2)	4.0 (3.1, 5.2)	4.3 (3.3, 5.7)
Exeter V40/ Trident (Shell)	Robotically Assisted	78	3852	1.3 (1.0, 1.8)	1.9 (1.5, 2.4)	2.7 (2.1, 3.5)	3.7 (2.6, 5.2)	4.1 (2.9, 5.9)	4.1 (2.9, 5.9)
	Traditional Instrumentation	962	40260	1.3 (1.2, 1.4)	1.9 (1.7, 2.0)	2.3 (2.1, 2.5)	2.8 (2.6, 3.0)	3.0 (2.8, 3.2)	3.2 (3.0, 3.5)
Exeter V40/ Trident II/ Tritanium (Shell)	Robotically Assisted	27	1957	1.3 (0.9, 2.0)	2.1 (1.3, 3.5)				
	Traditional Instrumentation	44	2613	1.5 (1.1, 2.1)	2.3 (1.7, 3.3)				
Short Exeter V40/ Trident (Shell)	Robotically Assisted	20	1044	1.0 (0.5, 1.8)	1.6 (1.0, 2.8)	2.6 (1.5, 4.3)	4.6 (2.5, 8.1)		
	Traditional Instrumentation	90	4080	1.3 (1.0, 1.7)	1.9 (1.5, 2.4)	2.4 (2.0, 3.0)	2.7 (2.1, 3.4)	2.8 (2.2, 3.6)	3.5 (2.6, 4.7)
TOTAL		1973	81381						

Note: Restricted to modern prostheses

Restricted to prosthesis combinations with > 1,000 procedures in both groups - only one combination had >5000 procedures

Table HT80 Comparisons of Revision Rates for Primary Total Conventional Hip Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Comparison	HR – adjusted for age, sex, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume.
Accolade II/ Trident (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=1.12 (95% CI 0.90, 1.41), p=0.309
Accolade II/ Trident II/ Tritanium (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=1.40 (95% CI 0.92, 2.14), p=0.119
Accolade II/ Trident/ Tritanium (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=1.33 (95% CI 0.94, 1.89), p=0.107
Exeter V40/ Trident (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=1.06 (95% CI 0.83, 1.34), p=0.642
Exeter V40/ Trident II/ Tritanium (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=0.77 (95% CI 0.47, 1.28), p=0.316
Exeter V40/ Trident (Shell)	Robotically Assisted vs Traditional Instrumentation	Entire Period: HR=0.99 (95% CI 0.59, 1.66), p=0.973

Note: Restricted to modern prostheses

Only prosthesis combinations with > 1,000 procedures in both groups have been listed



Primary Total Hip Replacement

Table HT81 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

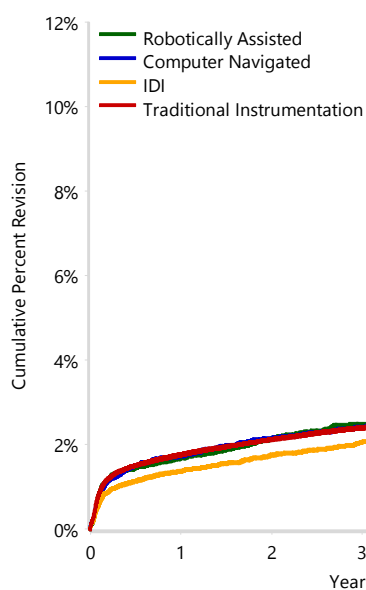
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	501	22315	1.7 (1.5, 1.9)	2.5 (2.3, 2.7)	3.1 (2.8, 3.5)	4.0 (3.5, 4.6)	4.0 (3.5, 4.6)	4.0 (3.5, 4.6)
Computer Navigated	340	14334	1.7 (1.5, 2.0)	2.4 (2.2, 2.7)	2.9 (2.6, 3.2)	3.1 (2.7, 3.5)	3.2 (2.8, 3.6)	3.7 (3.0, 4.5)
IDI	599	30849	1.4 (1.2, 1.5)	2.1 (1.9, 2.3)	2.4 (2.2, 2.7)	3.0 (2.7, 3.3)	3.1 (2.8, 3.5)	3.5 (3.0, 4.2)
Traditional Instrumentation	5793	217240	1.8 (1.7, 1.8)	2.4 (2.3, 2.5)	2.8 (2.8, 2.9)	3.3 (3.2, 3.4)	3.5 (3.4, 3.6)	3.7 (3.6, 3.9)
TOTAL	7233	284738						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Restricted to procedures with known age, sex, ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Figure HT89 Cumulative Percent Revision of Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, sex, ASA, BMI, head size, head material, femoral fixation, surgical approach and surgeon volume

Computer Navigated vs IDI

Entire Period: HR=1.15 (95% CI 1.00, 1.31), p=0.046

Computer Navigated vs Traditional Instrumentation

Entire Period: HR=0.99 (95% CI 0.89, 1.10), p=0.844

IDI vs Traditional Instrumentation

0 - 3Mth: HR=0.82 (95% CI 0.73, 0.93), p=0.002

3Mth+: HR=1.03 (95% CI 0.91, 1.16), p=0.685

Robotically Assisted vs Computer Navigated

Entire Period: HR=1.09 (95% CI 0.95, 1.25), p=0.241

Robotically Assisted vs IDI

Entire Period: HR=1.24 (95% CI 1.10, 1.40), p<0.001

Robotically Assisted vs Traditional Instrumentation

0 - 3Mth: HR=1.02 (95% CI 0.90, 1.16), p=0.746

3Mths-1.5Yrs: HR=0.88 (95% CI 0.72, 1.08), p=0.226

1.5Yrs+: HR=1.39 (95% CI 1.15, 1.68), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Robotically Assisted	22315	16118	7511	3080	1022	434	87
Computer Navigated	14334	11527	6996	3669	1436	751	343
IDI	30849	24039	13320	6537	2420	1174	375
Traditional Instrumentation	217240	187817	134817	87904	46787	28726	12793

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Table HT82 Cumulative Percent Revision of Accolade II/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

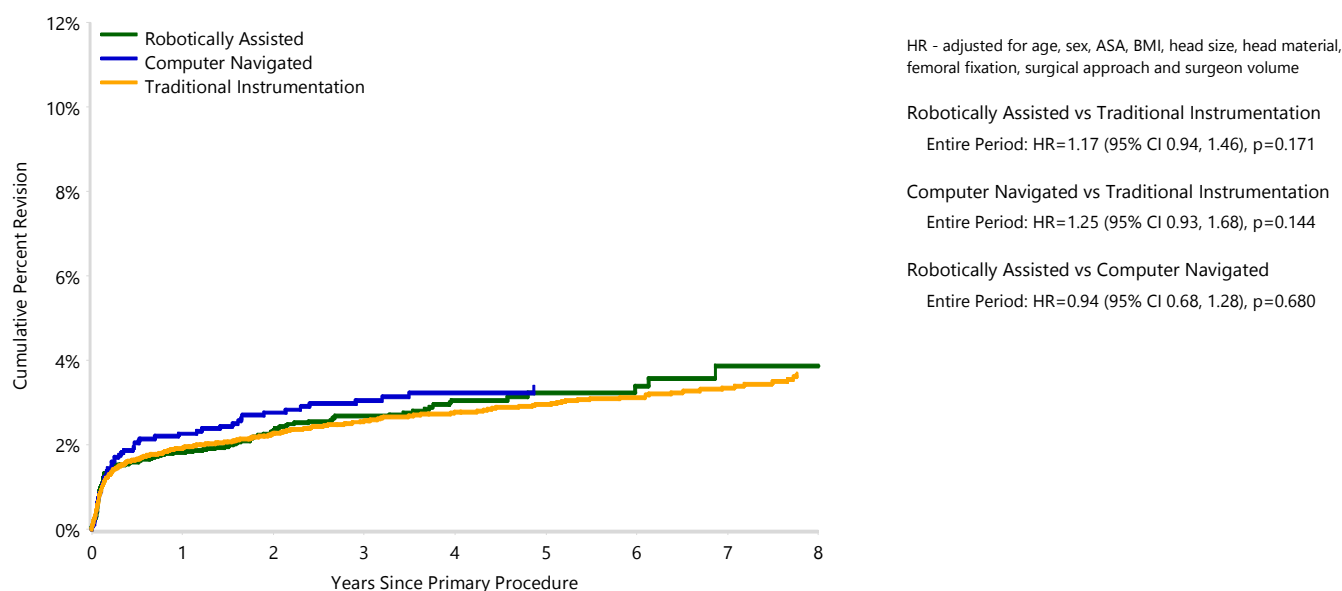
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	140	5236	1.8 (1.5, 2.2)	2.7 (2.3, 3.2)	3.2 (2.7, 3.9)	3.4 (2.8, 4.1)	3.9 (3.0, 4.9)	3.9 (3.0, 4.9)
Computer Navigated	57	1885	2.3 (1.7, 3.1)	3.1 (2.3, 4.0)	3.4 (2.6, 4.4)	3.4 (2.6, 4.4)	3.4 (2.6, 4.4)	3.4 (2.6, 4.4)
Traditional Instrumentation	313	11235	1.9 (1.7, 2.2)	2.6 (2.3, 2.9)	3.0 (2.6, 3.3)	3.1 (2.8, 3.5)	3.4 (3.0, 3.8)	3.7 (3.2, 4.2)
TOTAL	510	18356						

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Excludes 3 procedures using IDI

Figure HT90 Cumulative Percent Revision of Accolade II/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	5236	4569	2724	945	583	303	101
Computer Navigated	1885	1676	1193	652	446	288	129
Traditional Instrumentation	11235	9953	7197	4567	3380	2248	1349

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Excludes 3 procedures using IDI



Primary Total Hip Replacement

Table HT83 Cumulative Percent Revision of Exeter V40/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

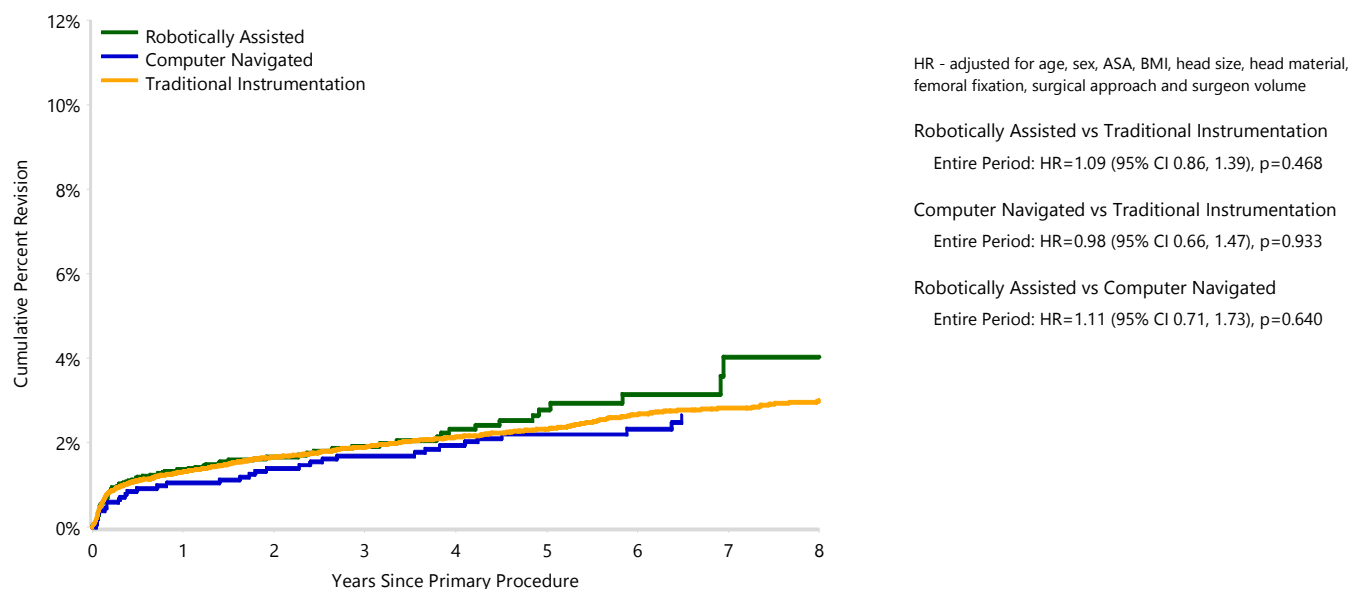
Robotic Assistance	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	77	3778	1.4 (1.0, 1.8)	1.9 (1.5, 2.5)	2.8 (2.1, 3.6)	3.1 (2.4, 4.2)	4.0 (2.8, 5.9)	4.0 (2.8, 5.9)
Computer Navigated	35	1534	1.1 (0.6, 1.7)	1.7 (1.1, 2.5)	2.2 (1.5, 3.1)	2.3 (1.6, 3.3)	2.6 (1.9, 3.7)	2.6 (1.9, 3.7)
Traditional Instrumentation	850	36445	1.3 (1.2, 1.4)	1.9 (1.8, 2.0)	2.3 (2.2, 2.5)	2.7 (2.5, 2.9)	2.8 (2.6, 3.0)	3.0 (2.8, 3.2)
TOTAL	962	41757						

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

Excludes 5 procedures using IDI

Figure HT91 Cumulative Percent Revision of Exeter V40/Trident (Shell) Primary Total Conventional Hip Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Robotically Assisted	3778	3212	1574	681	407	209	89
Computer Navigated	1534	1465	1311	946	733	489	284
Traditional Instrumentation	36445	33243	25629	17389	13456	9405	5768

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, femoral fixation, head size, surgical approach, head material and surgeon volume

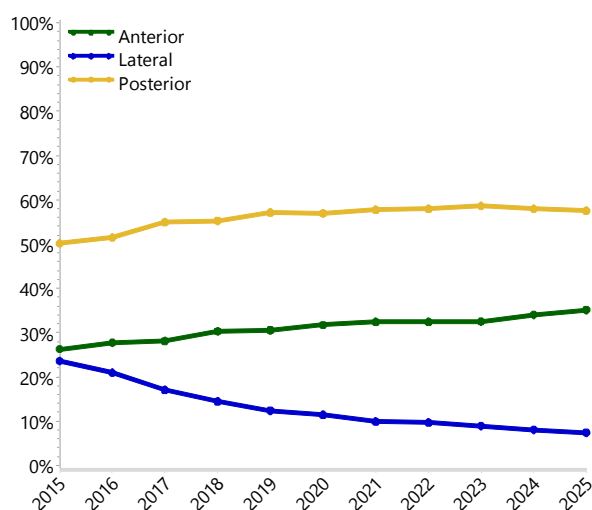
Excludes 5 procedures using IDI

Primary Total Hip Replacement

SURGICAL APPROACH

Collection of surgical approach data began in 2015 and the outcome of 114,370 anterior, 43,521 lateral, and 204,677 posterior total conventional hip replacement procedures for osteoarthritis are compared. The proportional use of anterior, lateral and posterior approaches over time is shown in Figure HT92.

Figure HT92 Primary Total Conventional Hip Replacement by Approach (Primary Diagnosis OA)



The anterior approach is used more often in younger patients than the posterior and lateral approaches, and in a higher proportion of patients with lower BMI and ASA scores (Table HT84 to Table HT86).

The following comparisons were adjusted for age, sex, ASA score, BMI category, femoral fixation, and head size. When compared to the anterior approach, the lateral and posterior approaches have a higher rate of revision. The lateral approach also has a higher rate of revision compared to the posterior approach (Table HT87 and Figure HT93). There are also differences in the types of revision and reasons for revision between the approaches.

Major Revisions

The posterior approach has a lower rate of major revision compared to the anterior approach and the lateral approach. There is no difference between the lateral and anterior approaches (Table HT88 and Figure HT94).

Reasons for Revision

The most common reasons for revision of primary total hip replacement by surgical approach are shown in Figure HT95.

Revision for Loosening

The posterior approach has a lower rate of revision for loosening compared to the lateral approach and to the anterior approach. There is also a lower rate of revision for loosening with the lateral approach compared to the anterior approach (Table HT89 and Figure HT96).

Revision for Fracture

The anterior approach also has an early increased rate of revision for fracture when compared to both the lateral and posterior approaches. The anterior approach then has a lower rate of revision for fracture between 3 months and 2 years compared to the posterior approach. There is no difference when the posterior approach is compared to the lateral approach (Table HT90 and Figure HT97).

Revision for Infection

There is a lower rate of revision for infection for the anterior approach for the first 3 months compared to the lateral approach and for the first 9 months compared to the posterior approach, after which there are no differences. There is no difference between the posterior and lateral approaches (Table HT91 and Figure HT98).

Revision for Dislocation/Instability

The anterior approach has a lower rate of revision for dislocation/instability compared to both the posterior and lateral approaches. There is no difference when the posterior is compared to the lateral approach (Table HT92 and Figure HT99).

Table HT84 Primary Total Conventional Hip Replacement by Age and Surgical Approach (Primary Diagnosis OA)

Age	Anterior		Lateral		Posterior	
	N	Col%	N	Col%	N	Col%
<55	13730	12.0	4305	9.9	20079	9.8
55-64	28607	25.0	9889	22.7	46865	22.9
65-74	41349	36.2	15819	36.3	73484	35.9
≥75	30684	26.8	13508	31.0	64249	31.4
TOTAL	114370	100.0	43521	100.0	204677	100.0

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT85 Primary Total Conventional Hip Replacement by BMI Category and Surgical Approach (Primary Diagnosis OA)

BMI	Anterior		Lateral		Posterior	
	N	Col%	N	Col%	N	Col%
Underweight	864	0.8	315	0.8	1453	0.7
Normal	26968	23.9	7989	19.0	38211	19.1
Pre Obese	44309	39.3	14705	35.0	70513	35.3
Obese Class 1	27260	24.2	11255	26.8	52899	26.5
Obese Class 2	9516	8.5	5213	12.4	24343	12.2
Obese Class 3	3689	3.3	2501	6.0	12523	6.3
TOTAL	112606	100.0	41978	100.0	199942	100.0

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

BMI has not been presented for patients aged ≤19 years

Table HT86 Primary Total Conventional Hip Replacement by ASA Score and Surgical Approach (Primary Diagnosis OA)

ASA Score	Anterior		Lateral		Posterior	
	N	Col%	N	Col%	N	Col%
ASA 1	10820	9.5	2936	6.8	12583	6.2
ASA 2	63689	55.8	22350	51.5	105046	51.4
ASA 3	38582	33.8	17498	40.3	83780	41.0
ASA 4	1132	1.0	635	1.5	3005	1.5
ASA 5	6	0.0	3	0.0	15	0.0
TOTAL	114229	100.0	43422	100.0	204429	100.0

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Table HT87 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA)

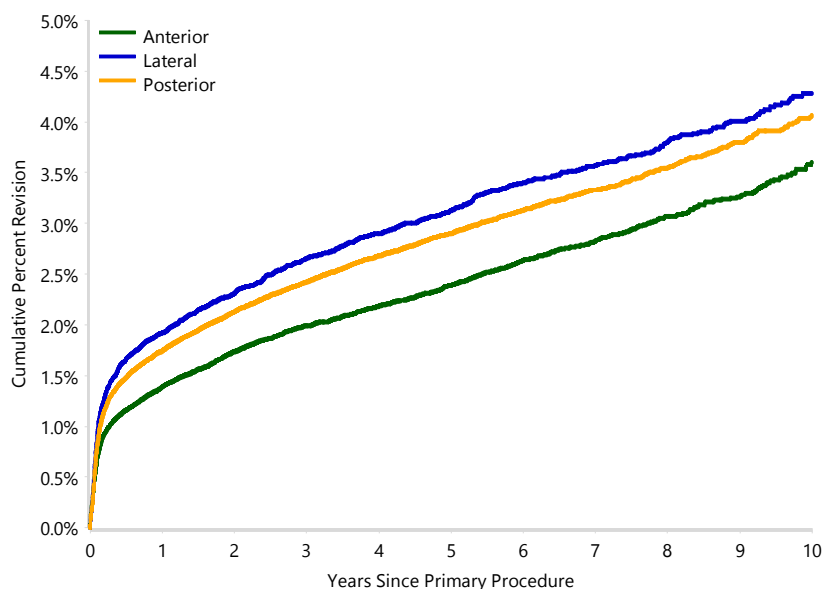
Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	2489	112492	1.4 (1.3, 1.5)	2.0 (1.9, 2.1)	2.4 (2.3, 2.5)	2.8 (2.7, 3.0)	3.1 (2.9, 3.2)	3.3 (3.1, 3.4)
Lateral	1328	41902	1.9 (1.8, 2.1)	2.7 (2.5, 2.8)	3.1 (3.0, 3.3)	3.6 (3.4, 3.8)	3.8 (3.6, 4.0)	4.0 (3.8, 4.3)
Posterior	5332	199724	1.7 (1.7, 1.8)	2.4 (2.4, 2.5)	2.9 (2.8, 3.0)	3.3 (3.2, 3.4)	3.5 (3.4, 3.7)	3.8 (3.7, 3.9)
TOTAL	9149	354118						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA Score, BMI category or head size

Figure HT93 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA)



HR - adjusted for age, sex, ASA score and BMI category, femoral fixation and head size.

Lateral vs Anterior

Entire Period: HR=1.24 (95% CI 1.16, 1.33), p<0.001

Posterior vs Anterior

Entire Period: HR=1.15 (95% CI 1.10, 1.21), p<0.001

Posterior vs Lateral

Entire Period: HR=0.93 (95% CI 0.87, 0.99), p=0.017

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	112492	95116	66153	42913	24395	16434	9736
Lateral	41902	37603	29759	22311	14872	11050	7181
Posterior	199724	170026	118742	77152	43515	29329	16991

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA score, BMI category or head size

Due to low numbers, ASA score 1-2 and 3-5 have been combined

Due to low numbers BMI category underweight and normal have been combined



Primary Total Hip Replacement

Table HT88 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Major Revisions)

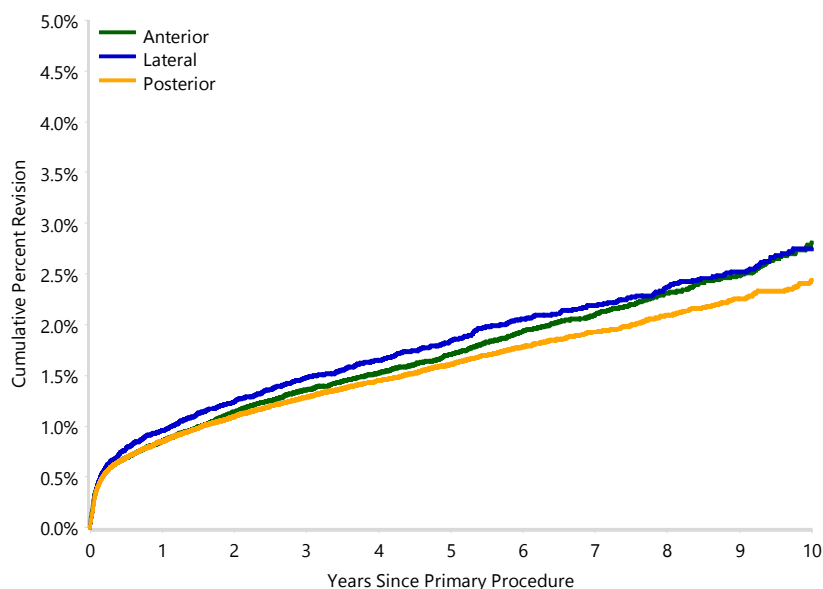
Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	1762	112492	0.9 (0.8, 0.9)	1.4 (1.3, 1.4)	1.7 (1.6, 1.8)	2.1 (2.0, 2.2)	2.3 (2.2, 2.4)	2.5 (2.3, 2.6)
Lateral	785	41902	1.0 (0.9, 1.1)	1.5 (1.4, 1.6)	1.8 (1.7, 2.0)	2.2 (2.0, 2.4)	2.4 (2.2, 2.6)	2.5 (2.3, 2.7)
Posterior	2923	199724	0.8 (0.8, 0.9)	1.3 (1.2, 1.3)	1.6 (1.5, 1.7)	1.9 (1.9, 2.0)	2.1 (2.0, 2.2)	2.3 (2.2, 2.4)
TOTAL	5470	354118						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA Score, BMI category or head size

Figure HT94 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Major Revisions)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	112492	95116	66153	42913	24395	16434	9736
Lateral	41902	37603	29759	22311	14872	11050	7181
Posterior	199724	170026	118742	77152	43515	29329	16991

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

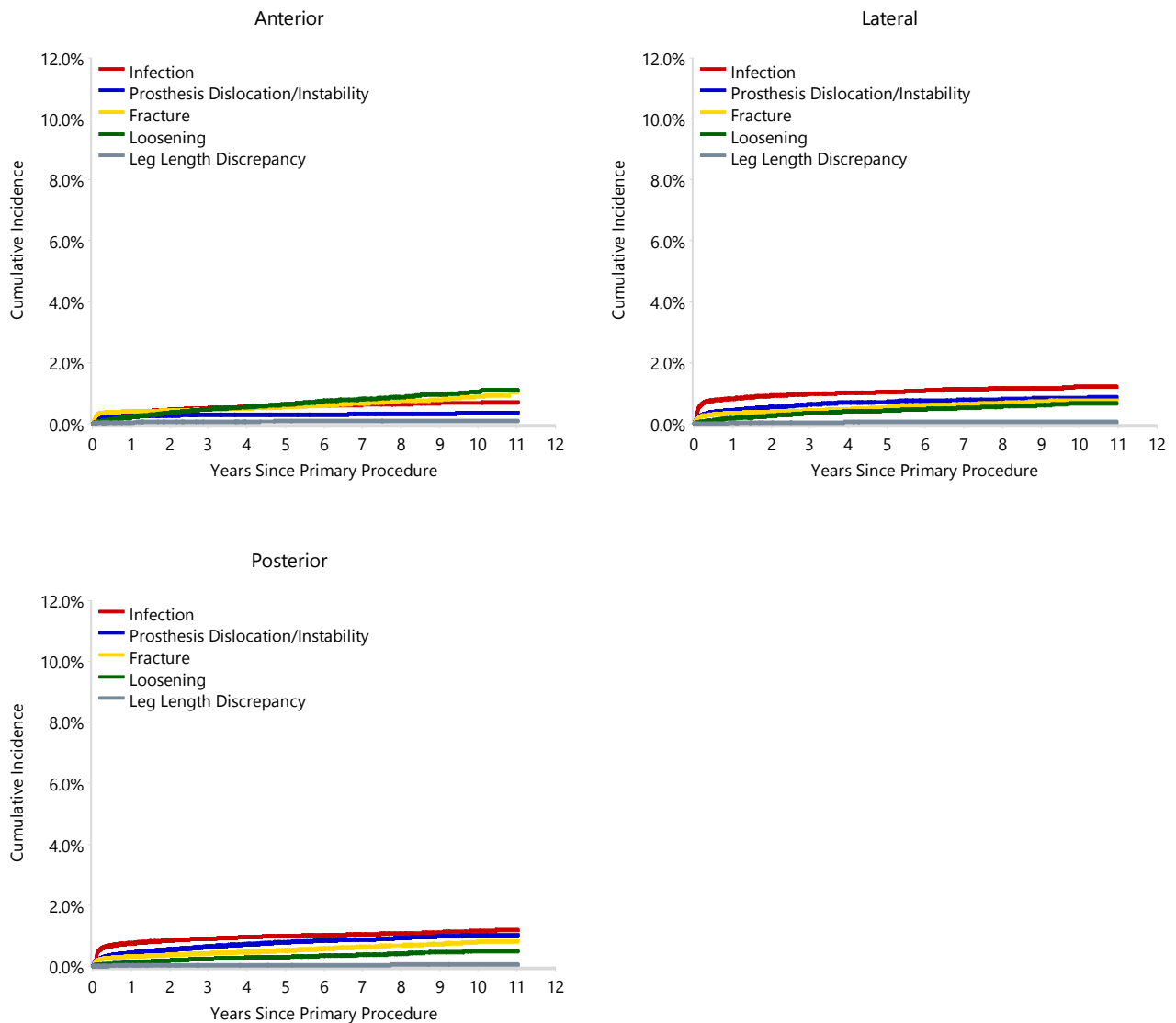
Excludes procedures with unknown ASA Score, BMI category or head size

Due to low numbers ASA score 1–2 and 3–5 have been combined

Due to low numbers BMI category underweight and normal have been combined

Primary Total Hip Replacement

Figure HT95 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Table HT89 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Loosening)

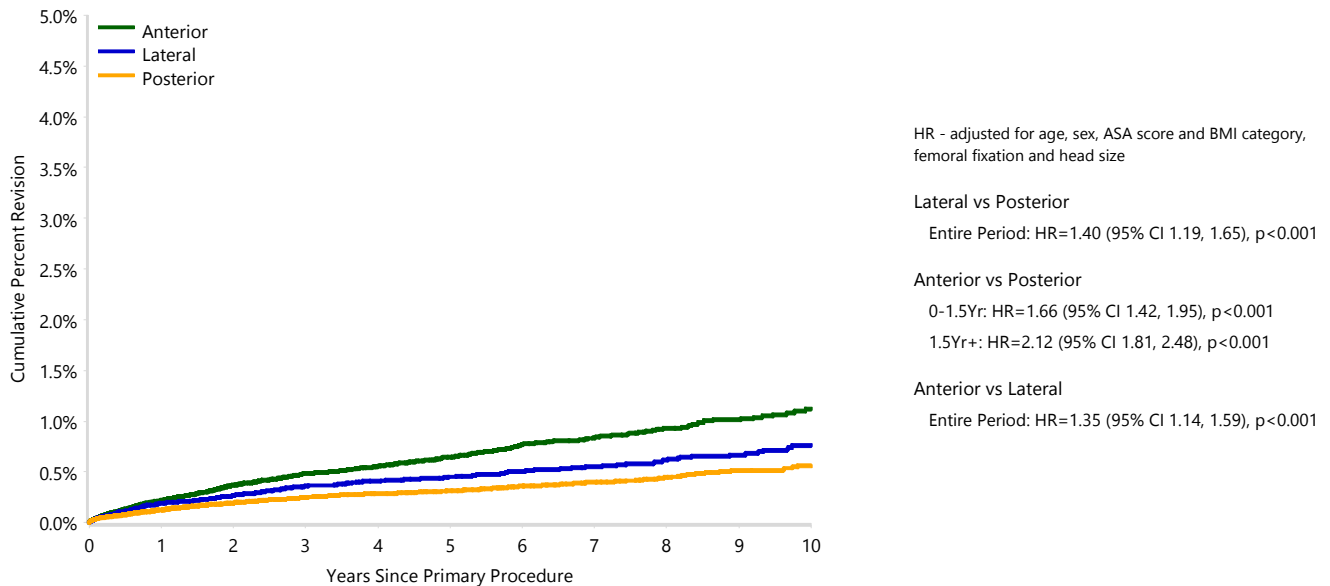
Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	637	112492	0.2 (0.2, 0.3)	0.5 (0.4, 0.5)	0.6 (0.6, 0.7)	0.8 (0.8, 0.9)	0.9 (0.8, 1.0)	1.0 (0.9, 1.1)
Lateral	194	41902	0.2 (0.2, 0.2)	0.4 (0.3, 0.4)	0.5 (0.4, 0.5)	0.6 (0.5, 0.6)	0.6 (0.5, 0.7)	0.7 (0.6, 0.8)
Posterior	570	199724	0.1 (0.1, 0.1)	0.3 (0.2, 0.3)	0.3 (0.3, 0.3)	0.4 (0.4, 0.4)	0.4 (0.4, 0.5)	0.5 (0.5, 0.6)
TOTAL	1401	354118						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA score, BMI category or head size

Figure HT96 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	112492	95116	66153	42913	24395	16434	9736
Lateral	41902	37603	29759	22311	14872	11050	7181
Posterior	199724	170026	118742	77152	43515	29329	16991

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA Score, BMI category or head size

Due to low numbers ASA score 1-2 and 3-5 have been combined

Due to low numbers BMI category underweight and normal have been combined

Primary Total Hip Replacement

Table HT90 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Fracture)

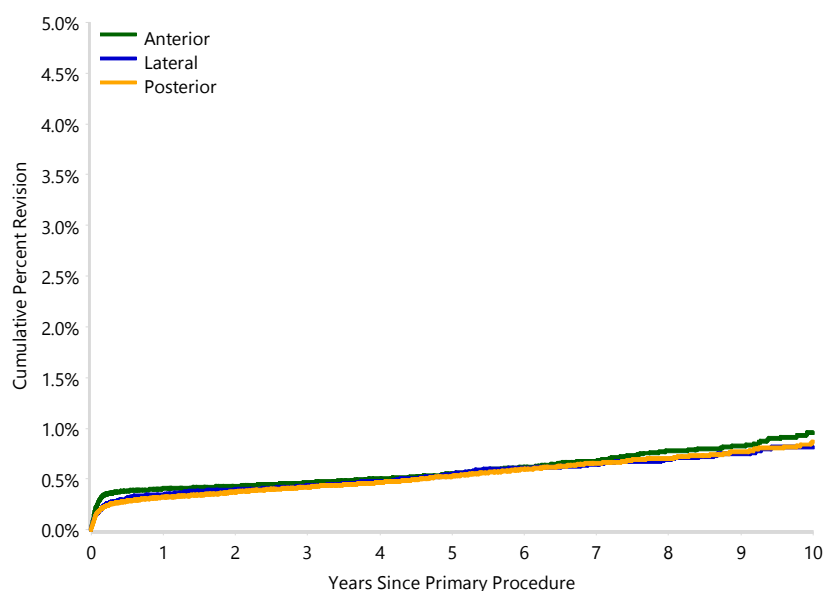
Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	622	112492	0.4 (0.4, 0.4)	0.5 (0.4, 0.5)	0.6 (0.5, 0.6)	0.7 (0.6, 0.7)	0.8 (0.7, 0.9)	0.8 (0.7, 0.9)
Lateral	236	41902	0.3 (0.3, 0.4)	0.4 (0.4, 0.5)	0.5 (0.5, 0.6)	0.6 (0.6, 0.7)	0.7 (0.6, 0.8)	0.7 (0.6, 0.9)
Posterior	994	199724	0.3 (0.3, 0.3)	0.4 (0.4, 0.5)	0.5 (0.5, 0.6)	0.7 (0.6, 0.7)	0.7 (0.7, 0.8)	0.8 (0.7, 0.8)
TOTAL	1852	354118						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA score, BMI category or head size

Figure HT97 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Fracture)



HR - adjusted for age, sex, ASA score and BMI category, femoral fixation and head size

Posterior vs Lateral

Entire Period: HR=1.00 (95% CI 0.86, 1.15), p=0.956

Anterior vs Lateral

0-1Mth: HR=1.47 (95% CI 1.21, 1.79), p<0.001

1Mth+: HR=0.96 (95% CI 0.81, 1.14), p=0.610

Anterior vs Posterior

0-3Mth: HR=1.46 (95% CI 1.28, 1.67), p<0.001

3Mth-2.5Yr: HR=0.59 (95% CI 0.46, 0.76), p<0.001

2.5Yr+: HR=1.03 (95% CI 0.84, 1.26), p=0.809

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	112492	95116	66153	42913	24395	16434	9736
Lateral	41902	37603	29759	22311	14872	11050	7181
Posterior	199724	170026	118742	77152	43515	29329	16991

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA Score, BMI category or head size

Due to low numbers ASA score 1-2 and 3-5 have been combined

Due to low numbers BMI category underweight and normal have been combined



Primary Total Hip Replacement

Table HT91 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Infection)

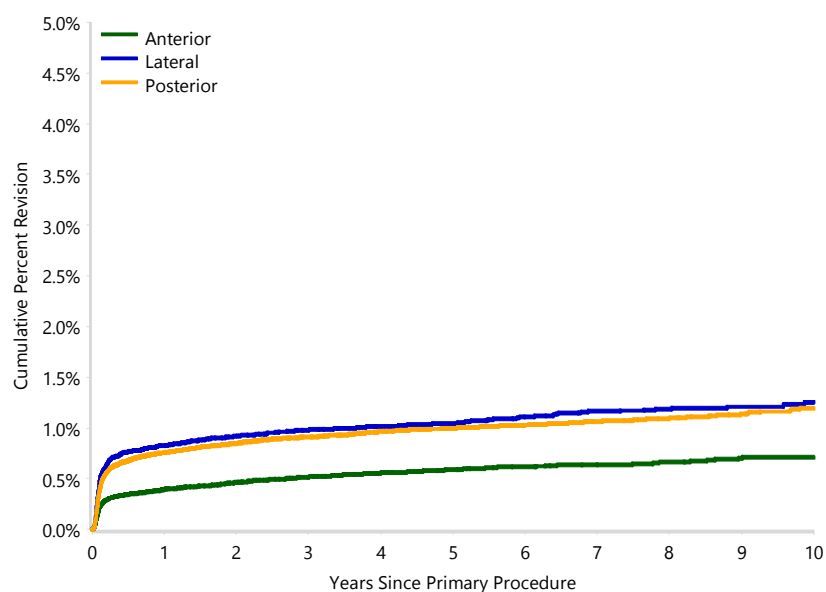
Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	597	112492	0.4 (0.4, 0.4)	0.5 (0.5, 0.6)	0.6 (0.5, 0.6)	0.6 (0.6, 0.7)	0.7 (0.6, 0.7)	0.7 (0.6, 0.8)
Lateral	440	41902	0.8 (0.7, 0.9)	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)	1.2 (1.1, 1.3)	1.2 (1.1, 1.3)	1.2 (1.1, 1.3)
Posterior	1856	199724	0.8 (0.7, 0.8)	0.9 (0.9, 1.0)	1.0 (1.0, 1.0)	1.1 (1.0, 1.1)	1.1 (1.0, 1.2)	1.1 (1.1, 1.2)
TOTAL	2893	354118						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA score, BMI category or head size

Figure HT98 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Infection)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	112492	95116	66153	42913	24395	16434	9736
Lateral	41902	37603	29759	22311	14872	11050	7181
Posterior	199724	170026	118742	77152	43515	29329	16991

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA Score, BMI category or head size

Due to low numbers ASA score 1-2 and 3-5 have been combined

Due to low numbers BMI category underweight and normal have been combined

Primary Total Hip Replacement

Table HT92 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Dislocation/Instability)

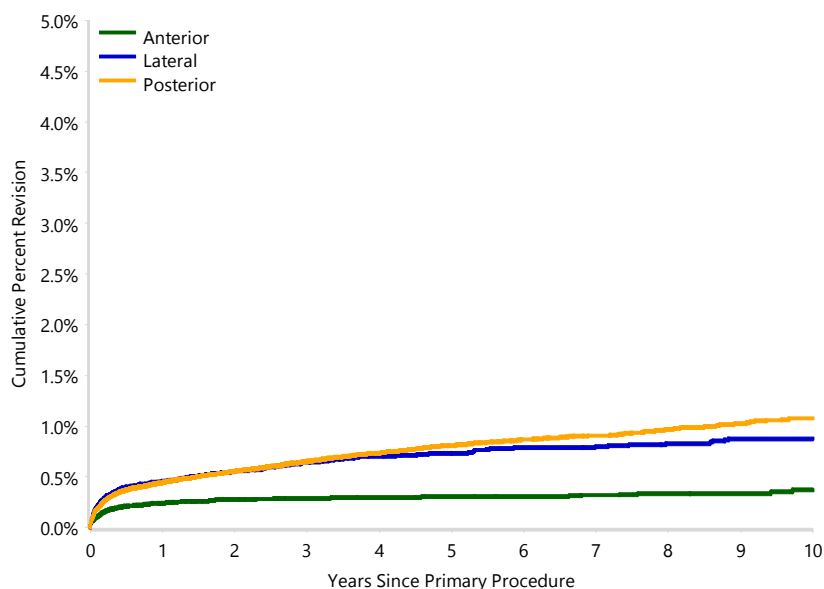
Surgical Approach	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	320	112492	0.2 (0.2, 0.3)	0.3 (0.3, 0.3)	0.3 (0.3, 0.3)	0.3 (0.3, 0.4)	0.3 (0.3, 0.4)	0.3 (0.3, 0.4)
Lateral	296	41902	0.5 (0.4, 0.5)	0.6 (0.6, 0.7)	0.7 (0.6, 0.8)	0.8 (0.7, 0.9)	0.8 (0.7, 0.9)	0.9 (0.8, 1.0)
Posterior	1417	199724	0.4 (0.4, 0.5)	0.7 (0.6, 0.7)	0.8 (0.8, 0.9)	0.9 (0.9, 1.0)	1.0 (0.9, 1.0)	1.0 (1.0, 1.1)
TOTAL	2033	354118						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA score, BMI category or head size

Figure HT99 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Surgical Approach (Primary Diagnosis OA, Revision for Dislocation/Instability)



HR - adjusted for age, sex, ASA score and BMI category, femoral fixation and head size

Lateral vs Anterior

0-2wk: HR=1.63 (95% CI 1.15, 2.32), p=0.006

2wk-1Mth: HR=2.21 (95% CI 1.54, 3.16), p<0.001

1Mth-6Mth: HR=1.90 (95% CI 1.47, 2.47), p<0.001

6Mth+: HR=3.06 (95% CI 2.37, 3.96), p<0.001

Posterior vs Anterior

0-3Mth: HR=1.70 (95% CI 1.44, 2.00), p<0.001

3Mth-9Mth: HR=2.30 (95% CI 1.78, 2.97), p<0.001

9Mth+: HR=4.39 (95% CI 3.51, 5.48), p<0.001

Posterior vs Lateral

Entire Period: HR=1.12 (95% CI 0.99, 1.27), p=0.074

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Anterior	112492	95116	66153	42913	24395	16434	9736
Lateral	41902	37603	29759	22311	14872	11050	7181
Posterior	199724	170026	118742	77152	43515	29329	16991

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Excludes procedures with unknown ASA Score, BMI category or head size

Due to low numbers ASA score 1-2 and 3-5 have been combined

Due to low numbers BMI category underweight and normal have been combined



Primary Total Hip Replacement

OUTCOME FOR FRACTURED NECK OF FEMUR

There have been 33,438 primary total conventional hip replacement procedures undertaken for a diagnosis of fractured neck of femur.

The cumulative percent revision of primary total conventional hip replacement for fractured neck of femur is 9.8% at 20

years (Table HT93 and Figure HT100). At 20 years, the cumulative percent survival of patients is 21.8% (Table HT94 and Figure HT101).

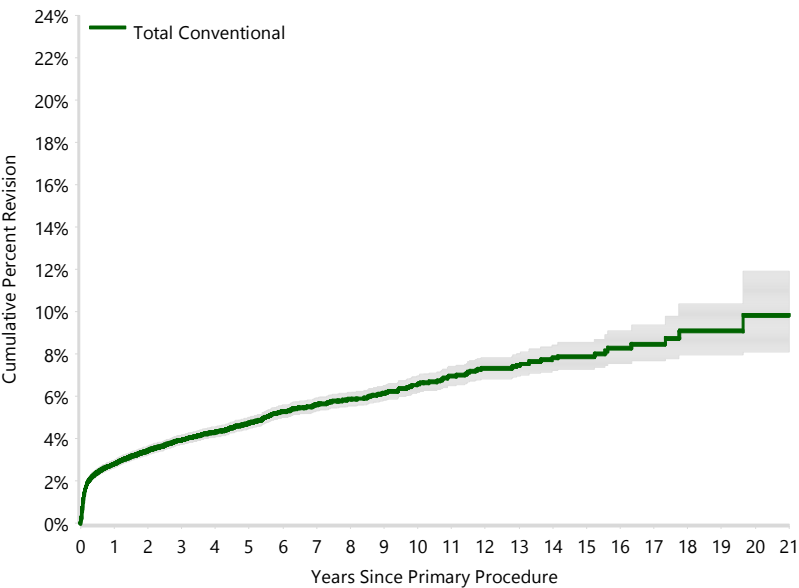
This compares to the cumulative percent revision of 7.7% at 20 years when the diagnosis is osteoarthritis, which has a cumulative percent survival of 41.2% of patients at 20 years.

Table HT93 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	1520	33438	2.8 (2.6, 3.0)	3.9 (3.7, 4.2)	4.7 (4.5, 5.0)	6.6 (6.2, 7.0)	7.9 (7.3, 8.5)	9.8 (8.1, 11.9)
TOTAL	1520	33438						

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT100 Cumulative Percent Revision of Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	33438	27604	19815	13466	3943	814	105

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

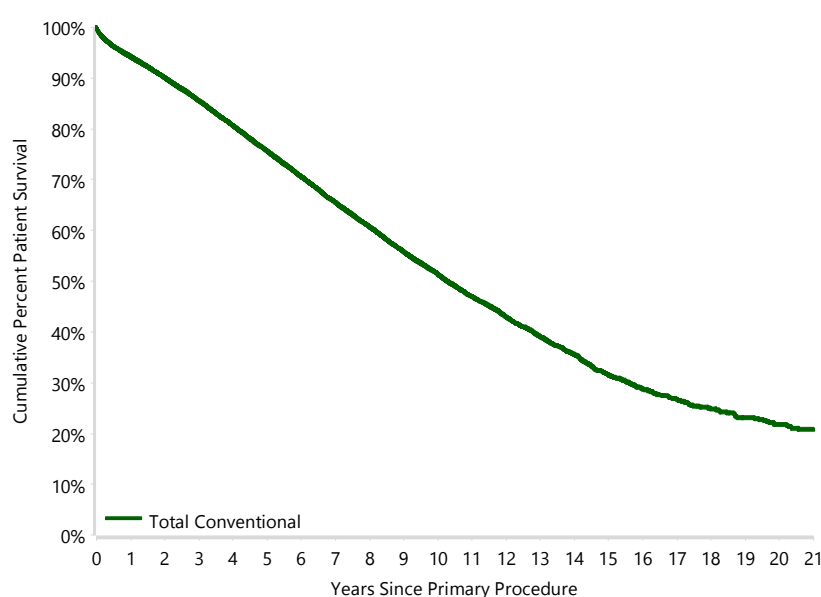
Primary Total Hip Replacement

Table HT94 Cumulative Percent Survival of Patients with Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)

Hip Class	N Deceased	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	10238	33438	94.2 (94.0, 94.5)	85.6 (85.1, 86.0)	75.6 (75.1, 76.2)	51.3 (50.5, 52.2)	31.5 (30.3, 32.7)	21.8 (20.0, 23.6)
TOTAL	10238	33438						

Note: All procedures using metal/metal prostheses have been excluded
Restricted to modern prostheses

Figure HT101 Cumulative Percent Survival of Patients with Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Conventional	33438	27604	19815	13466	3943	814	105

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded s



Primary Total Hip Replacement

Reasons for Revision

Prosthesis dislocation/instability is the most common reason for revision, followed by fracture, infection, and loosening (Table HT95 and Figure HT102).

Type of Revision

The most common type of revision is femoral component only, followed by head and insert, acetabular only, and total hip replacement (femoral/acetabular) (Table HT96).

Table HT95 Primary Total Conventional Hip Replacement by Reason for Revision (Primary Diagnosis Fractured NOF)

Reason for Revision	Number	Percent
Prosthesis Dislocation/Instability	481	31.6
Fracture	454	29.9
Infection	306	20.1
Loosening	188	12.4
Leg Length Discrepancy	13	0.9
Malposition	11	0.7
Pain	10	0.7
Implant Breakage Acetabular Insert	8	0.5
Implant Breakage Stem	7	0.5
Lysis	6	0.4
Implant Breakage Acetabular	6	0.4
Tumour	5	0.3
Incorrect Sizing	4	0.3
Metal Related Pathology	3	0.2
Heterotopic Bone	2	0.1
Wear Head	1	0.1
Other	15	1.0
TOTAL	1520	100.0

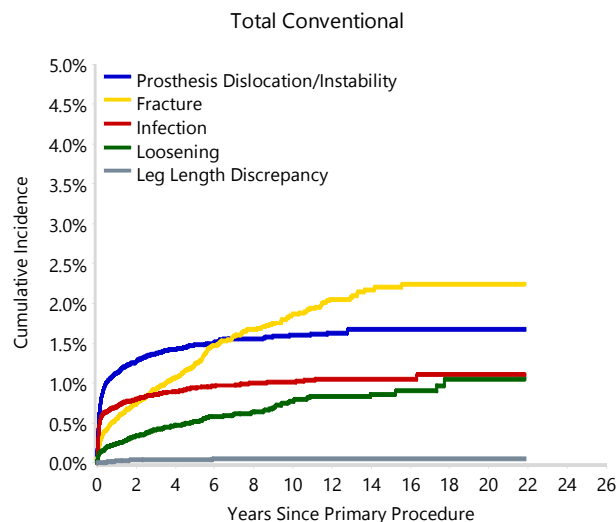
Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Table HT96 Primary Total Conventional Hip Replacement by Type of Revision (Primary Diagnosis Fractured NOF)

Type of Revision	Number	Percent
Femoral Component	558	36.7
Head/Insert	412	27.1
Acetabular Component	232	15.3
THR (Femoral/Acetabular)	165	10.9
Head Only	59	3.9
Cement Spacer	32	2.1
Minor Components	28	1.8
Insert Only	20	1.3
Removal of Prostheses	9	0.6
Total Femoral	3	0.2
Reinsertion of Components	1	0.1
Bipolar Head and Femoral	1	0.1
TOTAL	1520	100.0

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
Femoral heads are usually replaced when the acetabular component or femoral stem is revised

Figure HT102 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Age and Sex

There is a difference in the rate of revision with respect to age with patients aged <55 years having a higher rate of revision compared to patients aged ≥75 years. There are no differences between patients aged ≥75 years and the other two age groups (Table HT97 and Figure HT103). Males have a higher rate of revision compared to females except for the first month (Table HT98 and Figure HT104).

There are no revision rate differences for males with respect to age (Table HT98 and Figure HT105).

Females aged <55 years have a higher rate of revision compared to females aged ≥75 years. There are no differences when other age groups are compared to females aged ≥75 (Table HT98 and Figure HT106).

The most common reasons for revision by sex and age are shown in Figure HT107 and Figure HT108.

ASA and BMI

ASA scores are an indication of comorbidity and have been collected since 2012. The outcome of 27,841 primary total conventional hip replacement procedures for fractured neck of femur is reported in relation to these scores.

The majority of patients having a primary conventional hip replacement for fracture have an ASA score of 2 or 3, and this has changed little over time (Figure HT109).

When compared to patients with an ASA score of 1, patients with other ASA scores all have an early period where the revision rates are higher (Table HT99 and Figure HT110). The most common reasons for revision for each ASA score are shown in Figure HT111. The difference in the rate of revision is partially due to an increase in revision for dislocation/instability and infection with increasing ASA score.

There is a larger proportion of fractured neck of femur patients with an ASA score of 3 or 4 than patients with osteoarthritis (Figure HT115).

BMI data have been collected since 2015. The revision outcomes are reported for 18,791 primary total conventional hip replacement procedures for fractured neck of femur.

Over 75% of patients having a hip replacement for fracture are in the normal or pre-obese category, and there has been little change in BMI over time (Figure HT112).

Patients in obese classes 1, 2 and 3 all have a higher rate of revision compared to patients in the normal BMI class (Table HT101 and Figure HT113). Revision for infection increases with obesity class. The most common reasons for revision are shown in Figure HT114.



Primary Total Hip Replacement

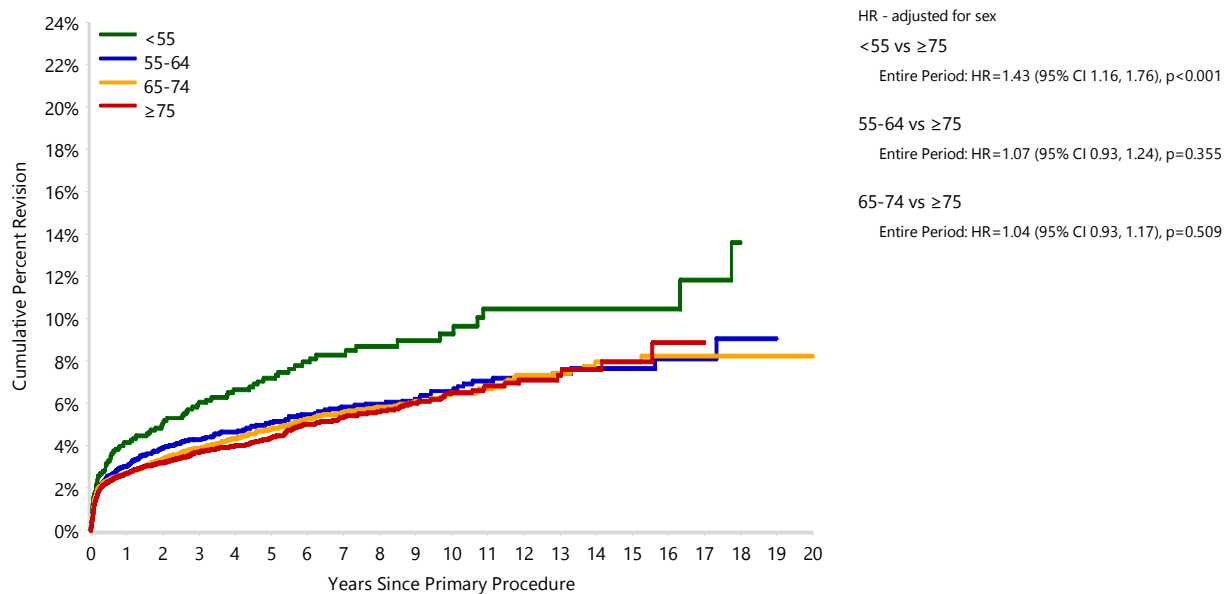
Table HT97 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis Fractured NOF)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	104	1462	4.1 (3.2, 5.3)	6.0 (4.8, 7.5)	7.2 (5.8, 8.8)	9.3 (7.5, 11.4)	10.5 (8.4, 13.0)	
55-64	242	4733	3.0 (2.6, 3.6)	4.3 (3.7, 4.9)	5.1 (4.5, 5.8)	6.6 (5.7, 7.6)	7.6 (6.5, 8.9)	
65-74	495	10559	2.7 (2.4, 3.0)	3.9 (3.5, 4.3)	4.8 (4.4, 5.3)	6.5 (5.8, 7.2)	7.9 (7.0, 9.0)	8.2 (7.1, 9.5)
≥75	679	16684	2.7 (2.4, 2.9)	3.7 (3.4, 4.0)	4.4 (4.0, 4.8)	6.5 (5.9, 7.2)	8.0 (6.8, 9.4)	
TOTAL	1520	33438						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT103 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	1462	1180	868	645	260	86	26
55-64	4733	4032	3018	2236	855	233	29
65-74	10559	8917	6634	4741	1563	354	42
≥75	16684	13475	9295	5844	1265	141	8

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

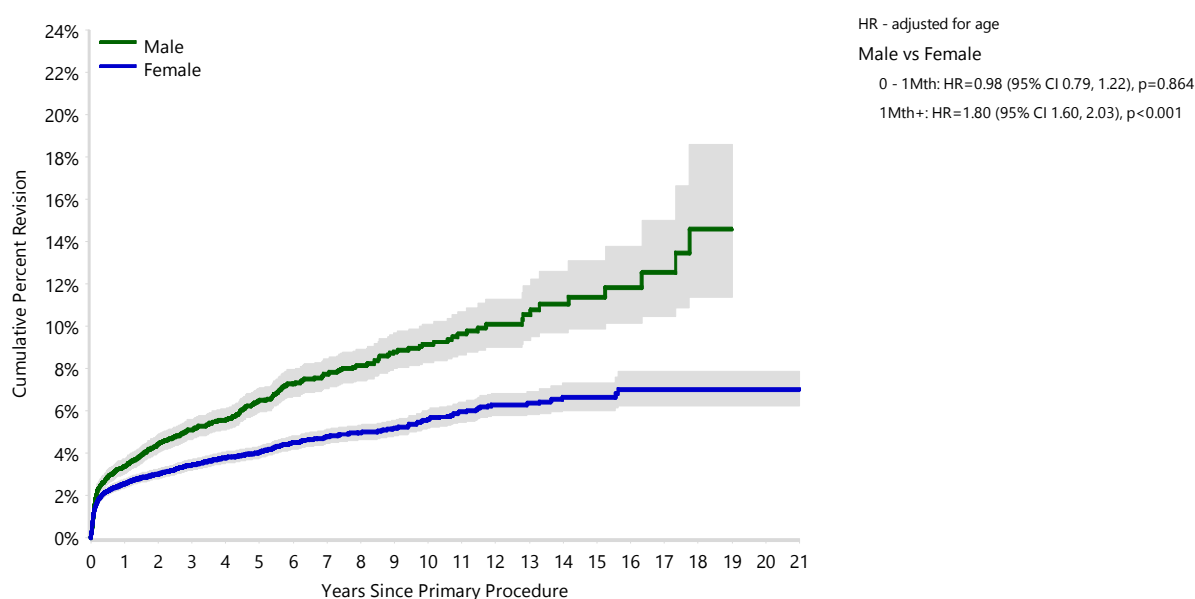
Table HT98 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Sex and Age (Primary Diagnosis Fractured NOF)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		590	10260	3.4 (3.0, 3.8)	5.1 (4.7, 5.6)	6.5 (5.9, 7.1)	9.2 (8.3, 10.1)	11.4 (9.9, 13.1)	
	<55	55	703	4.5 (3.1, 6.3)	6.7 (5.0, 9.0)	8.1 (6.1, 10.7)	9.3 (7.0, 12.4)	11.1 (8.0, 15.3)	
	55-64	95	1602	3.5 (2.7, 4.5)	5.0 (4.0, 6.3)	6.1 (4.9, 7.6)	7.2 (5.8, 8.9)	10.1 (7.5, 13.7)	
	65-74	182	3075	3.3 (2.7, 4.0)	5.1 (4.4, 6.1)	6.6 (5.6, 7.7)	9.0 (7.6, 10.6)	10.4 (8.4, 12.9)	
	≥75	258	4880	3.3 (2.8, 3.8)	4.9 (4.2, 5.6)	6.4 (5.5, 7.3)	11.2 (9.3, 13.5)		
Female		930	23178	2.6 (2.4, 2.8)	3.4 (3.2, 3.7)	4.0 (3.8, 4.3)	5.6 (5.2, 6.1)	6.6 (6.0, 7.3)	7.0 (6.2, 7.9)
	<55	49	759	3.9 (2.7, 5.6)	5.4 (3.9, 7.4)	6.3 (4.6, 8.6)	9.2 (6.8, 12.5)	9.9 (7.2, 13.4)	
	55-64	147	3131	2.8 (2.3, 3.4)	3.9 (3.3, 4.7)	4.6 (3.9, 5.5)	6.2 (5.2, 7.5)	6.6 (5.5, 7.9)	
	65-74	313	7484	2.5 (2.2, 2.9)	3.4 (3.0, 3.9)	4.1 (3.6, 4.6)	5.6 (4.9, 6.3)	7.1 (6.0, 8.3)	
	≥75	421	11804	2.4 (2.2, 2.8)	3.2 (2.9, 3.6)	3.7 (3.3, 4.1)	5.2 (4.6, 5.9)	6.2 (5.2, 7.3)	
TOTAL		1520	33438						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT104 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Sex (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	10260	8068	5436	3420	907	210	25
Female	23178	19536	14379	10046	3036	604	80

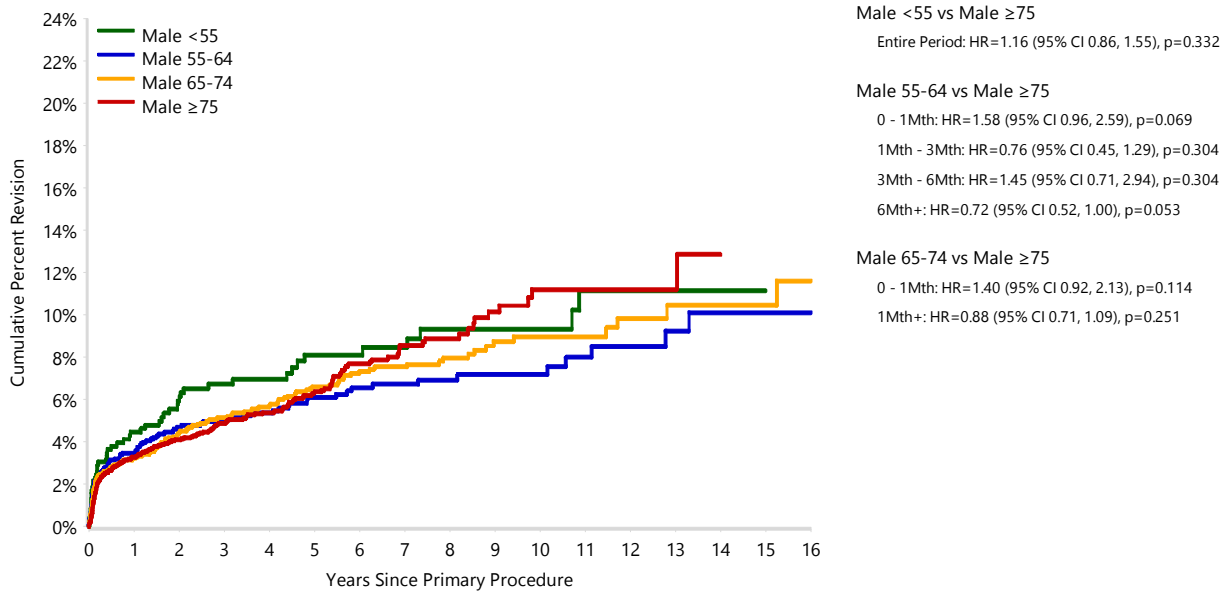
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT105 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis Fractured NOF)

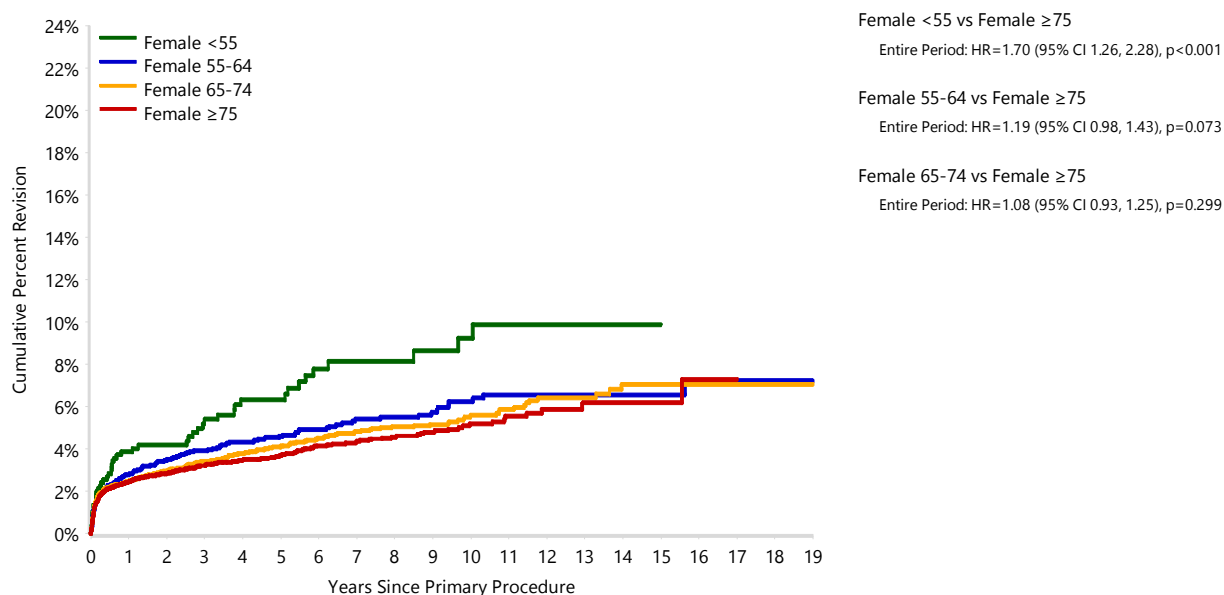


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<55	703	569	413	304	119	41	14
	55-64	1602	1340	976	689	246	59	3
	65-74	3075	2479	1747	1182	332	84	7
	≥75	4880	3680	2300	1245	210	26	1

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT106 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis Fractured NOF)



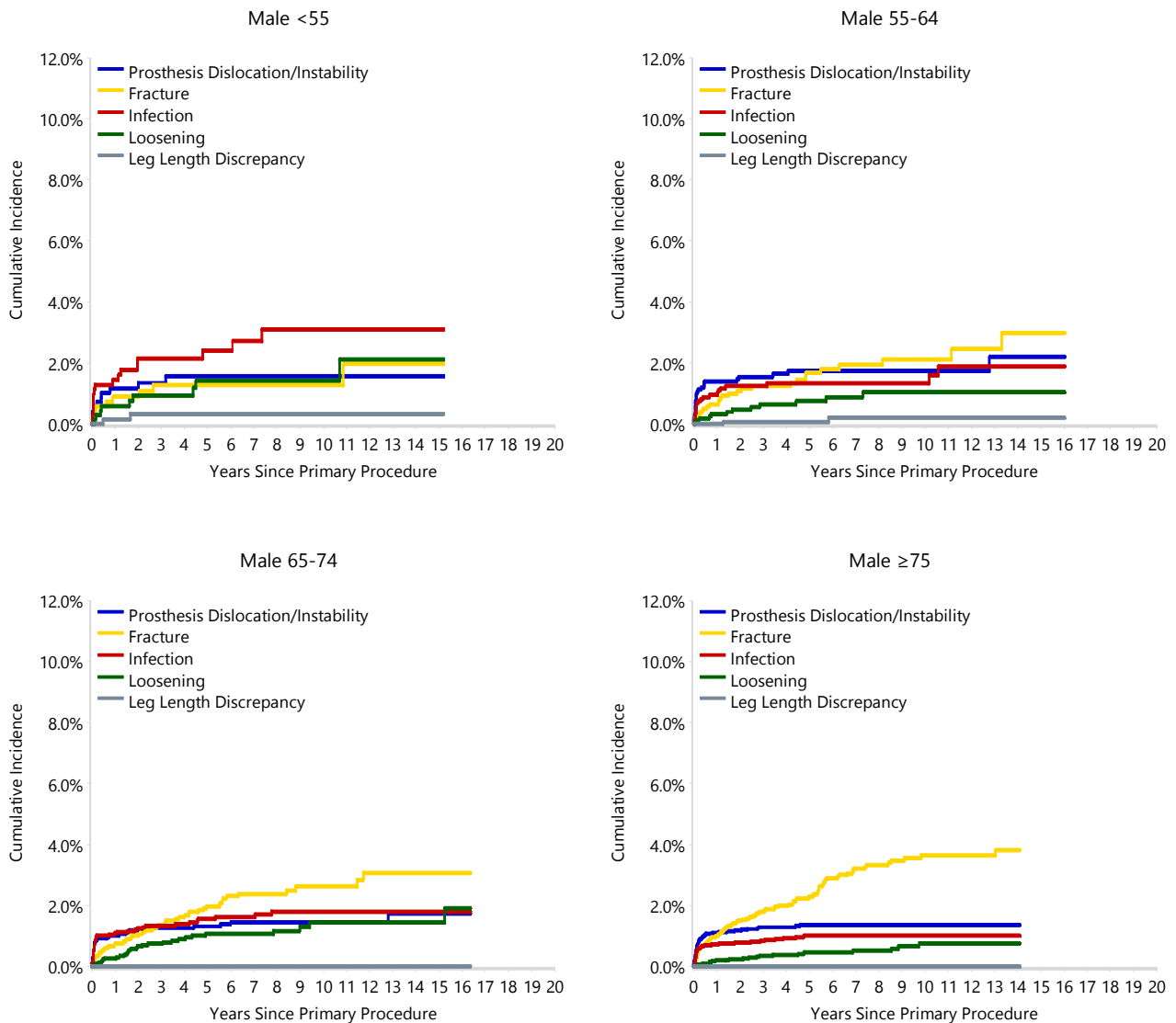
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	<55	759	611	455	341	141	45	12
	55-64	3131	2692	2042	1547	609	174	26
	65-74	7484	6438	4887	3559	1231	270	35
	≥75	11804	9795	6995	4599	1055	115	7

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT107 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Males by Age (Primary Diagnosis Fractured NOF)



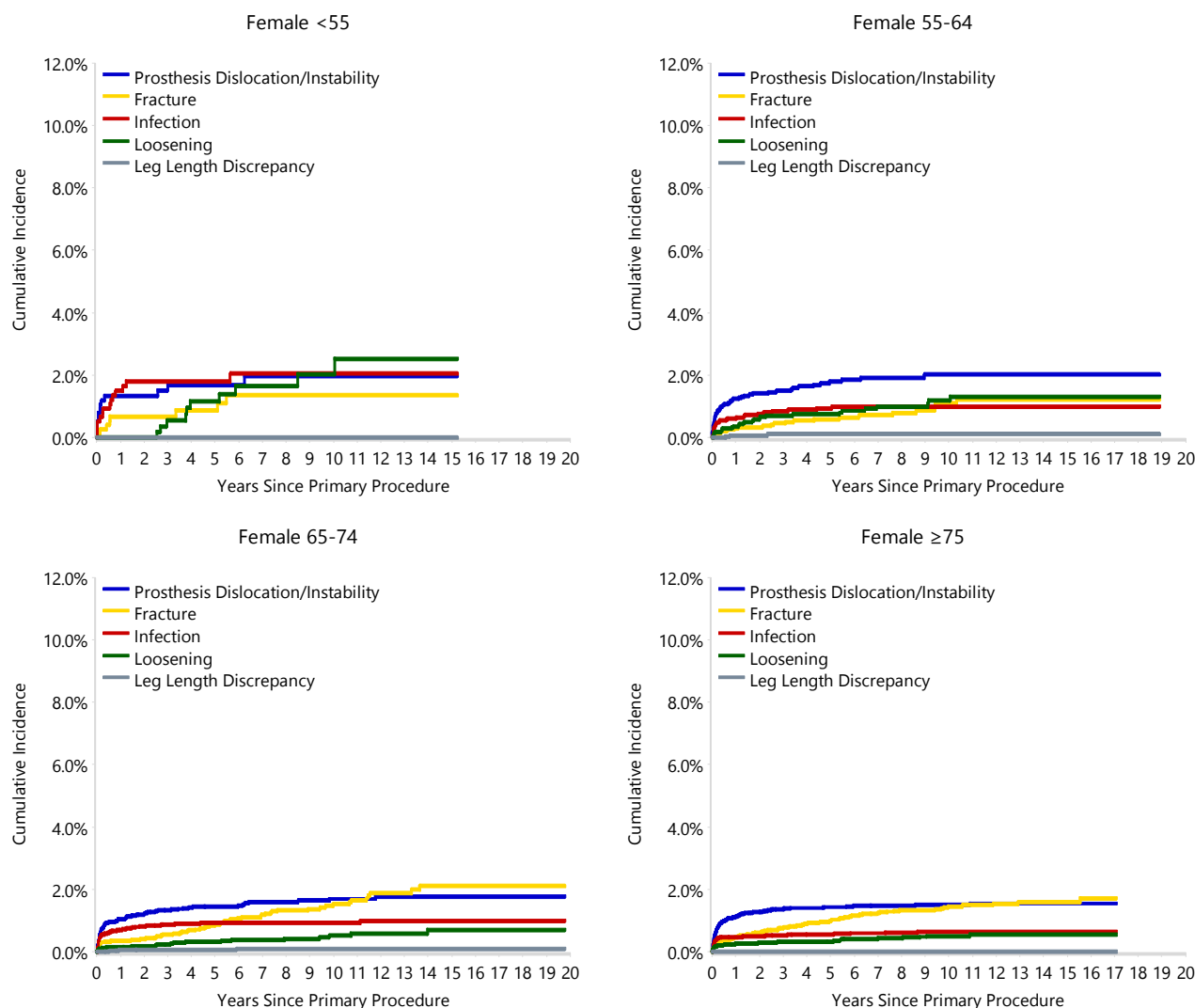
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



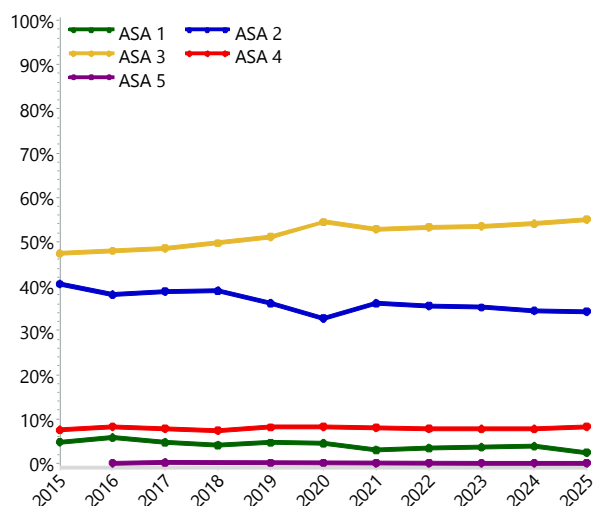
Primary Total Hip Replacement

Figure HT108 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement in Females by Age (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded

Figure HT109 Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

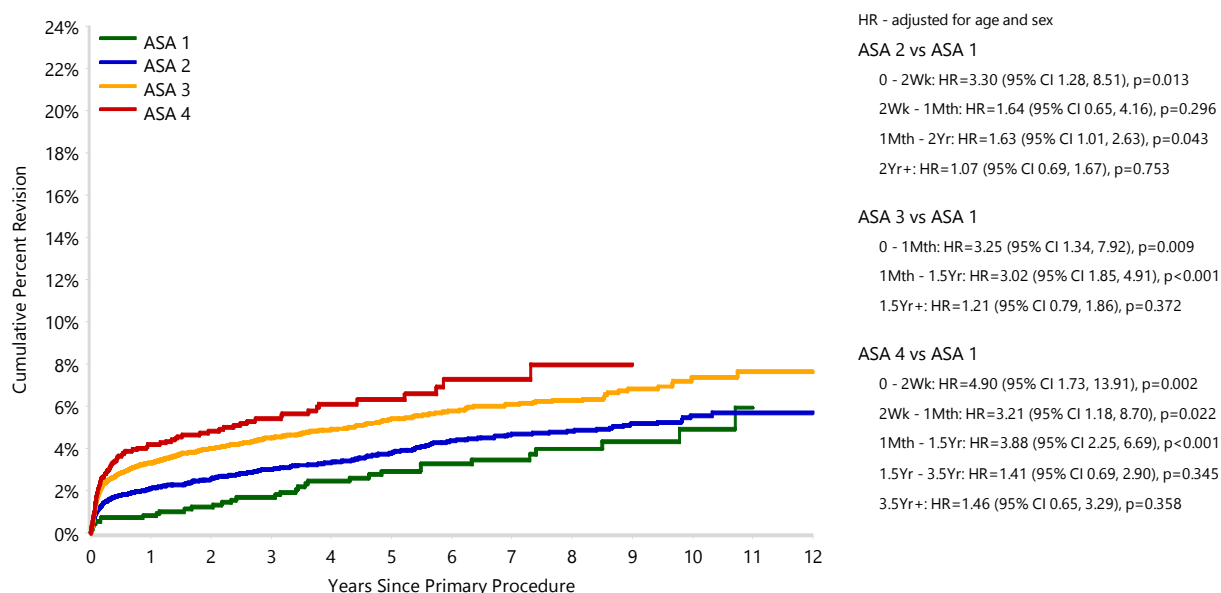
Table HT99 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	11 Yrs
ASA 1	34	1108	0.8 (0.4, 1.6)	1.2 (0.7, 2.1)	1.7 (1.0, 2.7)	2.5 (1.6, 3.7)	2.9 (2.0, 4.3)	3.5 (2.4, 5.0)	5.9 (3.7, 9.4)
ASA 2	367	10058	2.1 (1.8, 2.4)	2.6 (2.3, 2.9)	3.0 (2.7, 3.4)	3.4 (3.0, 3.8)	3.8 (3.4, 4.2)	4.7 (4.2, 5.2)	5.7 (5.0, 6.5)
ASA 3	672	14467	3.3 (3.0, 3.6)	4.0 (3.7, 4.3)	4.5 (4.2, 4.9)	4.9 (4.5, 5.3)	5.4 (5.0, 5.8)	6.1 (5.6, 6.6)	7.6 (6.7, 8.7)
ASA 4	107	2193	4.2 (3.4, 5.2)	4.8 (3.9, 5.9)	5.4 (4.4, 6.6)	6.1 (5.0, 7.5)	6.3 (5.1, 7.7)	7.3 (5.8, 9.2)	
ASA 5	0	15	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
TOTAL	1180	27841							

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT110 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	7 Yrs	11 Yrs
ASA 1	1108	1020	896	790	687	611	403	82
ASA 2	10058	8647	7508	6396	5344	4370	2715	442
ASA 3	14467	11491	9406	7500	5820	4421	2245	285
ASA 4	2193	1450	1085	796	569	379	154	11

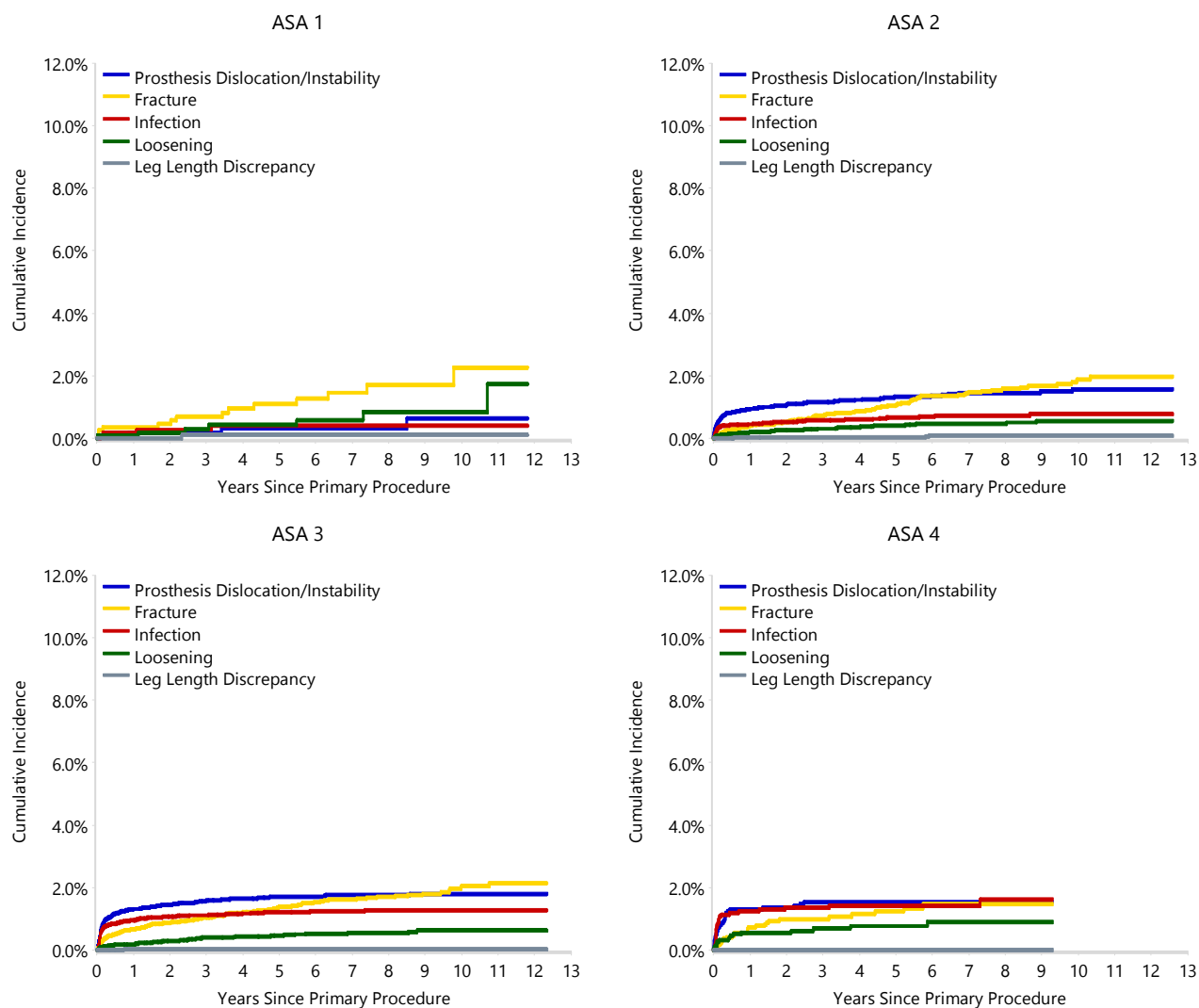
Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

Figure HT111 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by ASA Score (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded



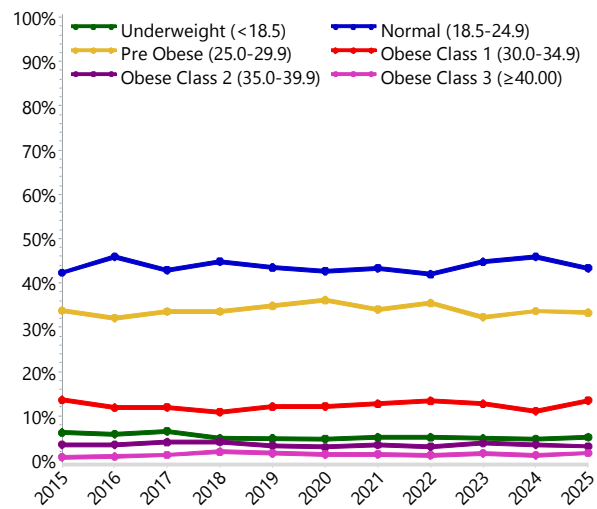
Primary Total Hip Replacement

Table HT100 Primary Total Conventional Hip Replacement by ASA Score and Primary Diagnosis

ASA Score	Fractured Neck of Femur		Osteoarthritis		TOTAL	
	N	Col%	N	Col%	N	Col%
ASA 1	1108	4.0	29806	7.5	30914	7.3
ASA 2	10058	36.1	210963	53.1	221021	52.0
ASA 3	14467	52.0	151257	38.1	165724	39.0
ASA 4	2193	7.9	5296	1.3	7489	1.8
ASA 5	15	0.1	28	0.0	43	0.0
TOTAL	27841	100.0	397350	100.0	425191	100.0

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Figure HT112 Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
BMI has not been presented for patients aged ≤19 years

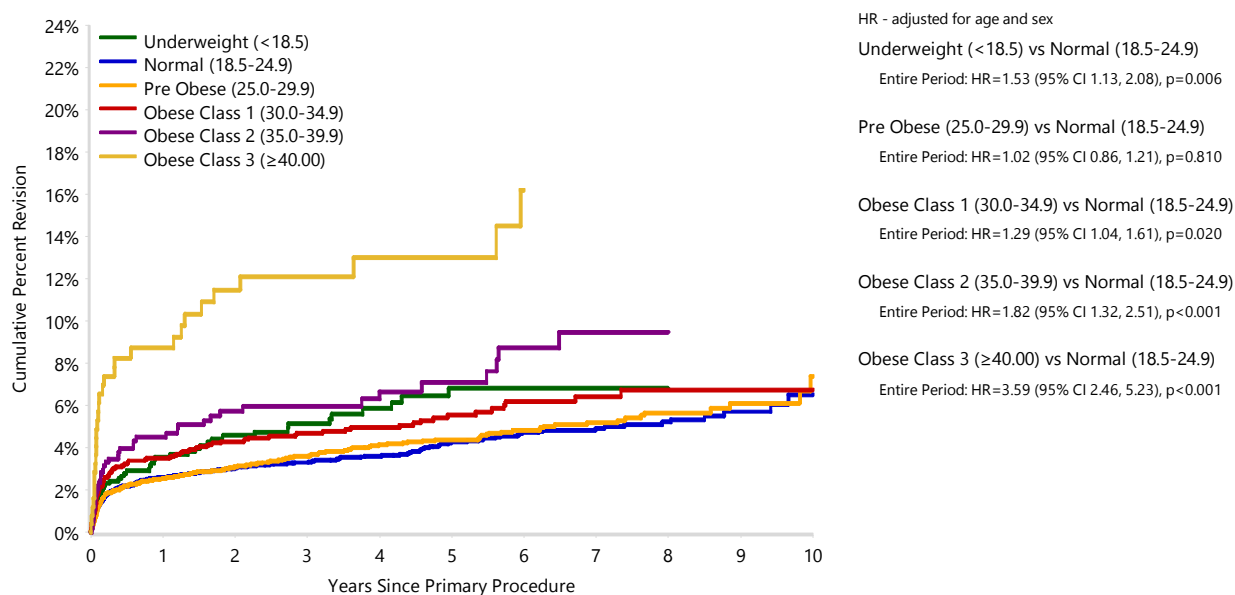
Primary Total Hip Replacement

Table HT101 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)

BMI Category	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	6 Yrs	9 Yrs
Underweight (<18.5)	48	972	3.5 (2.5, 5.0)	4.6 (3.4, 6.2)	5.1 (3.8, 6.9)	5.9 (4.3, 7.9)	6.8 (5.0, 9.2)	
Normal (18.5-24.9)	297	8231	2.6 (2.3, 3.0)	3.0 (2.7, 3.4)	3.3 (2.9, 3.7)	3.6 (3.2, 4.1)	4.7 (4.2, 5.4)	5.7 (4.9, 6.7)
Pre Obese (25.0-29.9)	247	6374	2.6 (2.2, 3.0)	3.1 (2.7, 3.6)	3.6 (3.1, 4.1)	4.2 (3.6, 4.8)	4.8 (4.2, 5.5)	6.1 (5.1, 7.3)
Obese Class 1 (30.0-34.9)	113	2321	3.5 (2.8, 4.3)	4.3 (3.5, 5.2)	4.7 (3.9, 5.7)	5.0 (4.1, 6.0)	6.2 (5.1, 7.6)	6.7 (5.4, 8.4)
Obese Class 2 (35.0-39.9)	43	644	4.5 (3.1, 6.5)	5.7 (4.1, 7.9)	6.0 (4.3, 8.2)	6.7 (4.8, 9.2)	8.7 (6.2, 12.1)	
Obese Class 3 (≥40.0)	30	249	8.7 (5.8, 13.1)	11.5 (7.9, 16.5)	12.1 (8.4, 17.2)	13.0 (9.0, 18.5)	16.2 (10.9, 23.6)	
TOTAL	778	18791						

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded. BMI has not been presented for patients aged ≤19 years

Figure HT113 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)



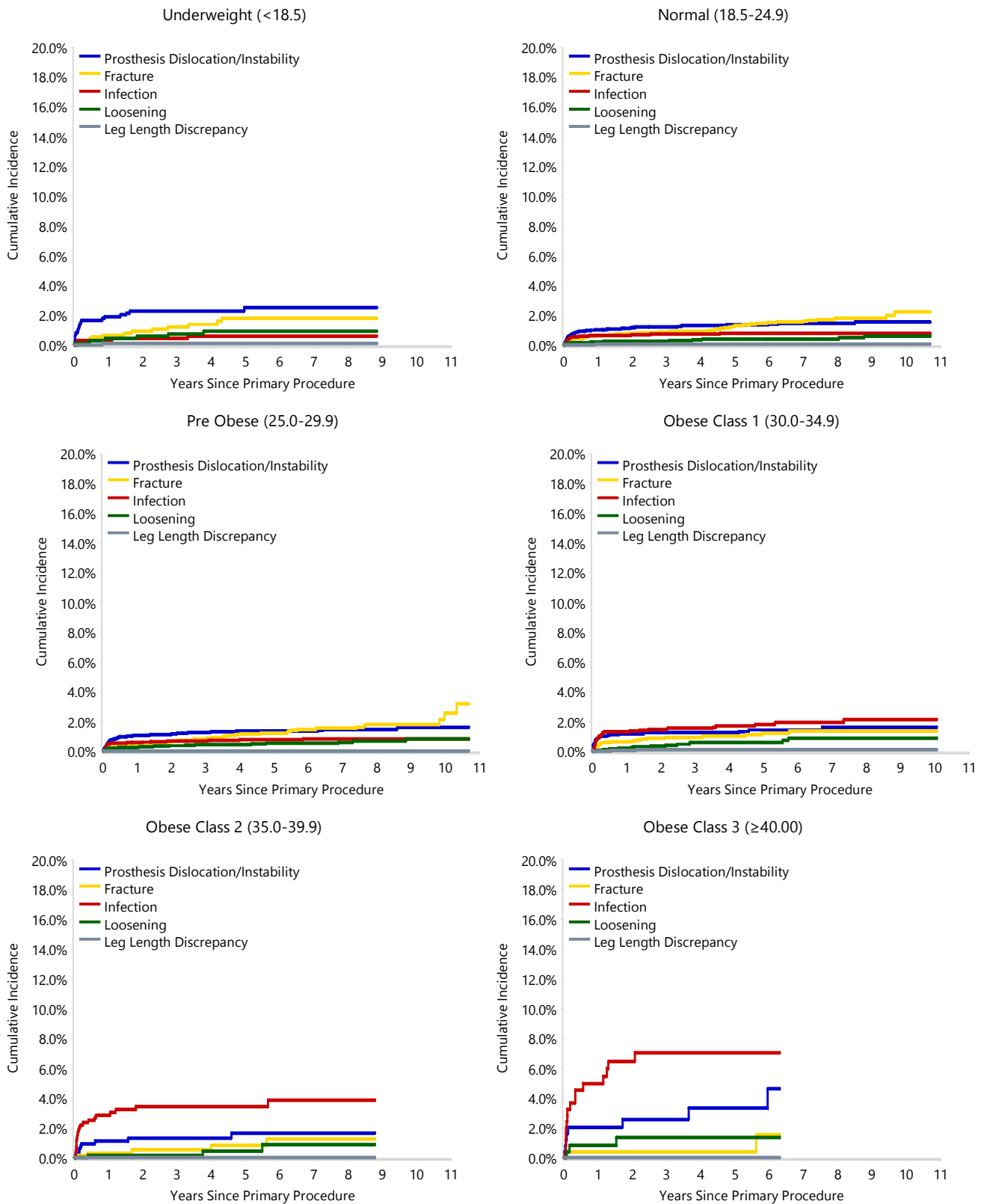
Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	6 Yrs	9 Yrs
Underweight (<18.5)	972	727	591	451	345	173	35
Normal (18.5-24.9)	8231	6564	5318	4197	3276	1786	409
Pre Obese (25.0-29.9)	6374	5149	4230	3424	2634	1458	338
Obese Class 1 (30.0-34.9)	2321	1832	1516	1222	936	511	126
Obese Class 2 (35.0-39.9)	644	510	414	331	261	147	36
Obese Class 3 (≥40.0)	249	177	146	113	90	48	4

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
BMI has not been presented for patients aged ≤19 years



Primary Total Hip Replacement

Figure HT114 Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement by BMI Category (Primary Diagnosis Fractured NOF)



Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded
BMI has not been presented for patients aged ≤19 years

Primary Total Hip Replacement

Fixation

The analysis for fractured neck of femur and fixation has been performed for modern prostheses with modern bearing surfaces.

There are 1,749 procedures with cemented fixation, 7,033 with cementless fixation and 22,818 with hybrid fixation. There is no difference in the rate of revision between cemented and either hybrid or cementless fixation. Cementless fixation has a higher rate of revision than hybrid fixation for the first 3 months only, with no difference after this time (Table HT102 and Figure HT115).

There are differences in outcome with respect to fixation and age. For patients aged <70 years, there is little difference with fixation type. There is no difference in the rate of revision between cemented and cementless fixation. For the first month, cementless fixation has a higher rate of revision than hybrid fixation for this age group. From 1 month onwards, this reverses, and hybrid fixation has a higher rate of revision compared to cementless fixation (Table HT103 and Figure HT116).

For patients aged ≥ 70 years, there is a 95% higher rate of revision for cementless fixation compared to hybrid fixation for the first 3 months.

For patients aged ≥ 70 years, cementless fixation has a higher rate of revision than cemented fixation but only for the first 3 months compared to hybrid fixation. There is no difference in the rate of revision when hybrid fixation is compared to cemented fixation (Table HT103 and Figure HT117).

Table HT102 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis Fractured NOF)

Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cemented	67	1749	2.8 (2.1, 3.7)	3.4 (2.6, 4.4)	3.7 (2.9, 4.8)	4.4 (3.5, 5.6)	4.7 (3.7, 5.9)	4.7 (3.7, 5.9)
Cementless	390	7033	3.7 (3.3, 4.2)	4.3 (3.8, 4.8)	5.0 (4.4, 5.5)	5.6 (5.0, 6.2)	6.2 (5.5, 6.8)	7.4 (6.6, 8.3)
Hybrid	970	22818	2.5 (2.3, 2.8)	3.2 (2.9, 3.4)	3.6 (3.4, 3.9)	4.5 (4.2, 4.8)	5.5 (5.2, 5.9)	6.5 (6.0, 7.1)
TOTAL	1427	31600						

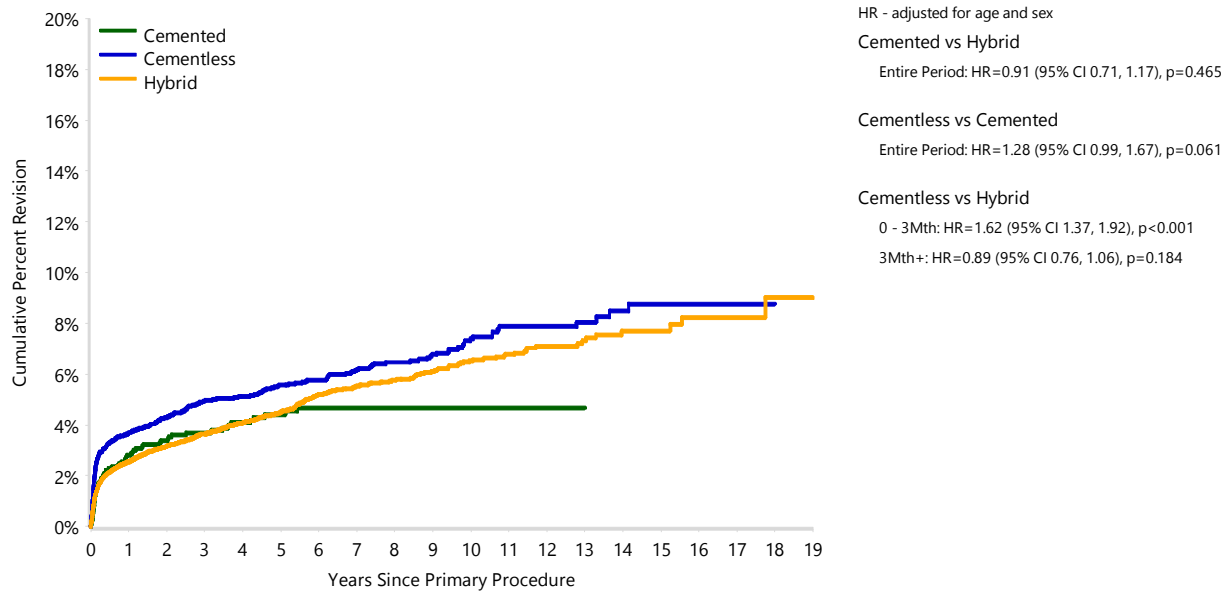
Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces



Primary Total Hip Replacement

Figure HT115 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Fixation (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Cemented	1749	1430	1253	1076	768	464	206
Cementless	7033	5887	5136	4492	3303	2264	1098
Hybrid	22818	18800	15895	13210	8688	5367	2283

Note: Restricted to modern prostheses
Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces

Primary Total Hip Replacement

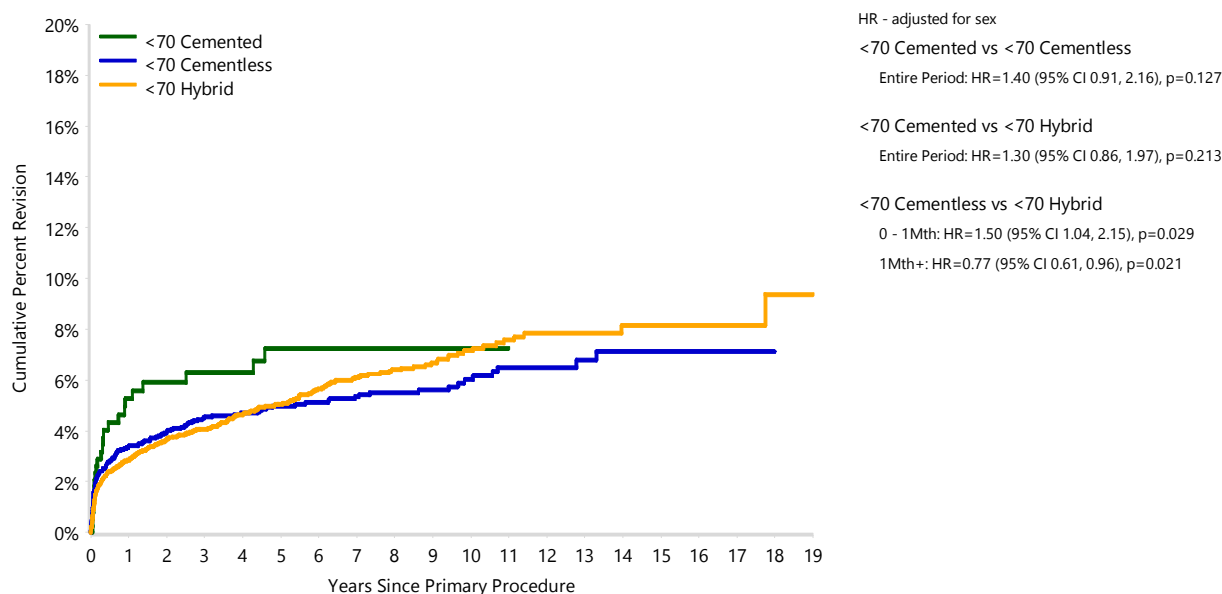
Table HT103 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Age and Fixation (Primary Diagnosis Fractured NOF)

Age	Fixation	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70		522	10345	3.1 (2.8, 3.5)	3.8 (3.5, 4.2)	4.3 (3.9, 4.7)	5.1 (4.7, 5.6)	5.9 (5.4, 6.4)	6.8 (6.1, 7.4)
	Cemented	24	394	5.3 (3.4, 8.1)	5.9 (3.9, 8.9)	6.3 (4.2, 9.4)	7.2 (4.9, 10.7)	7.2 (4.9, 10.7)	7.2 (4.9, 10.7)
	Cementless	151	3008	3.4 (2.8, 4.1)	3.9 (3.3, 4.7)	4.5 (3.8, 5.4)	5.0 (4.2, 5.9)	5.3 (4.5, 6.3)	6.0 (5.1, 7.1)
	Hybrid	347	6943	2.8 (2.5, 3.3)	3.7 (3.2, 4.1)	4.1 (3.6, 4.6)	5.1 (4.5, 5.7)	6.1 (5.4, 6.8)	7.1 (6.3, 8.1)
≥70		905	21255	2.7 (2.5, 2.9)	3.2 (3.0, 3.5)	3.7 (3.5, 4.0)	4.5 (4.2, 4.9)	5.5 (5.1, 5.9)	6.6 (6.1, 7.2)
	Cemented	43	1355	2.1 (1.5, 3.1)	2.7 (1.9, 3.7)	3.0 (2.1, 4.1)	3.6 (2.6, 4.9)	3.9 (2.9, 5.3)	3.9 (2.9, 5.3)
	Cementless	239	4025	3.9 (3.4, 4.6)	4.5 (3.9, 5.3)	5.3 (4.6, 6.0)	6.0 (5.3, 6.9)	6.8 (6.0, 7.8)	8.8 (7.5, 10.3)
	Hybrid	623	15875	2.4 (2.2, 2.7)	2.9 (2.7, 3.2)	3.4 (3.1, 3.8)	4.3 (3.9, 4.6)	5.3 (4.8, 5.7)	6.2 (5.6, 6.9)
TOTAL		1427	31600						

Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces

Figure HT116 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged <70 Years by Fixation (Primary Diagnosis Fractured NOF)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70	Cemented	394	302	263	234	180	127	56
	Cementless	3008	2602	2277	2026	1597	1166	645
	Hybrid	6943	5837	5019	4257	3005	2046	992

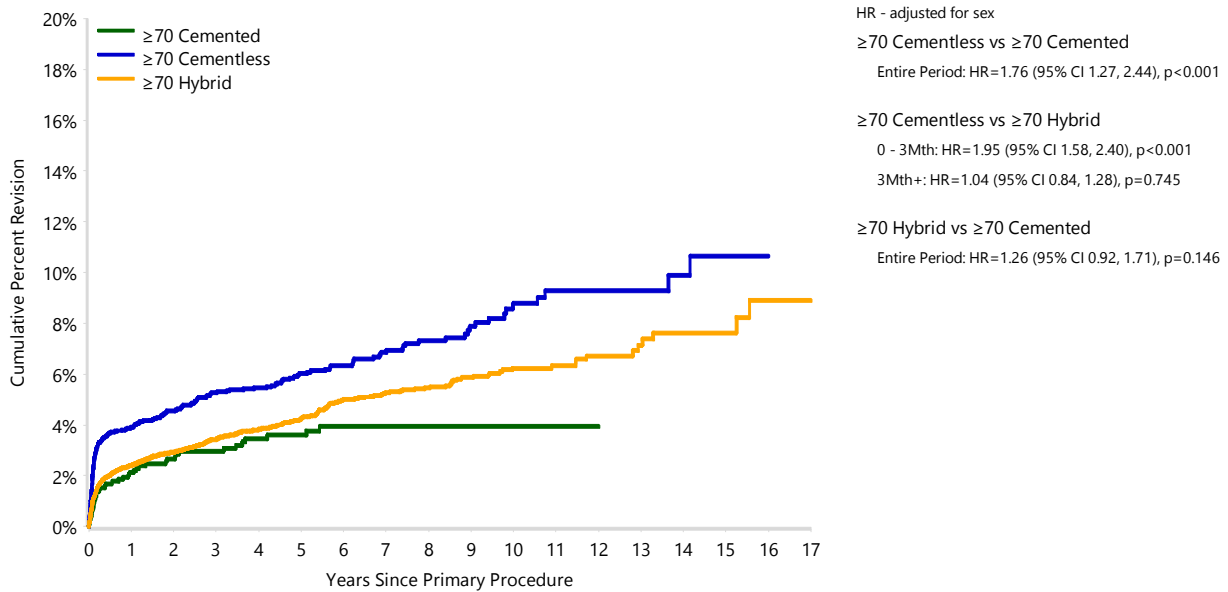
Note: Restricted to modern prostheses

Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces



Primary Total Hip Replacement

Figure HT117 Cumulative Percent Revision of Primary Total Conventional Hip Replacement in Patients Aged ≥70 Years by Fixation (Primary Diagnosis Fractured NOF)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
≥70	Cemented	1355	1128	990	842	588	337	150
	Cementless	4025	3285	2859	2466	1706	1098	453
	Hybrid	15875	12963	10876	8953	5683	3321	1291

Note: Restricted to modern prostheses
Includes mixed ceramic/mixed ceramic and XLPE bearing surfaces

Primary Total Hip Replacement

Head Size

When used for fractured neck of femur, there is no difference in the overall rate of revision between head sizes <32mm, 32mm, and >32mm (Table HT104 and Figure HT118).

However, there is a higher rate of revision for prosthesis dislocation/instability for head size 32mm when compared to >32mm head sizes (Table HT105 and Figure HT119).

Constrained Acetabular Prostheses

When used for fractured neck of femur, there is no difference in the rate of revision for constrained prostheses compared

to other acetabular prostheses (Table HT106 and Figure HT120). However, constrained prostheses are used in less than 1% of procedures.

Dual Mobility

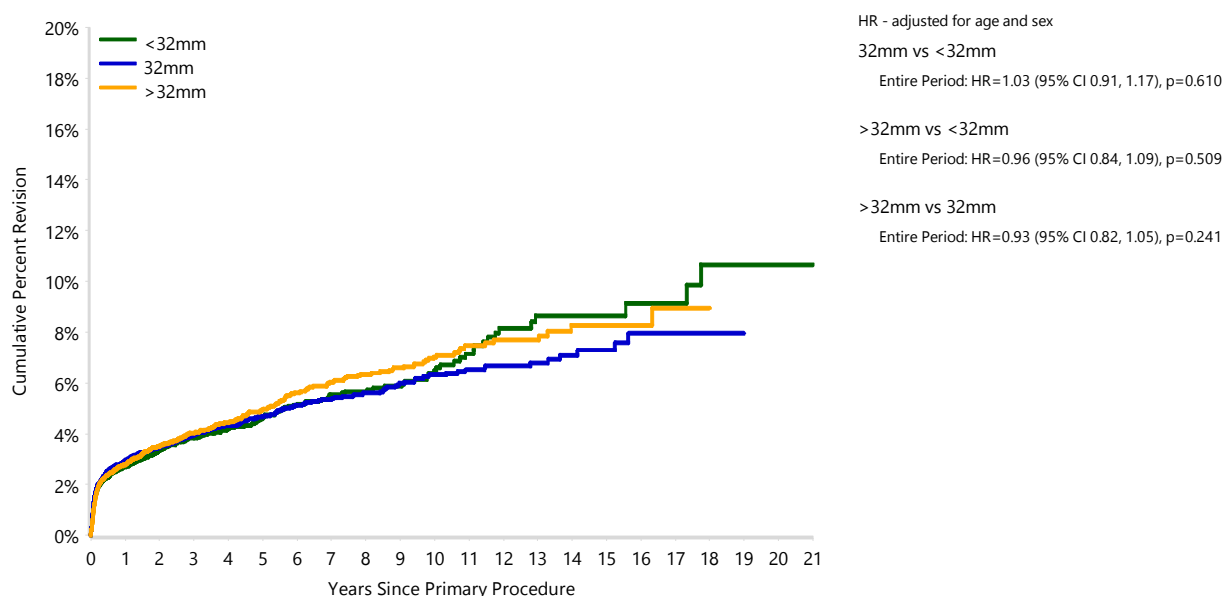
When used for fractured neck of femur, there is no difference in the rate of revision when dual mobility prostheses are used compared to other acetabular components (Table HT107 and Figure HT121). Dual mobility prostheses have a lower rate of revision for dislocation compared to other acetabular components (Table HT108 and Figure HT122).

Table HT104 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF)

Head Size	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	463	11254	2.7 (2.4, 3.0)	3.3 (3.0, 3.7)	3.8 (3.5, 4.2)	4.6 (4.2, 5.1)	5.6 (5.0, 6.2)	6.5 (5.7, 7.4)
32mm	509	10426	2.9 (2.6, 3.3)	3.5 (3.1, 3.8)	3.9 (3.6, 4.3)	4.7 (4.3, 5.1)	5.4 (4.9, 5.9)	6.3 (5.7, 7.0)
>32mm	547	11735	2.8 (2.5, 3.1)	3.5 (3.2, 3.9)	4.0 (3.7, 4.4)	4.9 (4.5, 5.4)	6.0 (5.5, 6.6)	7.0 (6.4, 7.8)
TOTAL	1519	33415						

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded. Excludes 23 procedures with unknown head size

Figure HT118 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	11254	8910	7223	5730	3264	1889	812
32mm	10426	9161	8241	7346	5607	3859	1821
>32mm	11735	9516	8063	6725	4582	2864	1303

Note: Restricted to modern prostheses. All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

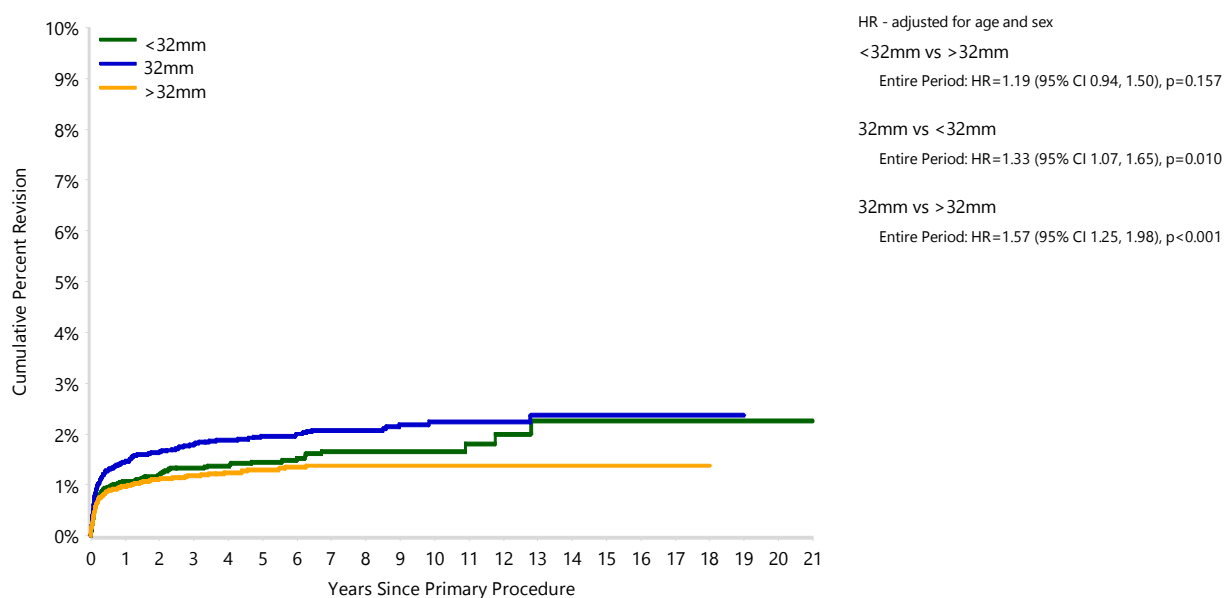
Table HT105 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF, Revision for Prosthesis Dislocation/Instability)

Head Size	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	147	11254	1.1 (0.9, 1.3)	1.2 (1.0, 1.4)	1.3 (1.1, 1.6)	1.4 (1.2, 1.7)	1.7 (1.4, 2.0)	1.7 (1.4, 2.0)
32mm	197	10426	1.5 (1.2, 1.7)	1.6 (1.4, 1.9)	1.8 (1.5, 2.1)	2.0 (1.7, 2.3)	2.1 (1.8, 2.4)	2.2 (1.9, 2.6)
>32mm	136	11735	1.0 (0.8, 1.2)	1.1 (0.9, 1.3)	1.2 (1.0, 1.4)	1.3 (1.1, 1.5)	1.4 (1.2, 1.6)	1.4 (1.2, 1.6)
TOTAL	480	33415						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT119 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis Fractured NOF, Revision for Prosthesis Dislocation/Instability)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<32mm	11254	8910	7223	5730	3264	1889	812
32mm	10426	9161	8241	7346	5607	3859	1821
>32mm	11735	9516	8063	6725	4582	2864	1303

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

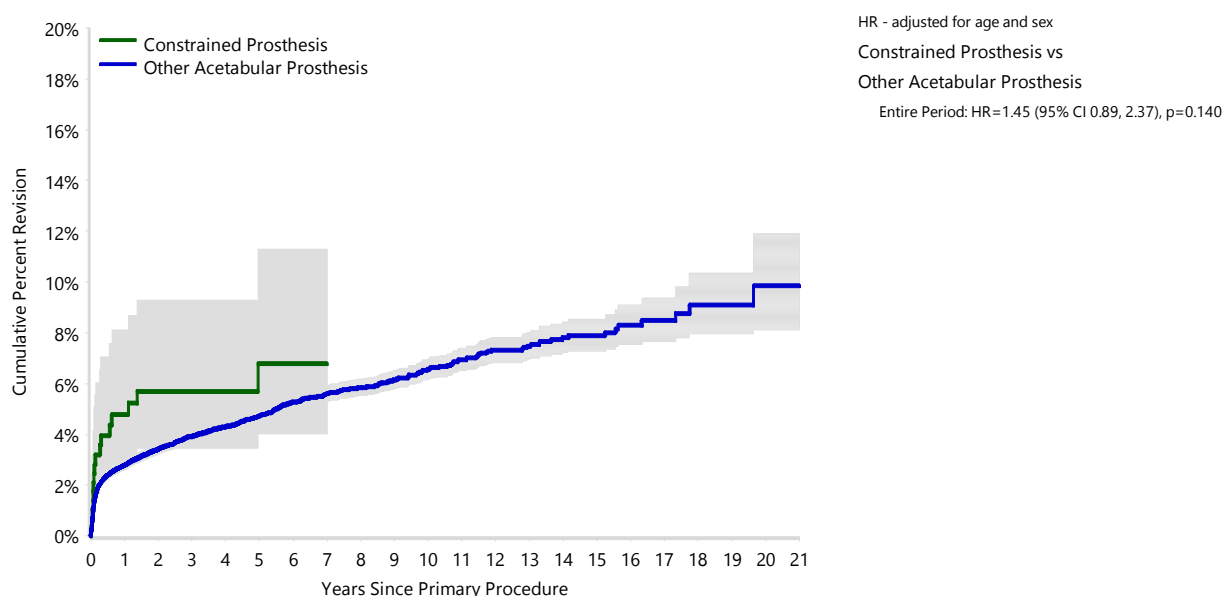
Table HT106 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis Fractured NOF)

Acetabular Type	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Constrained Prosthesis	16	294	4.8 (2.8, 8.1)	5.7 (3.5, 9.3)	5.7 (3.5, 9.3)	6.8 (4.0, 11.3)	6.8 (4.0, 11.3)	
Other Acetabular Prosthesis	1504	33144	2.8 (2.6, 3.0)	3.4 (3.2, 3.6)	3.9 (3.7, 4.1)	4.7 (4.5, 5.0)	5.6 (5.3, 5.9)	6.6 (6.2, 7.0)
TOTAL	1520	33438						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT120 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Type (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Constrained Prosthesis	294	217	178	139	85	43	19
Other Acetabular Prosthesis	33144	27387	23365	19676	13381	8579	3924

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

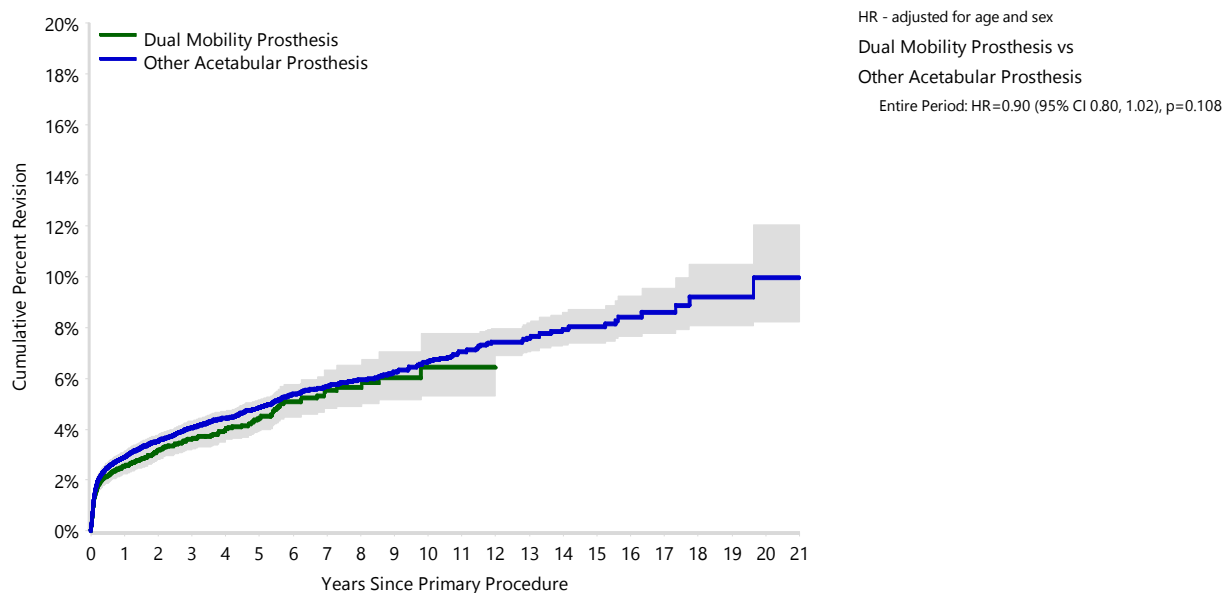
Table HT107 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis Fractured NOF)

Acetabular Mobility	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Dual Mobility Prosthesis	327	9113	2.5 (2.2, 2.9)	3.2 (2.8, 3.6)	3.6 (3.2, 4.1)	4.5 (3.9, 5.0)	5.5 (4.8, 6.3)	6.4 (5.3, 7.8)
Other Acetabular Prosthesis	1193	24325	2.9 (2.7, 3.1)	3.5 (3.3, 3.8)	4.1 (3.8, 4.3)	4.9 (4.6, 5.2)	5.7 (5.4, 6.0)	6.7 (6.3, 7.1)
TOTAL	1520	33438						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT121 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Dual Mobility Prosthesis	9113	7039	5505	4148	1998	899	207
Other Acetabular Prosthesis	24325	20565	18038	15667	11468	7723	3736

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

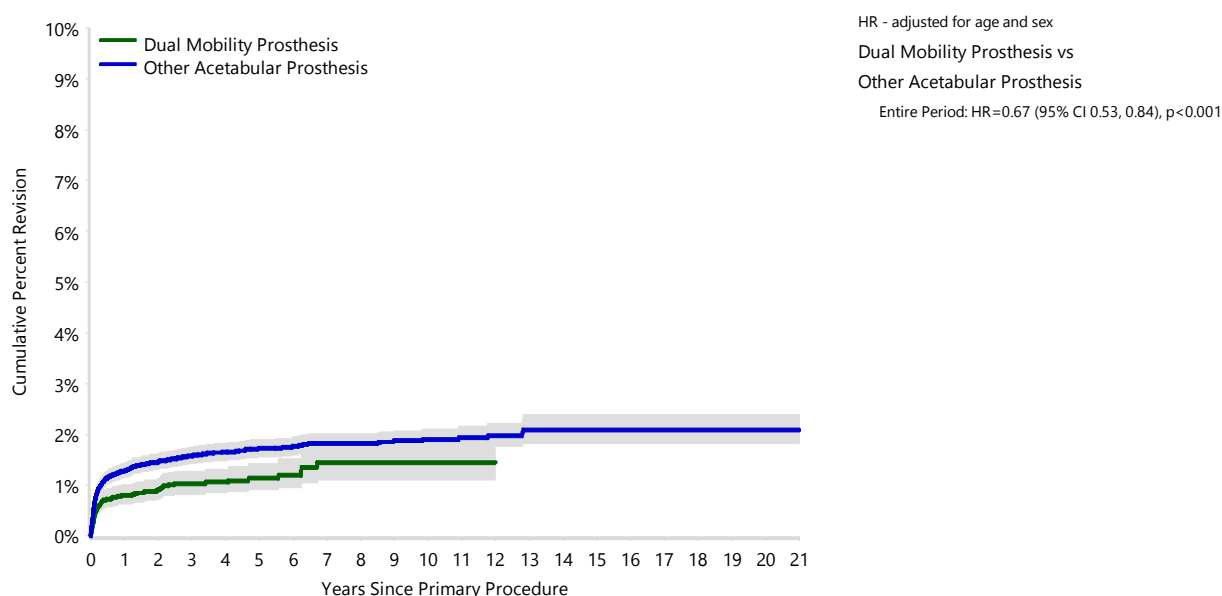
Table HT108 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis Fractured NOF, Revision for Prosthesis Dislocation/Instability)

Acetabular Mobility	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Dual Mobility Prosthesis	89	9113	0.8 (0.6, 1.0)	0.9 (0.7, 1.1)	1.0 (0.8, 1.3)	1.1 (0.9, 1.4)	1.5 (1.1, 1.9)	1.5 (1.1, 1.9)
Other Acetabular Prosthesis	392	24325	1.3 (1.1, 1.4)	1.5 (1.3, 1.6)	1.6 (1.4, 1.7)	1.7 (1.6, 1.9)	1.8 (1.6, 2.0)	1.9 (1.7, 2.1)
TOTAL	481	33438						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT122 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Acetabular Mobility (Primary Diagnosis Fractured NOF, Revision for Prosthesis Dislocation/Instability)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Dual Mobility Prosthesis	9113	7039	5505	4148	1998	899	207
Other Acetabular Prosthesis	24325	20565	18038	15667	11468	7723	3736

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

OUTCOME OF TOTAL CONVENTIONAL COMPARED TO PARTIAL HIP REPLACEMENT FOR NECK OF FEMUR FRACTURE

The rate of revision for fractured neck of femur in primary total conventional hip replacement and in primary unipolar monoblock, primary unipolar modular, and primary bipolar partial hip replacement procedures are compared. These comparisons have not considered the competing risk of death, which increases with age, and are likely to be subject to selection bias. There are 129,359 procedures for this analysis.

Unipolar monoblock partial hip replacement (which is now infrequently used) has a lower rate of revision than total conventional hip only up to 1 month.

Unipolar modular partial hip replacement has a lower rate of revision than total conventional hip replacement for the first month but after 9 months unipolar modular has a higher rate of revision.

There is no difference in the rate of revision when comparing bipolar partial to total conventional hip replacement (Table HT109 and Figure HT123).

The rates of revision for each type of hip replacement for patients aged <70 years and ≥70 years are provided in Table HT110, Figure HT124 and Figure HT125.

When total conventional hip replacement for patients aged <70 years is compared, bipolar partial hip replacement has a higher rate of revision, as does unipolar modular after 3 months. There are few unipolar monoblock implants used for this age group. Unipolar monoblock does not have a different rate of revision compared to total conventional hip replacement (Table HT110 and Figure HT124).

For patients aged ≥70 years, all partial hip replacement categories have lower rates of revision compared to total conventional hip replacement (but only for the first 9 months for unipolar modular) (Table HT110 and Figure HT125).

Primary Total Hip Replacement

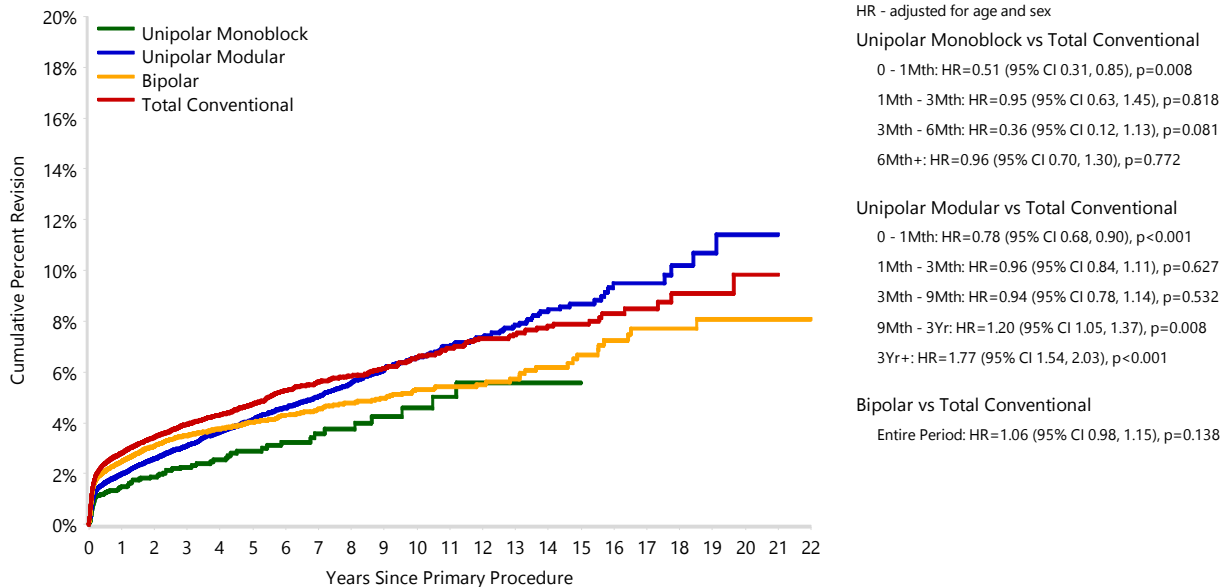
Table HT109 Cumulative Percent Revision of Primary Hip Replacement by Class (Primary Diagnosis Fractured NOF)

Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	84	3927	1.5 (1.1, 2.0)	1.9 (1.4, 2.4)	2.3 (1.8, 2.9)	2.9 (2.3, 3.7)	3.6 (2.8, 4.6)	4.6 (3.4, 6.2)
Unipolar Modular	1601	51168	2.0 (1.9, 2.1)	2.6 (2.4, 2.8)	3.1 (2.9, 3.3)	4.1 (3.9, 4.4)	5.0 (4.7, 5.3)	6.6 (6.1, 7.0)
Bipolar	1232	40826	2.5 (2.3, 2.7)	3.1 (2.9, 3.3)	3.5 (3.3, 3.7)	4.0 (3.8, 4.3)	4.5 (4.2, 4.9)	5.3 (4.9, 5.8)
Total Conventional	1520	33438	2.8 (2.6, 3.0)	3.4 (3.2, 3.6)	3.9 (3.7, 4.2)	4.7 (4.5, 5.0)	5.6 (5.3, 5.9)	6.6 (6.2, 7.0)
TOTAL	4437	129359						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Figure HT123 Cumulative Percent Revision of Primary Hip Replacement by Class (Primary Diagnosis Fractured NOF)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Unipolar Monoblock	3927	2505	1989	1564	931	557	243
Unipolar Modular	51168	34382	27302	21348	12637	7417	3229
Bipolar	40826	26352	19555	14446	7929	4366	1836
Total Conventional	33438	27604	23543	19815	13466	8622	3943

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

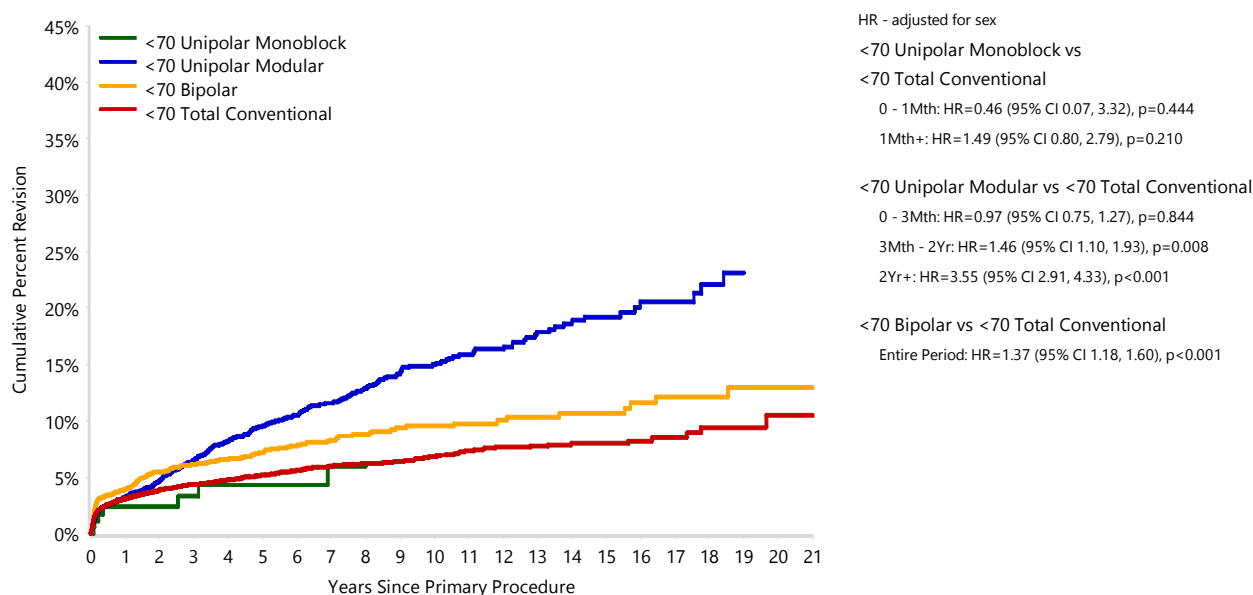
**Table HT110 Cumulative Percent Revision of Primary Hip Replacement by Age and Class
(Primary Diagnosis Fractured NOF)**

Age	Hip Class	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70		1113	17991	3.3 (3.0, 3.5)	4.3 (4.0, 4.6)	5.1 (4.7, 5.4)	6.3 (5.9, 6.7)	7.4 (7.0, 7.9)	8.9 (8.3, 9.5)
	Unipolar Monoblock	11	184	2.4 (0.9, 6.3)	2.4 (0.9, 6.3)	3.3 (1.4, 7.9)	4.3 (1.9, 9.6)	5.9 (2.7, 12.9)	
	Unipolar Modular	310	3307	3.2 (2.7, 3.9)	4.7 (4.0, 5.5)	6.5 (5.6, 7.5)	9.5 (8.4, 10.9)	11.6 (10.2, 13.1)	15.0 (13.3, 16.9)
	Bipolar	227	3635	3.9 (3.3, 4.6)	5.4 (4.7, 6.3)	6.1 (5.3, 7.1)	7.2 (6.2, 8.3)	8.3 (7.2, 9.6)	9.5 (8.2, 11.1)
	Total Conventional	565	10865	3.1 (2.8, 3.4)	3.9 (3.5, 4.3)	4.4 (4.0, 4.8)	5.2 (4.7, 5.7)	6.0 (5.5, 6.6)	6.8 (6.2, 7.5)
≥70		3324	111368	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	3.1 (3.0, 3.2)	3.8 (3.7, 4.0)	4.5 (4.4, 4.7)	5.5 (5.3, 5.8)
	Unipolar Monoblock	73	3743	1.4 (1.1, 1.9)	1.8 (1.4, 2.4)	2.2 (1.7, 2.8)	2.8 (2.2, 3.6)	3.4 (2.6, 4.4)	3.6 (2.7, 4.7)
	Unipolar Modular	1291	47861	1.9 (1.8, 2.0)	2.4 (2.3, 2.6)	2.8 (2.6, 3.0)	3.6 (3.4, 3.9)	4.4 (4.1, 4.7)	5.5 (5.1, 6.0)
	Bipolar	1005	37191	2.3 (2.2, 2.5)	2.8 (2.7, 3.0)	3.2 (3.0, 3.4)	3.7 (3.4, 3.9)	4.1 (3.8, 4.4)	4.7 (4.3, 5.2)
	Total Conventional	955	22573	2.7 (2.5, 2.9)	3.2 (3.0, 3.5)	3.7 (3.5, 4.0)	4.5 (4.2, 4.8)	5.4 (5.1, 5.8)	6.5 (6.0, 7.1)
TOTAL		4437	129359						

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

**Figure HT124 Cumulative Percent Revision of Primary Hip Replacement in Patients Aged <70 Years by Class
(Primary Diagnosis Fractured NOF)**



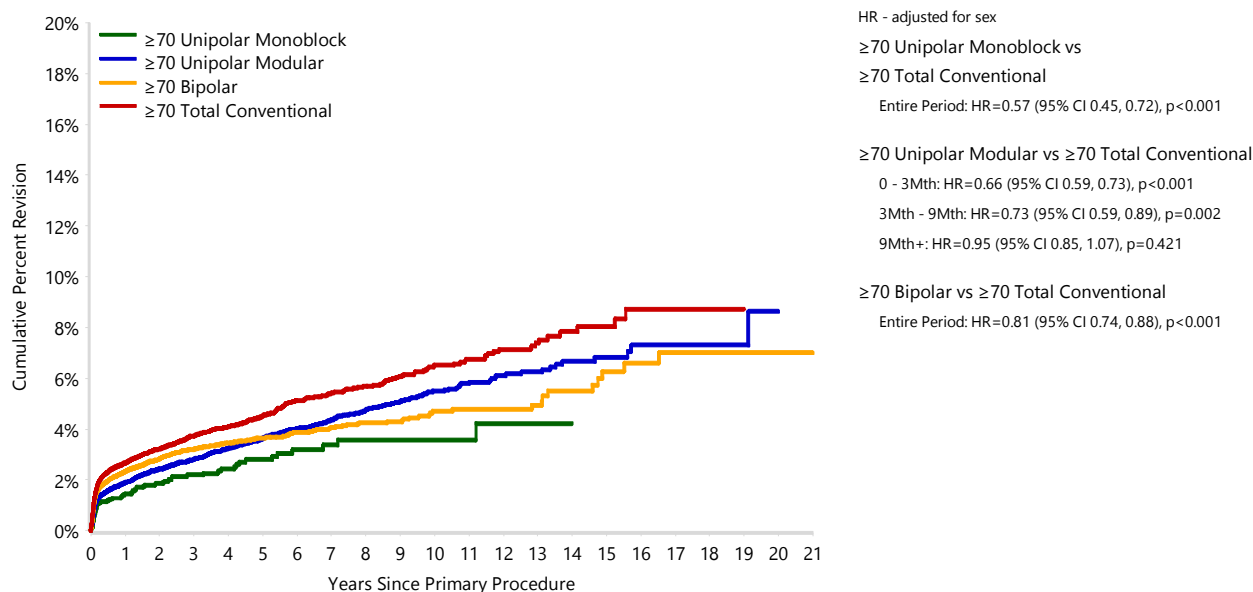
Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
<70	Unipolar Monoblock	184	129	114	99	70	57	30
	Unipolar Modular	3307	2502	2123	1830	1361	1017	614
	Bipolar	3635	2594	2048	1672	1122	798	457
	Total Conventional	10865	9181	7953	6860	5048	3561	1876

Note: Restricted to modern prostheses

All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Figure HT125 Cumulative Percent Revision of Primary Hip Replacement in Patients Aged ≥70 Years by Class (Primary Diagnosis Fractured NOF)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs
≥70	Unipolar Monoblock	3743	2376	1875	1465	861	500	213
	Unipolar Modular	47861	31880	25179	19518	11276	6400	2615
	Bipolar	37191	23758	17507	12774	6807	3568	1379
	Total Conventional	22573	18423	15590	12955	8418	5061	2067

Note: Restricted to modern prostheses
All procedures using metal/metal prostheses have been excluded

Primary Total Hip Replacement

Primary Total Resurfacing Hip Replacement

DEMOGRAPHICS

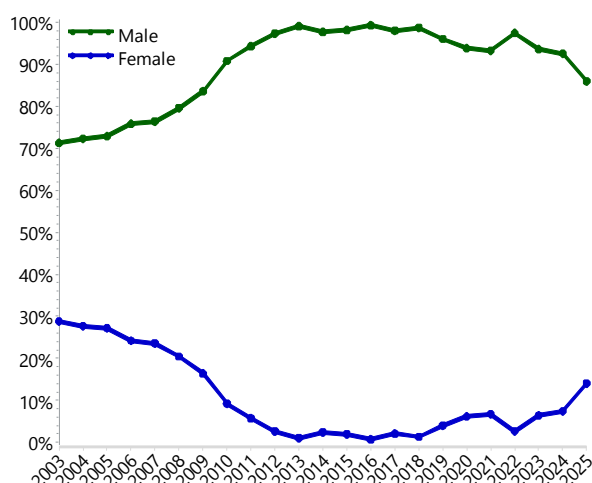
There are 22,138 primary total resurfacing hip replacement procedures. This is an additional 965 procedures compared to the previous report. With the restriction to modern prostheses, 4,366 (19.7%) hip resurfacing procedures have been excluded from the analysis in this year's Annual Report.

For further information on the **closure of the database** please see the Glossary of this report.

In 2025, the number of primary total resurfacing procedures is 43.4% more than in 2024, and 48.4% less than in 2005 when the use of hip resurfacing peaked. Primary total resurfacing hip replacement represents 1.5% of all hip replacements performed in 2025.

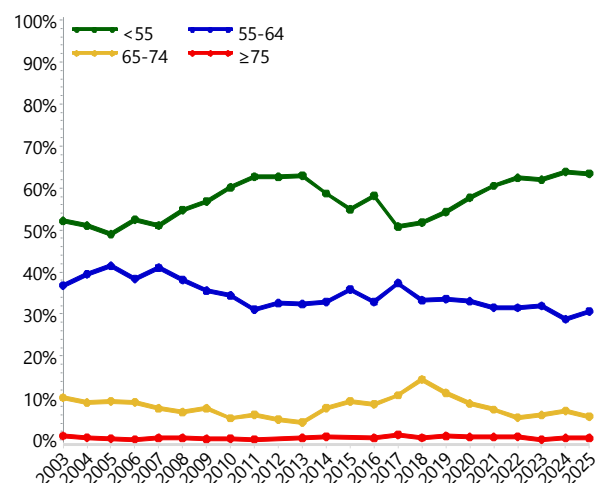
In 2025, 86.0% of primary total resurfacing hip replacements were undertaken in males (Table HT111 and Figure HT126).

Figure HT126 Primary Total Resurfacing Hip Replacement by Sex



The change in usage of primary total resurfacing hip replacement for each age group is provided in Figure HT127.

Figure HT127 Primary Total Resurfacing Hip Replacement by Age



There were only five types of resurfacing prostheses used in 2025, with the ReCerf the most commonly used (Table HT112). The ReCerf resurfacing head was used for the first time in 2018.

Table HT111 Age and Sex of Primary Total Resurfacing Hip Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	18221	82.3%	13	84	54	53.0	9.3
Female	3917	17.7%	14	81	52	51.3	8.7
TOTAL	22138	100.0%	13	84	53	52.7	9.2



Primary Total Hip Replacement

Table HT112 Most Used Resurfacing Heads in Primary Total Resurfacing Hip Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1359	BHR	354	Adept	409	Adept	406	Adept	567	ReCerf
58	Durom	99	BHR	129	ReCerf	163	ReCerf	312	Adept
43	ASR	49	ReCerf	85	BHR	77	BHR	39	BHR
42	Cormet					15	Polymotion	29	Polymotion
38	Cormet 2000 HAP							1	Romax
7	Conserve Plus								
10 Most Used									
1547	(6) 100.0%	502	(3) 100.0%	623	(3) 100.0%	661	(4) 100.0%	948	(5) 100.0%



Primary Total Hip Replacement

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

Again, this analysis is restricted to modern resurfacing prostheses in current use. The principal diagnosis for primary total resurfacing hip replacement is osteoarthritis, followed by developmental dysplasia and osteonecrosis.

Primary total resurfacing hip replacement for osteoarthritis has a lower rate of revision compared to developmental

dysplasia from 6 months up to 5 years. There is a higher rate of revision for osteonecrosis compared to osteoarthritis (Table HT113 and Figure HT128).

Prosthesis Types

The cumulative percent revision of the three different primary total resurfacing hip prosthesis combinations with >100 procedures is listed in Table HT114.

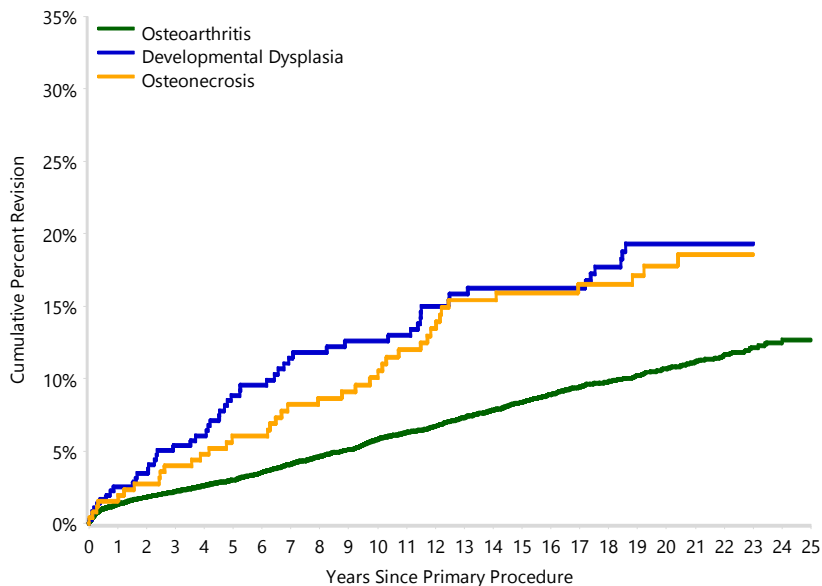
Table HT113 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	1276	17027	1.3 (1.2, 1.5)	2.2 (2.0, 2.5)	3.0 (2.8, 3.3)	5.8 (5.4, 6.2)	8.4 (7.9, 8.9)	10.7 (10.1, 11.3)
Developmental Dysplasia	53	365	2.5 (1.3, 4.8)	5.4 (3.4, 8.4)	8.8 (6.2, 12.6)	12.6 (9.3, 16.9)	16.3 (12.4, 21.1)	19.3 (15.0, 24.7)
Osteonecrosis	40	256	1.6 (0.6, 4.1)	4.0 (2.2, 7.3)	6.0 (3.7, 9.8)	10.1 (6.8, 14.7)	15.9 (11.7, 21.5)	17.8 (13.3, 23.6)
Other (6)	18	124	2.4 (0.8, 7.3)	3.3 (1.2, 8.5)	6.0 (2.9, 12.1)	12.0 (7.1, 19.8)	14.4 (8.9, 22.9)	17.4 (11.0, 26.8)
TOTAL	1387	17772						

Note: Restricted to modern prostheses

Only primary diagnoses with > 100 procedures have been listed

Figure HT128 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Primary Diagnosis



HR - adjusted for age and sex

Developmental Dysplasia vs Osteoarthritis

0 - 6Mth: HR=1.08 (95% CI 0.48, 2.45), p=0.848

6Mth - 2.5Yr: HR=2.21 (95% CI 1.20, 4.09), p=0.011

2.5Yr - 5Yr: HR=2.48 (95% CI 1.34, 4.59), p=0.003

5Yr+: HR=0.90 (95% CI 0.60, 1.34), p=0.592

Developmental Dysplasia vs Osteonecrosis

Entire Period: HR=0.69 (95% CI 0.46, 1.05), p=0.083

Osteonecrosis vs Osteoarthritis

Entire Period: HR=1.78 (95% CI 1.29, 2.45), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	17027	15882	14471	13240	10488	8003	4020
Developmental Dysplasia	365	330	284	260	221	187	125
Osteonecrosis	256	249	235	226	187	160	114

Note: Restricted to modern prostheses

Only primary diagnoses with > 100 procedures have been listed

Primary Total Hip Replacement

Table HT114 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Prosthesis Combination (All Diagnoses)

Head Component	Acetabular Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Adept	Adept	126	4154	1.2 (0.9, 1.5)	1.8 (1.4, 2.3)	2.3 (1.8, 2.8)	4.4 (3.6, 5.4)	5.7 (4.5, 7.2)	
BHR	BHR	1240	12356	1.4 (1.2, 1.6)	2.5 (2.2, 2.8)	3.4 (3.1, 3.8)	6.4 (6.0, 6.9)	9.1 (8.6, 9.7)	11.5 (10.8, 12.1)
ReCerf	ReCerf	18	1216	1.2 (0.7, 2.1)	2.0 (1.2, 3.3)	2.0 (1.2, 3.3)			
Other (3)		3	46	8.3 (2.7, 23.9)					
TOTAL		1387	17772						

Note: Restricted to modern prostheses

Only combinations with >100 procedures have been listed

OUTCOME FOR OSTEOARTHRITIS

The cumulative percent revision at 20 years for primary total resurfacing hip replacement undertaken for osteoarthritis is 10.7% (Table HT115 and Figure HT129).

Reasons for Revision

The main reasons for revision of primary total resurfacing hip replacement are loosening, metal related pathology, and fracture (Table HT116).

Loosening is the most common reason for revision after 12 years.

The five most common reasons for revision are shown in Figure HT130. The cumulative incidence of fracture increases rapidly in the first year. After this time, the incidence increases at a slower rate. The cumulative incidence of loosening increases to become the most common reason for revision after 12 years.

Type of Revision

The most common type of revision for total resurfacing hip replacement is revision of both the femoral and acetabular components. Femoral only revision is much less common and acetabular only revision is rarely undertaken (Table HT117).

Age and Sex

Patients aged ≥65 years have an early higher rate of revision compared to younger patients (lasting for 6 months for those aged <55 years and between 3 and 6 months only for those aged 55-64 years). Patients aged 55-64 years also have a higher rate of revision compared to patients aged <55 years for the first 1.5 years only (Table HT118 and Figure HT131).

Females have a higher rate of revision compared to males (Table HT119 and Figure HT132). Males aged ≥65 years have a higher rate of revision compared to males aged <55 years for the first 6 months and when compared to males aged 55-64 years (Table HT119 and Figure HT133). Age is not a risk factor for revision for female patients (Table HT119 and Figure HT134).

Head Size

The rate of revision decreases as the femoral head size increases. Femoral head sizes ≥55mm have a lower rate of revision compared to all other head size groups (Table HT120 and Figure HT135). This effect of femoral component head size is evident in both males and females (Table HT121 and Figure HT136).

The reason for revision varies with head size. Head sizes <50mm have a higher cumulative incidence of metal related pathology, loosening, fracture, infection, and lysis compared to head sizes ≥50mm (Figure HT137).



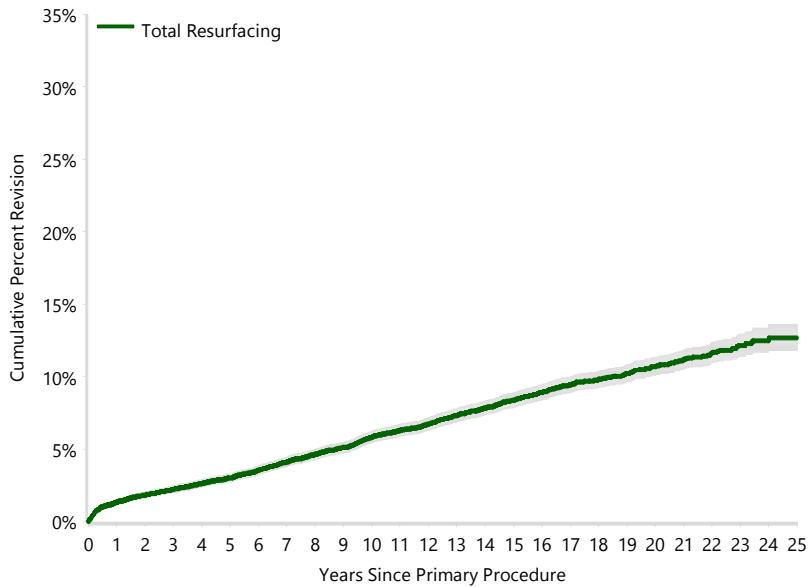
Primary Total Hip Replacement

Table HT115 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)

Hip Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	1276	17027	1.3 (1.2, 1.5)	2.2 (2.0, 2.5)	3.0 (2.8, 3.3)	5.8 (5.4, 6.2)	8.4 (7.9, 8.9)	10.7 (10.1, 11.3)
TOTAL	1276	17027						

Note: Restricted to modern prostheses

Figure HT129 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	17027	15882	14471	13240	10488	8003	4020

Note: Restricted to modern prostheses

Primary Total Hip Replacement

Table HT116 Primary Total Resurfacing Hip Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Loosening	316	24.8
Metal Related Pathology	275	21.6
Fracture	271	21.2
Lysis	130	10.2
Infection	85	6.7
Pain	70	5.5
Osteonecrosis	33	2.6
Prosthesis Dislocation/Instability	32	2.5
Malposition	23	1.8
Other	21	1.6
Other (8)	20	1.6
TOTAL	1276	100.0

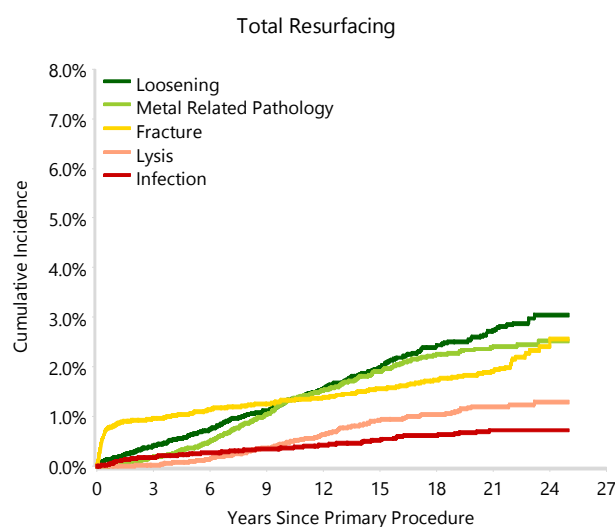
Note: Restricted to modern prostheses

Table HT117 Primary Total Resurfacing Hip Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
THR (Femoral/Acetabular)	839	65.8
Femoral Component	364	28.5
Acetabular Component	33	2.6
Cement Spacer	28	2.2
Removal of Prostheses	8	0.6
Insert Only	1	0.1
Head/Insert	1	0.1
Minor Components	1	0.1
Reinsertion of Components	1	0.1
TOTAL	1276	100.0

Note: Restricted to modern prostheses

Figure HT130 Cumulative Incidence Revision Diagnosis of Primary Total Resurfacing Hip Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



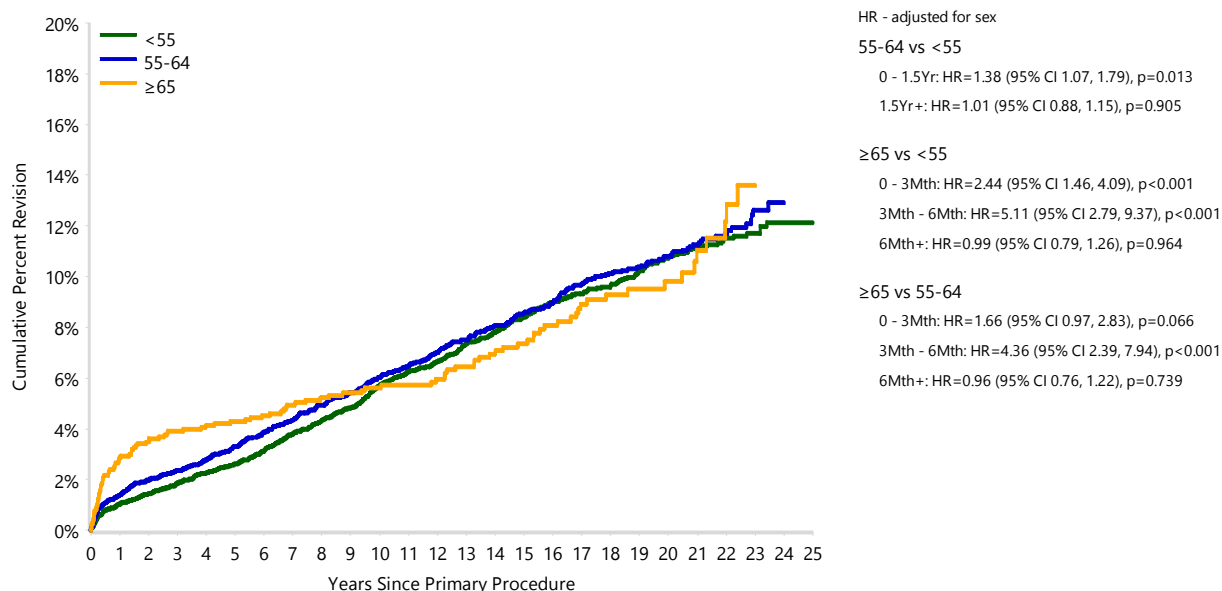
Primary Total Hip Replacement

Table HT118 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	668	9283	1.0 (0.9, 1.3)	1.9 (1.6, 2.2)	2.6 (2.3, 3.0)	5.7 (5.2, 6.3)	8.4 (7.7, 9.1)	10.7 (9.9, 11.6)
55-64	495	6210	1.4 (1.1, 1.7)	2.3 (2.0, 2.8)	3.3 (2.9, 3.8)	6.0 (5.4, 6.7)	8.5 (7.8, 9.4)	10.8 (9.9, 11.8)
≥65	113	1534	2.8 (2.1, 3.8)	3.9 (3.0, 5.0)	4.3 (3.4, 5.4)	5.6 (4.5, 7.0)	7.4 (6.0, 9.0)	9.8 (8.0, 12.0)
TOTAL	1276	17027						

Note: Restricted to modern prostheses

Figure HT131 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	9283	8614	7767	7049	5604	4254	2188
55-64	6210	5837	5379	4961	3992	3093	1547
≥65	1534	1431	1325	1230	892	656	285

Note: Restricted to modern prostheses

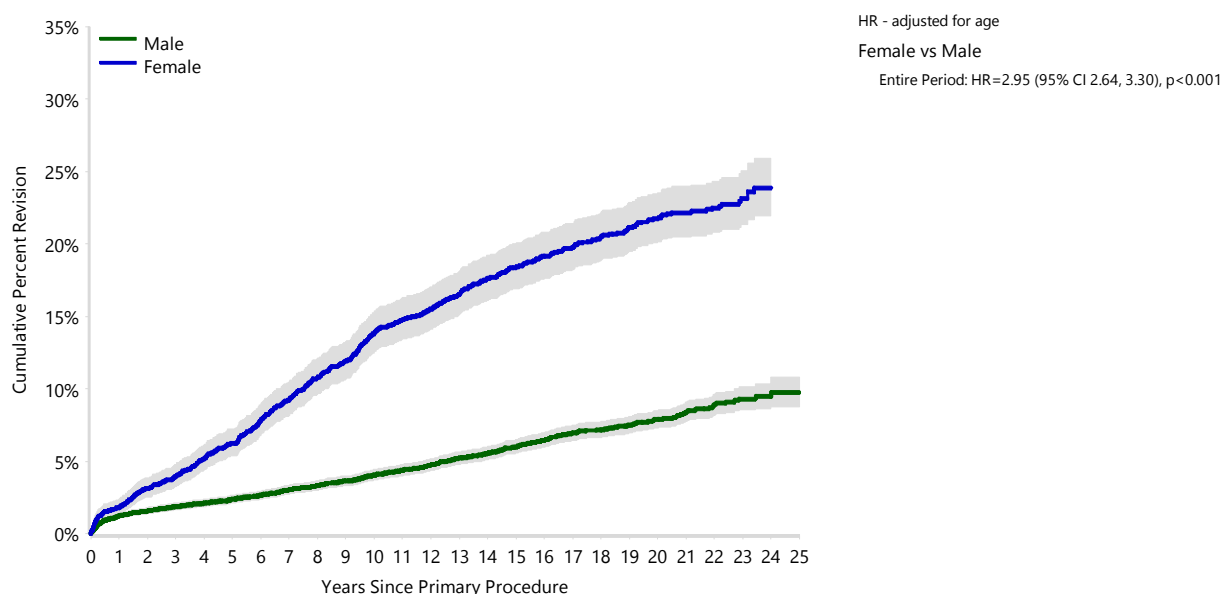
Primary Total Hip Replacement

Table HT119 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Sex and Age (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		761	14352	1.2 (1.1, 1.4)	1.9 (1.7, 2.1)	2.4 (2.1, 2.7)	4.0 (3.7, 4.4)	6.0 (5.6, 6.5)	7.9 (7.3, 8.5)
	<55	375	7724	1.0 (0.8, 1.2)	1.5 (1.3, 1.8)	2.0 (1.7, 2.3)	3.7 (3.2, 4.2)	5.8 (5.2, 6.5)	7.7 (6.9, 8.6)
	55-64	287	5204	1.2 (0.9, 1.6)	1.9 (1.6, 2.3)	2.5 (2.1, 3.0)	4.2 (3.6, 4.9)	6.1 (5.4, 6.9)	7.8 (6.9, 8.8)
	≥65	99	1424	2.9 (2.1, 3.9)	3.8 (2.9, 5.0)	4.2 (3.2, 5.4)	5.3 (4.2, 6.7)	6.7 (5.4, 8.4)	9.3 (7.5, 11.6)
Female		515	2675	1.8 (1.4, 2.4)	4.0 (3.3, 4.8)	6.2 (5.4, 7.3)	13.8 (12.5, 15.2)	18.4 (16.9, 20.0)	21.7 (20.1, 23.5)
	<55	293	1559	1.4 (1.0, 2.2)	3.5 (2.7, 4.6)	5.7 (4.6, 7.0)	14.0 (12.3, 16.0)	18.5 (16.5, 20.7)	21.8 (19.6, 24.2)
	55-64	208	1006	2.3 (1.5, 3.4)	4.6 (3.4, 6.1)	7.1 (5.7, 8.9)	14.1 (12.0, 16.5)	18.8 (16.4, 21.5)	22.4 (19.8, 25.3)
	≥65	14	110	2.8 (0.9, 8.4)	4.7 (2.0, 10.9)	5.7 (2.6, 12.2)	8.6 (4.6, 16.0)	13.2 (7.9, 21.7)	14.6 (8.9, 23.6)
TOTAL		1276	17027						

Note: Restricted to modern prostheses

Figure HT132 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Sex (Primary Diagnosis OA)



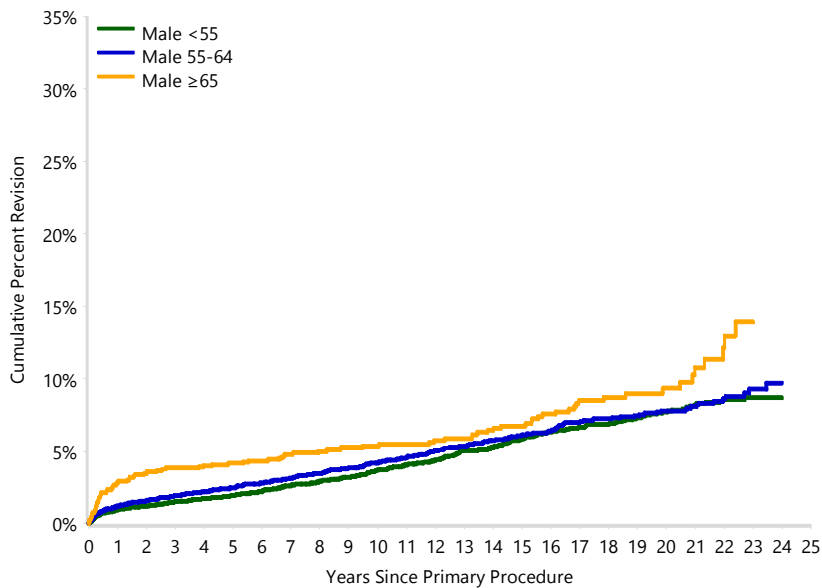
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	14352	13380	12112	10994	8512	6237	2921
Female	2675	2502	2359	2246	1976	1766	1099

Note: Restricted to modern prostheses



Primary Total Hip Replacement

Figure HT133 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement in Males by Age (Primary Diagnosis OA)



Male 55-64 vs Male <55

Entire Period: HR=1.08 (95% CI 0.93, 1.26), p=0.304

Male ≥65 vs Male <55

0 - 3Mth: HR=2.12 (95% CI 1.23, 3.66), p=0.007

3Mth - 6Mth: HR=4.27 (95% CI 2.26, 8.05), p<0.001

6Mth+: HR=1.20 (95% CI 0.93, 1.56), p=0.161

Male ≥65 vs Male 55-64

0 - 3Mth: HR=1.96 (95% CI 1.13, 3.39), p=0.016

3Mth - 6Mth: HR=3.94 (95% CI 2.08, 7.45), p<0.001

6Mth - 1Yr: HR=2.63 (95% CI 1.29, 5.37), p=0.007

1Yr - 16.5: HR=0.87 (95% CI 0.63, 1.19), p=0.376

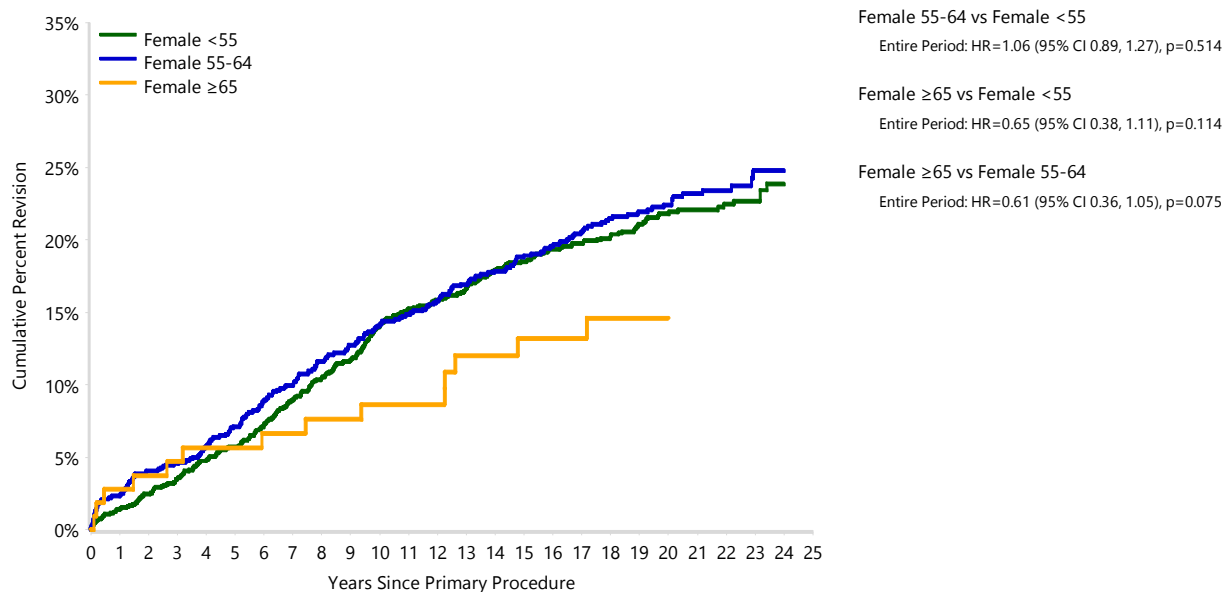
16.5+: HR=2.16 (95% CI 1.21, 3.88), p=0.009

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<55	7724	7169	6411	5761	4483	3239	1561
	55-64	5204	4882	4474	4100	3224	2415	1115
	≥65	1424	1329	1227	1133	805	583	245

Note: Restricted to modern prostheses

Primary Total Hip Replacement

Figure HT134 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement in Females by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	<55	1559	1445	1356	1288	1121	1015	627
	55-64	1006	955	905	861	768	678	432
	≥65	110	102	98	97	87	73	40

Note: Restricted to modern prostheses



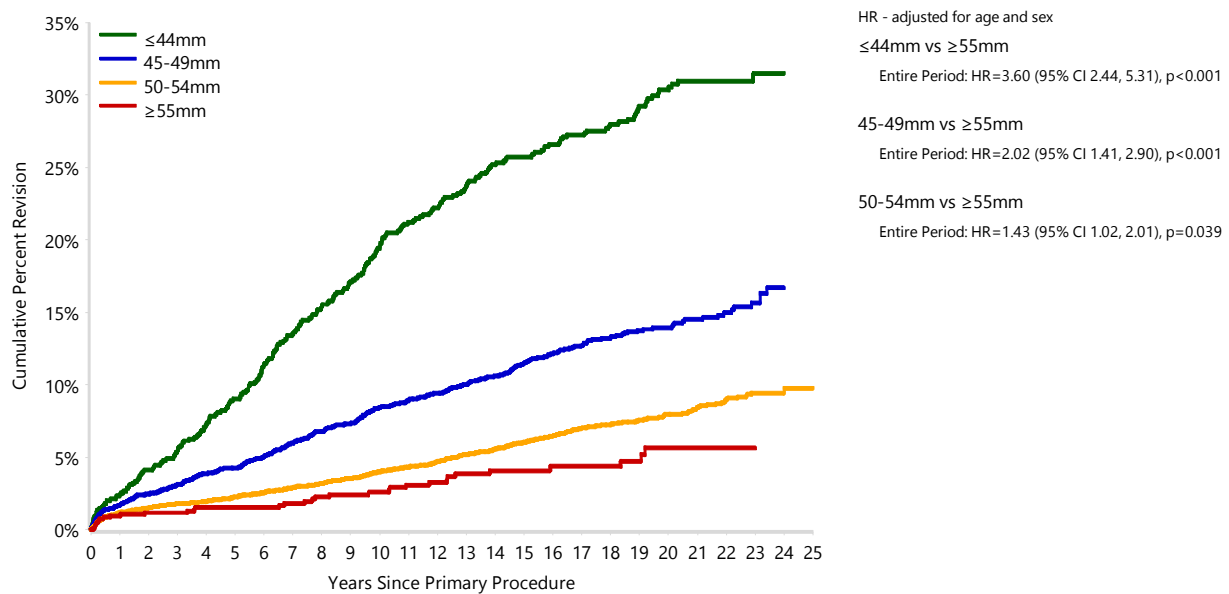
Primary Total Hip Replacement

Table HT120 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)

Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤44mm	253	964	2.4 (1.6, 3.6)	5.5 (4.2, 7.1)	9.0 (7.3, 11.1)	19.4 (16.9, 22.2)	25.7 (22.9, 28.8)	30.3 (27.3, 33.7)
45-49mm	354	3322	1.7 (1.3, 2.2)	3.1 (2.6, 3.8)	4.3 (3.6, 5.0)	8.4 (7.5, 9.5)	11.5 (10.3, 12.8)	13.9 (12.6, 15.4)
50-54mm	634	11686	1.2 (1.0, 1.4)	1.8 (1.6, 2.1)	2.3 (2.0, 2.6)	4.0 (3.6, 4.4)	6.0 (5.5, 6.6)	8.0 (7.3, 8.6)
≥55mm	35	1055	1.0 (0.5, 1.8)	1.2 (0.7, 2.1)	1.5 (0.9, 2.5)	2.6 (1.7, 3.9)	4.1 (2.8, 5.9)	5.6 (3.9, 8.2)
TOTAL	1276	17027						

Note: Restricted to modern prostheses

Figure HT135 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
≤44mm	964	889	829	783	665	582	341
45-49mm	3322	3102	2858	2638	2141	1687	825
50-54mm	11686	10915	9927	9061	7094	5334	2681
≥55mm	1055	976	857	758	588	400	173

Note: Restricted to modern prostheses

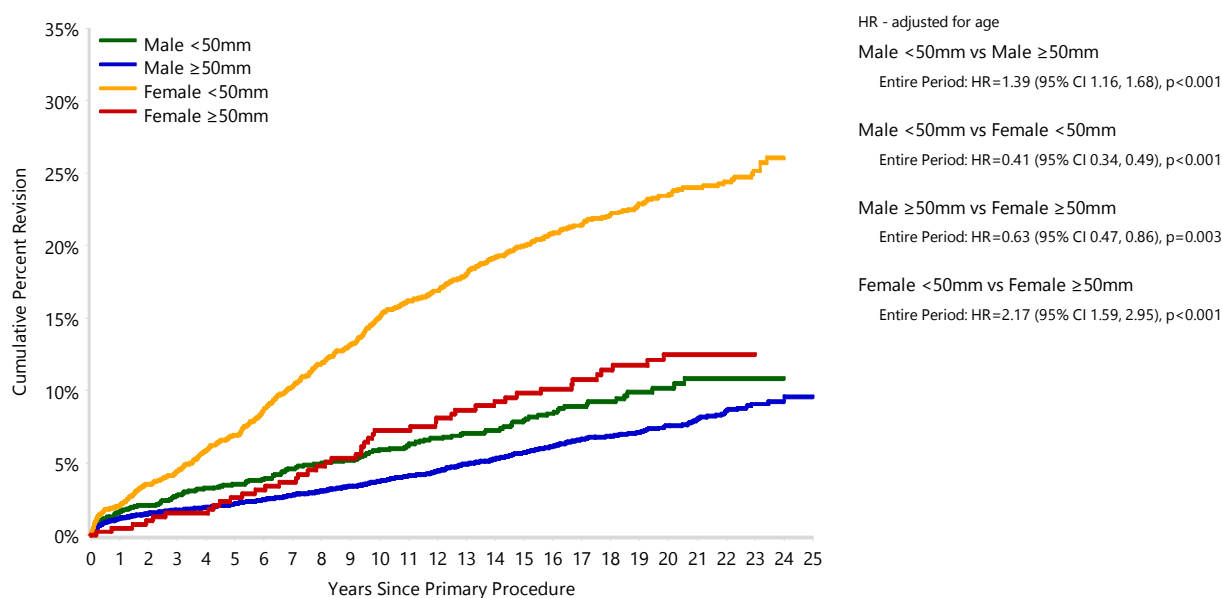
Primary Total Hip Replacement

Table HT121 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Sex and Femoral Head Size (Primary Diagnosis OA)

Sex	Femoral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		761	14352	1.2 (1.1, 1.4)	1.9 (1.7, 2.1)	2.4 (2.1, 2.7)	4.0 (3.7, 4.4)	6.0 (5.6, 6.5)	7.9 (7.3, 8.5)
	<50mm	136	2019	1.6 (1.1, 2.3)	2.8 (2.1, 3.6)	3.5 (2.8, 4.5)	5.9 (4.9, 7.2)	7.9 (6.6, 9.5)	10.1 (8.5, 12.1)
	≥50mm	625	12333	1.2 (1.0, 1.4)	1.7 (1.5, 2.0)	2.2 (1.9, 2.5)	3.7 (3.4, 4.1)	5.7 (5.2, 6.2)	7.5 (6.9, 8.2)
Female		515	2675	1.8 (1.4, 2.4)	4.0 (3.3, 4.8)	6.2 (5.4, 7.3)	13.8 (12.5, 15.2)	18.4 (16.9, 20.0)	21.7 (20.1, 23.5)
	<50mm	471	2267	2.1 (1.5, 2.7)	4.4 (3.6, 5.4)	6.9 (5.9, 8.1)	15.0 (13.5, 16.6)	20.0 (18.3, 21.8)	23.4 (21.6, 25.4)
	≥50mm	44	408	0.5 (0.1, 2.0)	1.5 (0.7, 3.4)	2.6 (1.4, 4.8)	7.2 (5.0, 10.4)	9.8 (7.2, 13.4)	12.5 (9.4, 16.5)
TOTAL		1276	17027						

Note: Restricted to modern prostheses

Figure HT136 Cumulative Percent Revision of Primary Total Resurfacing Hip Replacement by Sex and Femoral Head Size (Primary Diagnosis OA)



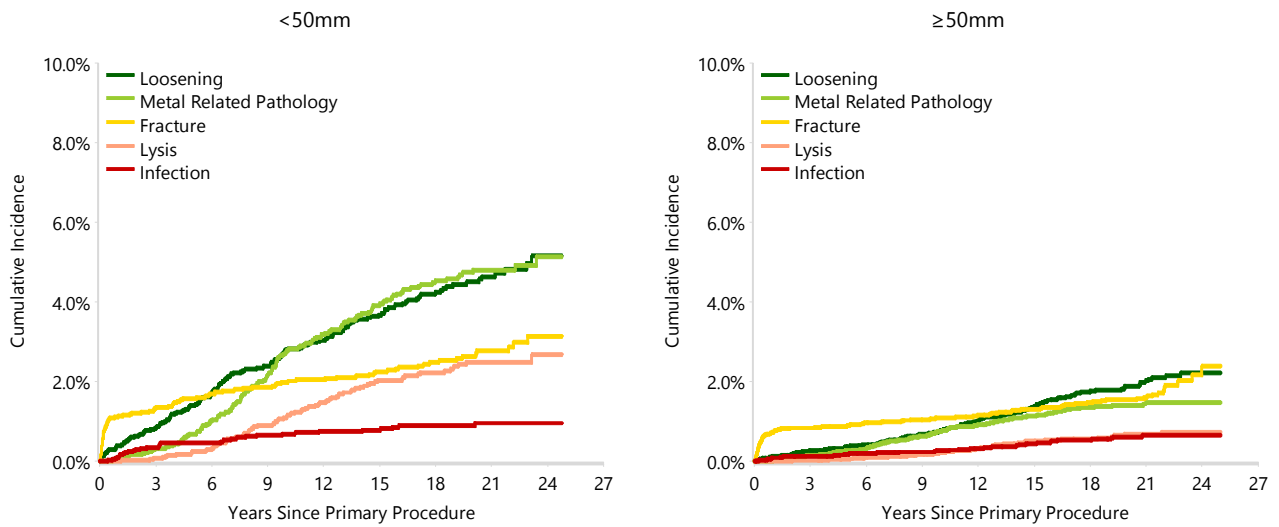
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male <50mm	2019	1879	1702	1536	1166	806	286
Male ≥50mm	12333	11501	10410	9458	7346	5431	2635
Female <50mm	2267	2112	1985	1885	1640	1463	880
Female ≥50mm	408	390	374	361	336	303	219

Note: Restricted to modern prostheses



Primary Total Hip Replacement

Figure HT137 Cumulative Incidence Revision Diagnosis of Primary Total Resurfacing Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Hip Replacement

OUTCOME OF PRIMARY TOTAL RESURFACING COMPARED TO PRIMARY TOTAL CONVENTIONAL HIP REPLACEMENT

The rates of revision for osteoarthritis in primary total resurfacing and primary total conventional hip replacement are compared using only modern prostheses.

Primary total resurfacing has a lower rate of revision than primary total conventional hip replacement in the first month.

After 3 months, primary total resurfacing has a higher rate of revision (Table HT122 and Figure HT138).

When analysed by sex, females with hip resurfacing have a higher rate of revision than females with total conventional hip replacement. Males with hip resurfacing have a lower rate of revision compared to males with a total conventional hip replacement for the first month, with no difference after this time (Table HT123 and Figure HT139).

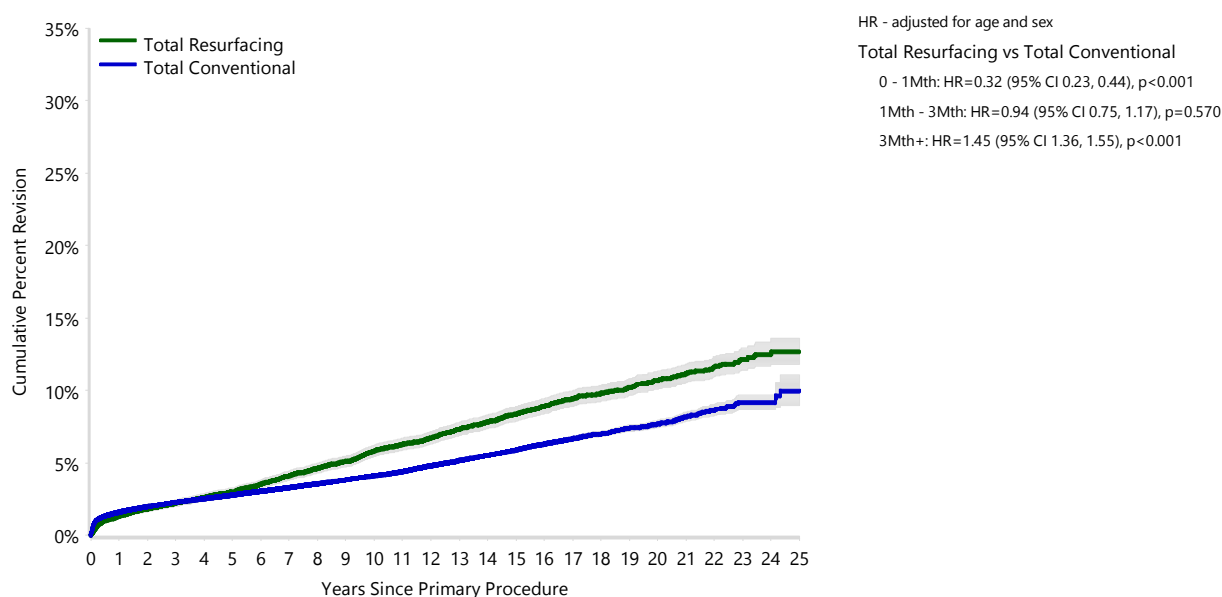
Table HT122 Cumulative Percent Revision of Primary Total Hip Replacement by Class (Primary Diagnosis OA)

Total Hip Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	1276	17027	1.3 (1.2, 1.5)	2.2 (2.0, 2.5)	3.0 (2.8, 3.3)	5.8 (5.4, 6.2)	8.4 (7.9, 8.9)	10.7 (10.1, 11.3)
Total Conventional	16280	496964	1.6 (1.6, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.8)	4.1 (4.0, 4.2)	5.9 (5.8, 6.0)	7.7 (7.4, 7.9)
TOTAL	17556	513991						

Note: Restricted to modern prostheses

All primary total conventional procedures using metal/metal prostheses have been excluded

Figure HT138 Cumulative Percent Revision of Primary Total Hip Replacement by Class (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	17027	15882	14471	13240	10488	8003	4020
Total Conventional	496964	441522	347132	267382	112862	34301	6491

Note: Restricted to modern prostheses

All primary total conventional procedures using metal/metal prostheses have been excluded



Primary Total Hip Replacement

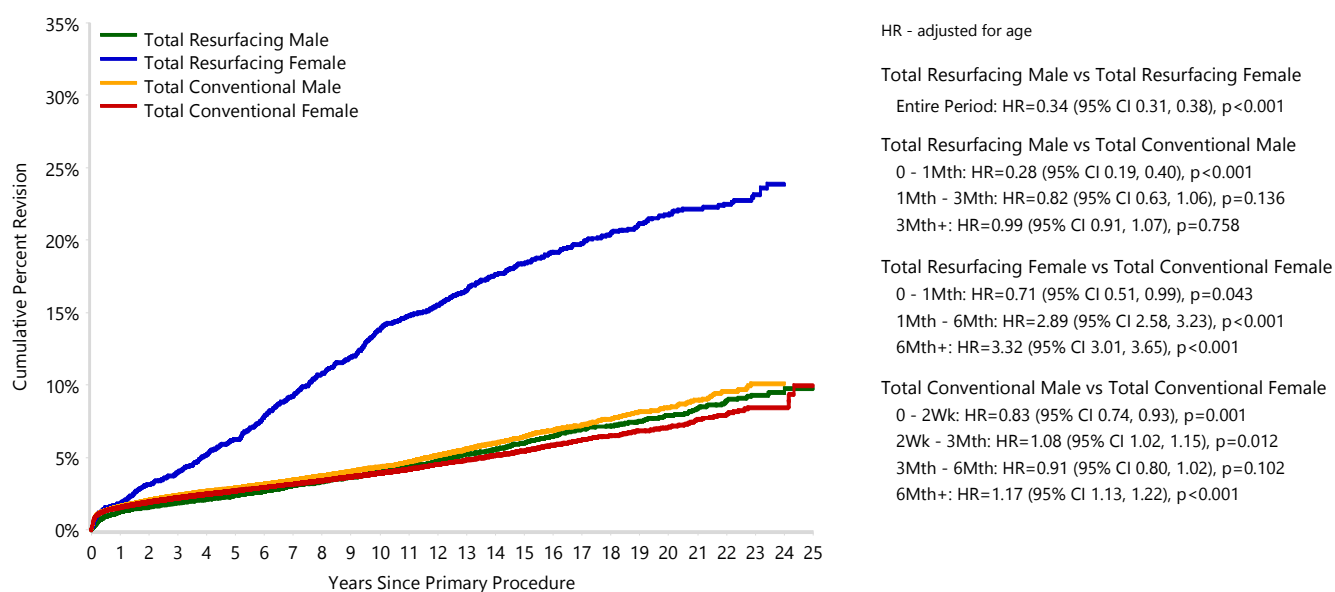
Table HT123 Cumulative Percent Revision of Primary Total Hip Replacement by Class and Sex (Primary Diagnosis OA)

Total Hip Class	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing		1276	17027	1.3 (1.2, 1.5)	2.2 (2.0, 2.5)	3.0 (2.8, 3.3)	5.8 (5.4, 6.2)	8.4 (7.9, 8.9)	10.7 (10.1, 11.3)
	Male	761	14352	1.2 (1.1, 1.4)	1.9 (1.7, 2.1)	2.4 (2.1, 2.7)	4.0 (3.7, 4.4)	6.0 (5.6, 6.5)	7.9 (7.3, 8.5)
	Female	515	2675	1.8 (1.4, 2.4)	4.0 (3.3, 4.8)	6.2 (5.4, 7.3)	13.8 (12.5, 15.2)	18.4 (16.9, 20.0)	21.7 (20.1, 23.5)
Total Conventional		16280	496964	1.6 (1.6, 1.6)	2.3 (2.2, 2.3)	2.8 (2.7, 2.8)	4.1 (4.0, 4.2)	5.9 (5.8, 6.0)	7.7 (7.4, 7.9)
	Male	7780	227056	1.6 (1.6, 1.7)	2.4 (2.3, 2.4)	2.9 (2.8, 3.0)	4.3 (4.2, 4.5)	6.5 (6.3, 6.7)	8.5 (8.1, 8.9)
	Female	8500	269908	1.6 (1.5, 1.6)	2.2 (2.2, 2.3)	2.7 (2.6, 2.7)	3.9 (3.8, 4.0)	5.4 (5.3, 5.6)	7.1 (6.8, 7.4)
TOTAL		17556	513991						

Note: Restricted to modern prostheses

All primary total conventional procedures using metal/metal prostheses have been excluded

Figure HT139 Cumulative Percent Revision of Primary Total Hip Replacement by Class and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Resurfacing	Male	14352	13380	12112	10994	8512	6237	2921
	Female	2675	2502	2359	2246	1976	1766	1099
Total Conventional	Male	227056	201550	158087	120722	49538	14300	2729
	Female	269908	239972	189045	146660	63324	20001	3762

Note: Restricted to modern prostheses

All primary total conventional procedures using metal/metal prostheses have been excluded



Bibliography (2021-2026)

DATA LINKAGE

1. Hussain SM, Wang Y, Heath AK, Giles GG, English DR, Eyles DW, Williamson EJ, Graves SE, Wluka AE, Cicuttini FM. Association between circulating 25-hydroxyvitamin D concentrations and hip replacement for osteoarthritis: a prospective cohort study. *BMC Musculoskelet Disord*. 2021;22(1):887. <https://doi.org/10.1186/s12891-021-04779-4>.
2. Mezhev V, Laslett LL, Ahedi H, Blizzard CL, Aspden RM, Gregory JS, Saunders FR, Munugoda IP, Cai G, Cicuttini F, Graves SE, Lorimer M, Jones G. Predictors of total hip replacement in community based older adults: a cohort study. *Osteoarthritis Cartilage*. 2021;29(8):1130-7. <https://doi.org/10.1016/j.joca.2021.04.013>.
3. Jin X, Gallego Luxan B, Hanly M, Pratt NL, Harris I, de Steiger R, Graves SE, Jorm L. Estimating incidence rates of periprosthetic joint infection after hip and knee arthroplasty for osteoarthritis using linked registry and administrative health data. *Bone Joint J*. 2022;104-B(9):1060-6. 10.1302/0301-620X. <https://doi.org/104B9.BJJ-2022-0116.R1>.
4. Munugoda IP, Brennan-Olsen SL, Wills K, Cai G, Graves SE, Lorimer M, Cicuttini FM, Callisaya ML, Aitken D, Jones G. Association between socioeconomic status and joint replacement of the hip and knee: a population-based cohort study of older adults in Tasmania. *Intern Med J*. 2022;52(2):265-71. <https://doi.org/10.1111/imj.15066>.
5. Pratt NL, Cicuttini FM, Wang Y, Graves SE. No increased risk of cancer associated with metal-on-metal or ceramic-on-ceramic procedures compared to other bearing surfaces in patients with total hip arthroplasty: A nationwide linked registry cohort analysis of 167,837 patients. *PLoS One*. 2022;17(11):e0278241. <https://doi.org/10.1371/journal.pone.0278241>.
6. de Steiger RN, Pratt NL, Gulyani A, Duszynski KM, Inacio MC, Graves SE, Smith PN, Improving Joint Replacement Outcomes in Australia using National Data Linkage Study Working G. Antibiotic utilisation in primary and revision total hip replacement patients: A registry linkage cohort study of 106 253 patients using the Australian Orthopaedic Association National Joint Replacement Registry. *Pharmacoepidemiol Drug Saf*. 2023;32(2):238-47. <https://doi.org/10.1002/pds.5522>.
7. Harris IA, Lorimer MF, Davies CE, Keuskamp D, Dansie KB, Lewis PL, Graves SE, McDonald SP. Hip Arthroplasty Outcomes in the Presence of Kidney Failure: A National Data Linkage Study. *J Arthroplasty*. 2023;38(7):1295-302. <https://doi.org/10.1016/j.arth.2023.01.014>.
8. Harris I, Duszynski K, Lorimer M, Alexander T, Ackerman I, Naylor J, Capell J. Practice Variation and Determinants of Post-Operative Inpatient Rehabilitation for Patients Following Joint Replacement Surgery: A Registry Linkage Cohort Study. *OSF*. 2024. osf.io/8he9g.

EPIDEMIOLOGY/SURGEON FACTORS

9. Ackerman IN, Busija L, Lorimer M, de Steiger R, Graves SE. Lifetime Risk of Revision Hip Replacement Surgery in Australia Remains Low: A Population-Level Analysis Using National Registry Data. *J Bone Joint Surg Am*. 2021;103(5):389-96. <https://doi.org/10.2106/JBJS.20.01235>.
10. Ackerman IN, Soh SE, de Steiger R. Actual versus Forecast Burden of Primary Hip and Knee Replacement Surgery in Australia: Analysis of Data from the Australian Orthopaedic Association National Joint Replacement Registry. *J Clin Med*. 2022;11(7):1883. <https://doi.org/10.3390/jcm11071883>.
11. Munugoda IP, Brennan-Olsen SL, Wills K, Cai G, Graves SE, Lorimer M, Cicuttini FM, Callisaya ML, Aitken D, Jones G. Association between socioeconomic status and joint replacement of the hip and knee: a population-based cohort study of older adults in Tasmania. *Intern Med J*. 2022;52(2):265-71. <https://doi.org/10.1111/imj.15066>.
12. Truong AP, Wall CJ, Stoney JD, Graves SE, Lorimer MF, de Steiger RN. Obesity is associated with an increased risk of undergoing hip replacement in Australia. *ANZ J Surg*. 2023;93(7-8):1901-6. <https://doi.org/10.1111/ans.18543>.
13. Handford C, Campbell R, Lorimer M, Molnar R, Harris IA. Risk of early revision in total hip arthroplasty: the relative contribution of the surgeon versus the hospital. *ANZ J Surg*. 2024;94(9):1507-10. <https://doi.org/10.1111/ans.19031>.
14. Wall CJ, Vertullo CJ, Gill DR, Page RS, Holder C, Smith PN. Reduced numbers of elective joint replacement procedures in Australia during the COVID-19 pandemic, 2020–2022: a registry data analysis study. *Med J Aust*. 2024;221(3):169-70. <https://doi.org/10.5694/mja2.52318>.
15. Hoskins W, Bingham R, Graves SE, Harries D, Cuthbert AR, Corfield S, Smith P, Vince KG. What Are the Relative Associations of Surgeon Performance and Prosthesis Quality with THA Revision Rates? *Clin Orthop Relat Res*. 2025;483(2). <https://doi.org/10.1097/CORR.00000000000003217>.
16. Scholes C, Holder C, Vertullo C, Broadhead M. Stay or go? Outcomes of lower limb arthroplasty in patients travelling away from home for surgery: A cross-sectional analysis of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) comparing patient residence and hospital remoteness. *Arch Orthop Trauma Surg*. 2025;145(1):343. <https://doi.org/10.1007/s00402-025-05944-3>.
17. Tsigaras, Z., C. Holder, C. Wall, and R. de Steiger. Total Hip Arthroplasty in Legg-Calve-Perthes Disease: A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *JB JS Open Access* 11, no. 2026: e26.00060. <https://dx.doi.org/10.2106/JBJS.OA.26.00060>.
18. Taylor-Williams, O., Wall CJ, Nossent J, Holder C, and Inderjeeth C. Revision Risk Following Total Hip Arthroplasty in Patients with Rheumatoid Arthritis: A Cohort Study from the Australian Orthopaedic Association



Bibliography (2021-2026)

National Joint Replacement Registry. ANZ J Surg. 2026. <https://dx.doi.org/10.1111/ans.70797>

19. Aebischer, A. S., J. Lang-Lemckert, P. Du, and C. J. Wall. Outcomes of Proximal Femoral Replacement for Nononcologic Indications in Australia. *J Arthroplasty*. 2026. 41(1): p. 169-175. <https://dx.doi.org/10.1016/j.arth.2025.06.019>.

FRACTURE

20. Hoskins W, Griffin X, Hatton A, de Steiger RN, Bingham R. THA for a Fractured Femoral Neck: Comparing the Revision and Dislocation Rates of Standard-head, Large-head, Dual-mobility, and Constrained Liners. *Clin Orthop Relat Res*. 2021;479(1):72-81. <https://doi.org/10.1097/CORR.0000000000001447>.
21. Hoskins W, Rainbird S, Peng Y, Graves SE, Bingham R. Hip Hemiarthroplasty for Fractured Neck of Femur Revised to Total Hip Arthroplasty: Outcomes Are Influenced by Patient Age Not Articulation Options. *J Arthroplasty*. 2021;36(8):2927-35. <https://doi.org/10.1016/j.arth.2021.04.001>.
22. Farey JE, Masters J, Cuthbert AR, Iversen P, van Steenberg LN, Prentice HA, Adie S, Sayers A, Whitehouse MR, Paxton EW, Costa ML, Overgaard S, Rogmark C, Rolfson O, Harris IA. Do Dual-mobility Cups Reduce Revision Risk in Femoral Neck Fractures Compared with Conventional THA Designs? An International Meta-analysis of Arthroplasty Registries. *Clin Orthop Relat Res*. 2022;480(10):1912-25. <https://doi.org/10.1097/CORR.0000000000002275>.
23. Hoskins W, Corfield S, Lorimer M, Peng Y, Bingham R, Graves SE, Vince KG. Is the Revision Rate for Femoral Neck Fracture Lower for Total Hip Arthroplasty Than for Hemiarthroplasty? A Comparison of Registry Data for Contemporary Surgical Options. *J Bone Joint Surg Am*. 2022;104(17):1530-41. <https://doi.org/10.2106/JBJS.21.01256>.
24. Tierney J, Jackman E, Holder C, Wall CJ, Wilson CJ. Increased Rates of Late Periprosthetic Fractures in Larger Hydroxyapatite-Coated Cementless Stems: Are Collared Stems a Better Alternative for Total Hip Arthroplasty? *J Arthroplasty*. 2024;39(3):744-9. <https://doi.org/10.1016/j.arth.2023.08.068>.

INTERNATIONAL

25. Silman AJ, Combescure C, Ferguson RJ, Graves SE, Paxton EW, Frampton C, Furnes O, Fenstad AM, Hooper G, Garland A, Spekenbrink-Spooren A, Wilkinson JM, Makela K, Lubbeke A, Rolfson O. International variation in distribution of ASA class in patients undergoing total hip arthroplasty and its influence on mortality: data from an international consortium of arthroplasty registries. *Acta Orthop*. 2021;92(3):304-10. <https://doi.org/10.1080/17453674.2021.1892267>.
26. Farey JE, Masters J, Cuthbert AR, Iversen P, van Steenberg LN, Prentice HA, Adie S, Sayers A, Whitehouse MR, Paxton EW, Costa ML, Overgaard S, Rogmark C, Rolfson O, Harris IA. Do Dual-mobility Cups Reduce Revision Risk in Femoral Neck Fractures Compared with Conventional THA Designs? An International Meta-analysis of Arthroplasty Registries. *Clin Orthop Relat Res*. 2022;480(10):1912-25. <https://doi.org/10.1097/CORR.0000000000002275>.
27. Van Veghel MHW, Hannink G, Lewis PL, Holder C, Van Steenberg LN, Schreurs BW. Short-stem hip arthroplasty in Australia and the Netherlands: a comparison of 12,680 cases between the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) and the Dutch Arthroplasty Register (LROI). *Acta Orthop*. 2023;94:453-9. <https://doi.org/10.2340/17453674.2023.18491>.
28. Roerink AMC, Nelissen RGHH, Holder C, Graves SE, Dunbar M, Bohm E, Grimberg AW, Steinbrück A, Dale H, Fenstad AM, Blom AW, Lenguerrand E, Frampton C, Willems T, Victor J, Espallargues M, Arias-De La Torre J, Ciminello E, Torre M, Pijls BG. Sex-based differences in risk of revision for infection after hip, knee, shoulder, and ankle arthroplasty in osteoarthritis patients: a multinational registry study of 4,800,000 implants. *Acta Orthop*. 2024;95:730-6. <https://doi.org/10.2340/17453674.2024.42183>.
29. Rilby K, van Veghel MH, Mohaddes M, van Steenberg LN, Lewis PL, Kärrholm J, Schreurs BW, Hannink G. Do Cumulative Revision Rate and First-time Re-revision Rate Vary Between Short and Standard Femoral Stem Lengths? A Multinational Registry Study. *Clin Orthop Relat Res*. 2025;483(6):1010-9. <https://doi.org/10.1097/CORR.0000000000003354>.



Bibliography (2021-2026)

MORTALITY

30. Campbell DG, Davis JS, de Steiger RN, Lorimer MF, Harries D, Harris IA, Manning L, Lewis PL. Long-Term Mortality Associated with Periprosthetic Infection in Total Hip Arthroplasty: A Registry Study of 4,651 Revisions for Infection. *J Bone Joint Surg Am.* 2025;107 (14): 1620 <https://doi.org/10.2106/JBJS.24.01629>.
31. Zhou Y, Fraval A, Vertullo CJ, Du P, Babazadeh S, Stevens J. Patient and Surgical Factors Associated with Long-term Mortality Outcomes up to Fifteen Years after Total Hip and Knee Arthroplasty: An Australian Orthopaedic Association National Joint Replacement Registry Study. *J Arthroplasty.* 2025;40(6):1471-7. <https://doi.org/10.1016/j.arth.2024.11.012>.

PROMS

32. Heath EL, Ackerman IN, Cashman K, Lorimer M, Graves SE, Harris IA. Patient-reported outcomes after hip and knee arthroplasty : results from a large national registry. *Bone J Open.* 2021;2(6):422-32. <https://doi.org/10.1302/2633-1462.26.BJO-2021-0053.R1>.
33. Heath EL, Ackerman IN, Holder C, Lorimer MF, Graves SE, Harris IA. Between-hospital and between-surgeon variation in thresholds for hip and knee replacement. *ANZ J Surg.* 2022;92(9):2229-34. <https://doi.org/10.1111/ans.17811>.
34. Soh SE, Harris IA, Cashman K, Graves SE, Ackerman IN. Crosswalks between the Oxford hip and knee scores and the HOOS-12 and KOOS-12 instruments. *Osteoarthritis Cartilage.* 2022;30(4):570-7. <https://doi.org/10.1016/j.joca.2022.01.004>.
35. Mulford JS, Ackerman I, Holder C, Cashman KS, Graves SE, Harris IA. The association between body mass index and patient-reported outcome measures before and after primary total hip or knee arthroplasty: a registry. *ANZ J Surg.* 2023;93(6):1665-73. <https://doi.org/10.1111/ans.18449>.
36. Ackerman IN, Cashman K, Lorimer M, Heath E, Harris IA. Hip-specific and generic patient-reported outcome measure scores after primary hip replacement are associated with early revision surgery: a national registry study. *J Patient Rep Outcomes.* 2024;8(1):34. <https://doi.org/10.1186/s41687-024-00713-z>.
37. Hoskins W, Bingham R, Corfield S, Harries D, Harris IA, Vince KG. Do the Revision Rates of Arthroplasty Surgeons Correlate with Postoperative Patient-reported Outcome Measure Scores? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res.* 2024;482(1):98-112. <https://doi.org/10.1097/CORR.0000000000002737>.
38. Lourens EC, Zhai Y, Harries D, Lewis PL, Kurmis AP. Early Patient-Reported Outcome Measures Following Computer Navigated Total Hip Arthroplasty: A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty.* 2025;40(7):1745-51 e5. <https://doi.org/10.1016/j.arth.2024.12.002>.

PROSTHESIS FACTORS

39. Babazadeh S, de Steiger RN, Peng Y, van Bavel D. Stainless Steel Femoral Heads Reduce Rate of Revision When Compared to Ion-Implanted Chromium-Cobalt Heads with a Single Cemented Femoral Design: An Analysis of 40,468 Total Hip Replacements from the Australian Orthopedic Association National Joint Replacement Registry. *J Arthroplasty.* 2021;36(12):3945-9. <https://doi.org/10.1016/j.arth.2021.08.024>.
40. Nugent M, Campbell DG, Lewis PL, Cuthbert AR, Solomon LB. Acetabular screws do not improve early revision rates in primary total hip arthroplasty. An instrumented registry analysis. *Int Orthop.* 2021;45(3):593-604. <https://doi.org/10.1007/s00264-021-04949-y>.
41. Babazadeh S, de Steiger RN, Holder C, van Bavel D. Cemented Polished Tapered Stems Have Lower Revision Rates Than Commonly Used Cementless Implant up to 17 Years of Follow-Up: An Analysis of 201,889 Total Hip Replacements from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty.* 2022;37(1):110-8. <https://doi.org/10.1016/j.arth.2021.09.013>.
42. Orce Rodriguez A, Smith PN, Johnson P, O'Sullivan M, Holder C, Shimmin A. Registry-based study of survivorship of cemented femoral components versus collared cementless femoral components in total hip arthroplasty in older patients with osteoarthritis. *Bone Joint J.* 2024;106-B(3 Supple A):121-9. <https://doi.org/10.1302/0301-620X.106B3.BJJ-2023-0771.R1>.
43. Hoskins W, Corfield S, Peng Y, Graves SE, Bingham R. A comparison of cemented femoral fixation via anterior versus posterior approach total hip arthroplasty: an analysis of 60,739 total hip arthroplasties. *HIP Internat.* 2024;34(4):442-51. <https://doi.org/10.1177/11207000241239914>.
44. Rele S, O'Bryan E, Holder C, Lewis PL, Di Bella C. Collared Cementless Femoral Components Reduce the Revision Rates in Primary Total Hip Arthroplasty Using the Direct Anterior Approach: An Australian Orthopaedic Association National Joint Replacement Registry Study. *J Arthroplasty.* 2024;39(9S2):S340-S6 e2. <https://doi.org/10.1016/j.arth.2024.05.009>.
45. Vercruysse LYG, Milne LP, Harries DTC, de Steiger RN, Wall CJ. Lower Revision Rates and Improved Stability with a Monoblock Ceramic Acetabular Cup. *J Arthroplasty.* 2024;39(4):985-90. <https://doi.org/10.1016/j.arth.2023.10.032>.
46. Aebischer AS, Lang-Lemckert J, Du P, Wall C. Outcomes of Proximal Femoral Replacement for Non-Oncologic Indications in Australia. *J Arthroplasty.* 2025: In Press. <https://doi.org/10.1016/j.arth.2025.06.019>.
47. Hoskins W, Rainbird S, Peng Y, Lorimer M, Graves SE, Bingham R. Incidence, Risk Factors, and Outcome of Ceramic-On-Ceramic Bearing Breakage in Total Hip



Bibliography (2021-2026)

- Arthroplasty. *J Arthroplasty*. 2021;36(8):2992-7.
<https://doi.org/10.1016/j.arth.2021.03.021>.
48. Hanly RJ, Whitehouse SL, Holder C, de Steiger R, Wall CJ, Timperley AJ, Crawford RW, and van Bavel D. Is There a Place for Routine Use of Cemented Acetabular Fixation in Primary Total Hip Arthroplasty for Osteoarthritis? Equivalence Demonstrated in an Analysis of 96,574 Cases from the Australian Orthopaedic Association National Joint Replacement Registry. *Article, Hip Int*. 2026: 11207000261430706.
<https://dx.doi.org/10.1177/11207000261430706>
49. Cho CH, Abrahams JM, Sharma DK, Solomon LB, Wall CJ, Pijls BG, Callary SA. Early Acetabular Cup Migration Is Associated with Long-Term Aseptic Loosening: Investigation of 1-Year and 2-Year Radiostereometric Analysis Cohort Migration Thresholds against Acetabular Cup Survivorship from Two National Registries. *Acta Orthop* 97: 319-25.
<https://dx.doi.org/10.2340/17453674.2026.45784>.
50. Lewis PL, Campbell DG, Du P, Oakey H, De Steiger RN, Smith PN. Association of Antioxidant-Added Highly Cross-Linked Polyethylene on Revision Risk: A Registry-Based Study of 198,073 Total Hip Replacements from the Australian Orthopaedic Association National Joint Replacement Registry between 2014 and 2023. *Acta Orthop* 97. 2026: 28-34.
<https://dx.doi.org/10.2340/17453674.2025.45181>.
- AOA CLINICAL STUDIES**
51. Sidhu VS, Kelly TL, Pratt N, Graves S, Buchbinder R, Naylor J, de Steiger R, Ackerman I, Adie S, Lorimer M, Bastiras D, Cashman K, Harris I. CRISTAL (a cluster-randomised, crossover, non-inferiority trial of aspirin compared to low molecular weight heparin for venous thromboembolism prophylaxis in hip or knee arthroplasty, a registry nested study): statistical analysis plan. *Trials*. 2021;22(1):564.
<https://doi.org/10.1186/s13063-021-05486-0>.
52. Farey JE, Hooper T, Alland T, Naylor JM, Kelly TL, Lorimer M, Lewin AM, Rogers M, Law CK, Close J, Graves SE, de Steiger RS, Lewis PL, Adie S, Harris IA. Dual mobility versus conventional total hip arthroplasty in femoral neck fractures (DISTINCT): protocol for a registry-nested, open-label, cluster-randomised crossover trial. *BMJ Open*. 2022;12(9):e064478. <https://doi.org/10.1136/bmjopen-2022-064478>.
53. Cristal Study Group, Sidhu VS, Kelly TL, Pratt N, Graves SE, Buchbinder R, Adie S, Cashman K, Ackerman I, Bastiras D, Brighton R, Burns AWR, Chong BH, Clavisi O, Cripps M, Dekkers M, de Steiger R, Dixon M, Ellis A, Griffith EC, Hale D, Hansen A, Harris A, Hau R, Horsley M, James D, Khorshid O, Kuo L, Lewis P, Lieu D, Lorimer M, MacDessi S, McCombe P, McDougall C, Mulford J, Naylor JM, Page RS, Radovanovic J, Solomon M, Sorial R, Summersell P, Tran P, Walter WL, Webb S, Wilson C, Wysocki D, Harris IA. Effect of Aspirin vs Enoxaparin on Symptomatic Venous Thromboembolism in Patients Undergoing Hip or Knee Arthroplasty: The CRISTAL Randomized Trial. *JAMA*. 2022;328(8):719-27.
<https://doi.org/10.1001/jama.2022.13416>.
54. Cristal Study Group, Sidhu VS, Kelly TL, Pratt N, Graves SE, Buchbinder R, Adie S, Cashman K, Ackerman IN, Bastiras D, Brighton R, Burns AWR, Chong BH, Clavisi O, Cripps M, Dekkers M, de Steiger R, Dixon M, Ellis A, Griffith EC, Hale D, Hansen A, Harris A, Hau R, Horsley M, James D, Khorshid O, Kuo L, Lewis PL, Lieu D, Lorimer M, MacDessi SJ, McCombe P, McDougall C, Mulford J, Naylor JM, Page RS, Radovanovic J, Solomon M, Sorial R, Summersell P, Tran P, Walter WL, Webb S, Wilson C, Wysocki D, Harris IA. Effect of Aspirin vs Enoxaparin on 90-Day Mortality in Patients Undergoing Hip or Knee Arthroplasty: A Secondary Analysis of the CRISTAL Cluster Randomized Trial. *JAMA Netw Open*. 2023;6(6):e2317838.
<https://doi.org/10.1001/jamanetworkopen.2023.17838>.
55. Sidhu V, Naylor JM, Adie S, Bastiras D, Buchbinder R, Ackerman I, Harris IA. Post-discharge patient-reported non-adherence to aspirin compared to enoxaparin for venous thromboembolism prophylaxis after hip or knee arthroplasty. *ANZ J Surg*. 2023;93(4):989-94.
<https://doi.org/10.1111/ans.18284>.
56. Sidhu V, Kelly TL, Pratt N, Graves SE, Buchbinder R, Adie S, Cashman K, Ackerman IN, Bastiras D, Brighton R. Aspirin or enoxaparin for VTE prophylaxis after primary partial, total or revision hip or knee arthroplasty: A secondary analysis from the CRISTAL cluster randomized trial. *PLoS One*. 2024;19(4):e0298152.
<https://doi.org/10.1371/journal.pone.0298152>.
57. Farey JE, Cuthbert AR, Adie S, Harris IA. Bipolar Hemiarthroplasty Does Not Result in a Higher Risk of Revision Compared with Total Hip Arthroplasty for Displaced Femoral Neck Fractures: An Instrumental Variable Analysis of 36,118 Procedures from the Australian Orthopaedic Association National Joint Replacement Registry. *J Bone Joint Surg Am*. 2022;104(10):919-27.
<https://doi.org/10.2106/JBJS.21.00972>.
- REVISION OUTCOME**
58. Hoskins W, Bingham R, Dyer C, Rainbird S, Graves SE. A Comparison of Revision Rates for Dislocation and Aseptic Causes Between Dual Mobility and Large Femoral Head Bearings in Primary Total Hip Arthroplasty with Subanalysis by Acetabular Component Size: An Analysis of 106,163 Primary Total Hip Arthroplasties. *J Arthroplasty*. 2021;36(9):3233-40.
<https://doi.org/10.1016/j.arth.2021.05.008>.
59. de Steiger RN, Lewis PL, Harris I, Lorimer MF, Graves SE. What Is the Outcome of the First Revision Procedure of Primary THA for Osteoarthritis? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res*. 2022;480(10):1952-70.
<https://doi.org/10.1097/CORR.0000000000002339>.
60. Hoskins W, Rainbird S, Dyer C, Graves SE, Bingham R. In Revision THA, Is the Re-revision Risk for Dislocation and Aseptic Causes Greater in Dual-mobility Constructs or



Bibliography (2021-2026)

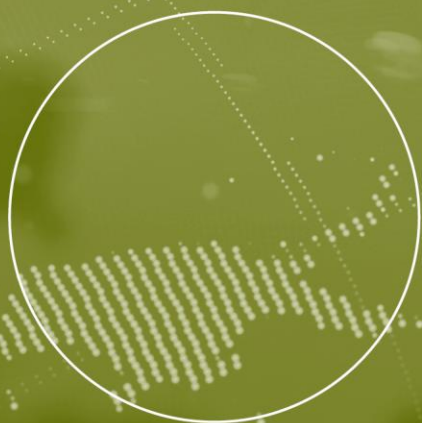
- Large Femoral Head Bearings? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res.* 2022;480(6):1091-101.
<https://doi.org/10.1097/CORR.0000000000002085>.
61. Hoskins W, Rainbird S, Holder C, Graves SE, Bingham R. Revision for Aseptic Loosening of Highly Porous Acetabular Components in Primary Total Hip Arthroplasty: An Analysis of 20,993 Total Hip Replacements. *J Arthroplasty.* 2022;37(2):312-5.
<https://doi.org/10.1016/j.arth.2021.10.011>.
 62. Hoskins W, Rainbird S, Holder C, Stoney J, Graves SE, Bingham R. A Comparison of Revision Rates and Dislocation After Primary Total Hip Arthroplasty with 28, 32, and 36-mm Femoral Heads and Different Cup Sizes: An Analysis of 188,591 Primary Total Hip Arthroplasties. *J Bone Joint Surg Am.* 2022;104(16):1462-74.
<https://doi.org/10.2106/JBJS.21.01101>.
 63. Hoskins W, Rainbird S, Lorimer M, Graves SE, Bingham R. What Can We Learn from Surgeons Who Perform THA and TKA and Have the Lowest Revision Rates? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res.* 2022;480(3):464-81.
<https://doi.org/10.1097/CORR.0000000000002007>.
 64. Handford C, Campbell R, Lorimer M, Molnar R, Harris IA. Risk of early revision in total hip arthroplasty: the relative contribution of the surgeon versus the hospital. *ANZ J Surg.* 2024;94(9):1507-1510.
<https://doi.org/10.1111/ans.19031>.
 65. Hoskins W, Bingham R, Graves SE, Harries D, Cuthbert AR, Corfield S, Smith P, Vince KG. What Are the Relative Associations of Surgeon Performance and Prosthesis Quality with THA Revision Rates? *Clin Orthop Relat Res.* 2025;483(2):237-249.
<https://doi.org/10.1097/CORR.0000000000003217>.
 66. Wallace DT, Whitehouse SL, Du P, Wall CJ, Crawford RW. Does a 36-mm Head Increase Cumulative Revision Rate in Total Hip Arthroplasty When Compared to a 32-mm Head? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty* 41, no. 4. 2026: 1204-14 e6.
<https://dx.doi.org/10.1016/j.arth.2025.08.014>.
 67. Shafiei, S. H., M. R. Latorre, and A. Shimmin. Impact of Offset Polyethylene Liners on Acetabular Component Loosening: An Australian Orthopaedic Association National Joint Replacement Registry-Based Analysis. *Bone Jt Open* 7, no. 6. 2026: 753-58.
<https://dx.doi.org/10.1302/2633-1462.76.BJO-2026-0033.R1>
 68. Babazadeh, S., J. Stevens, C. Wall, C. McDougall, A. Cuthbert, C. Holder, and D. van Bavel. Avascular Necrosis Is Associated with an Increased Risk of Revision for Infection Compared to Osteoarthritis in Total Hip Replacement in Younger Patients: An Analysis of 51,879 Procedures from the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). *Hip Int* 36, no. 2. 2026: 269-77.
<https://dx.doi.org/10.1177/11207000251357516>
- ### STATISTICAL MODELLING
69. Cuthbert AR, Graves SE, Giles LC, Glonek G, Pratt N. What Is the Effect of Using a Competing-risks Estimator when Predicting Survivorship After Joint Arthroplasty: A Comparison of Approaches to Survivorship Estimation in a Large Registry. *Clin Orthop Relat Res.* 2021;479(2):392-403. <https://doi.org/10.1097/CORR.0000000000001533>.
 70. Ghadirinejad K, Graves S, de Steiger R, Pratt N, Solomon LB, Taylor M, Hashemi R. What is the most appropriate comparator group to use in assessing the performance of primary total hip prostheses within the community? *Hip Int.* 2023;34(3):320-26.
<https://doi.org/10.1177/11207000231216708>.
 71. Ghadirinejad K, Milimonfared R, Taylor M, Solomon LB, Graves S, Pratt N, de Steiger R, Hashemi R. Supervised machine learning for the prediction of post-operative clinical outcomes of hip and knee replacements: a review. *ANZ J Surg.* 2024;94(7-8):1228-33.
<https://doi.org/10.1111/ans.19003>.
 72. Ghadirinejad K, Graves S, de Steiger R, Pratt N, Solomon LB, Taylor M, Hashemi R. Can Machine Learning Algorithms Contribute to the Initial Screening of Hip Prostheses and Early Identification of Outliers? *Prosthesis* 2024;6:744-52.
<https://doi.org/10.3390/prosthesis6040052>.
- ### SURGICAL APPROACH
73. Hoskins W, Rainbird S, Peng Y, Graves SE, Bingham R. The Effect of Surgical Approach and Femoral Prosthesis Type on Revision Rates Following Total Hip Arthroplasty: An Analysis of the Most Commonly Utilized Cementless Stems. *J Bone Joint Surg Am.* 2022;104(1):24-32.
<https://doi.org/10.2106/JBJS.21.00487>.
 74. Hoskins W, Corfield S, Peng Y, Graves SE, Bingham R. A comparison of cemented femoral fixation via anterior versus posterior approach total hip arthroplasty: an analysis of 60,739 total hip arthroplasties. *HIP Internat.* 2024;34(4): 442-51.
<https://doi.org/10.1177/11207000241239914>.
 75. Rele S, O'Bryan E, Holder C, Lewis PL, Di Bella C. Collared Cementless Femoral Components Reduce the Revision Rates in Primary Total Hip Arthroplasty Using the Direct Anterior Approach: An Australian Orthopaedic Association National Joint Replacement Registry Study. *J Arthroplasty.* 2024. <https://doi.org/10.1016/j.arth.2024.05.009>.
- ### SURGEON ASSISTIVE TOOLS
76. Agarwal S, Eckhard L, Walter WL, Peng A, Hatton A, Donnelly B, de Steiger R. The Use of Computer Navigation in Total Hip Arthroplasty Is Associated with a Reduced Rate of Revision for Dislocation: A Study of 6,912 Navigated THA Procedures from the Australian Orthopaedic Association National Joint Replacement



Bibliography (2021-2026)

- Registry. *J Bone Joint Surg Am*. 2021;103(20):1900-5.
<https://doi.org/10.2106/JBJS.20.00950>.
77. Lourens EC, Kurmis AP, Holder C, de Steiger RN. Early Revision Rates of Total Hip Arthroplasty Using the Intellijoint HIP Computer Navigation System: A Study from the Australian National Joint Replacement Registry of 1911 Procedures. *Arthroplasty Today*. 2022;18:149-56.
<https://doi.org/10.1016/j.artd.2022.09.019>.
78. Lourens EC, Zhai Y, Harries D, Lewis PL, Kurmis AP. Early Patient-Reported Outcome Measures Following Computer Navigated Total Hip Arthroplasty: A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty*. 2025;40(7):1745-51 e5. <https://doi.org/10.1016/j.arth.2024.12.002>.





Knee Replacement

Knee Replacement

Categories of Knee Replacement

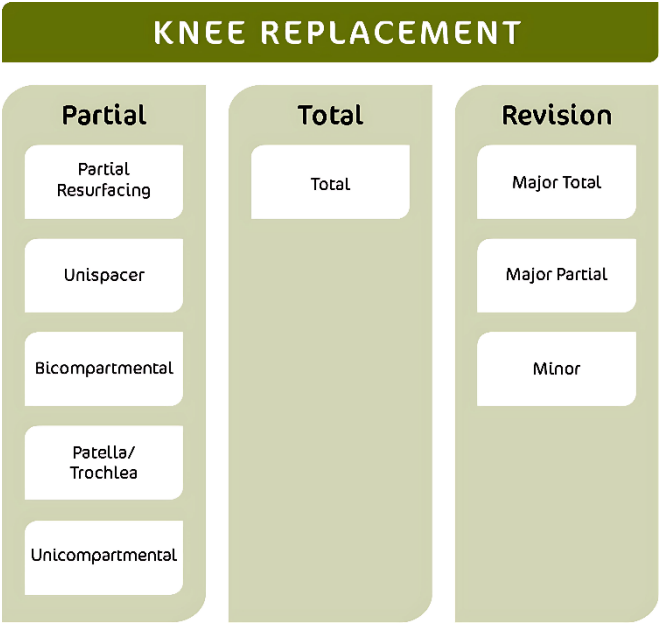
Knee replacement is grouped into three broad categories: primary partial, primary total and revision knee replacement.

A primary replacement is an initial replacement procedure undertaken on a joint and involves replacing either part (partial) or all (total) of the articular surface. The patella may or may not be resurfaced as part of a total replacement.

Primary partial knees are subcategorised into classes depending on the type of prosthesis used. The classes of primary partial knee replacement are partial resurfacing, unispacer, bicompartamental, patella/trochlea and unicompartmental. These are defined in the subsequent sections.

Revision knee replacements are re-operations of previous knee replacements where one or more of the prosthetic components are replaced, removed, or one or more components are added. Revisions include re-operations of primary partial, primary total or previous revision procedures. Knee revisions are subcategorised into three classes: major total, major partial, and minor revisions.

Detailed demographic information on knee replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>





Knee Replacement

Executive Summary Reference Tables

Table K1 and Table K2 index the analyses within this chapter. Variables are listed, and where there is a significant finding for a comparison, a red diamond is shown in the table. New

analyses for this year’s report are noted with an asterix. There are hyperlinks to the relevant tables and figures.

Table K1 Indexing Significant Characteristic Comparisons: Partial Knee Replacements

Characteristic	Variable	Patella/Trochlear Knee Osteoarthritis		Unicompartmental Knee Osteoarthritis	
		Significant HR	Figure no.	Significant HR	Figure no.
Patient					
	Age		Figure KP6	◆	Figure KP19
	Sex		Figure KP7	◆	Figure KP20
	Sex by Age		Figure KP8	◆	Figure KP22 Figure KP23
	ASA Score		Figure KP9	◆	Figure KP24
	BMI		Figure KP10		Figure KP26
Prosthesis					
	Bearing Mobility	NT		◆	Figure KP28
	Polyethylene*			◆	Figure KP29
	Fixation	NT		◆	Figure KP30
	Surgeon Assistive Tools		Figure KP12	◆	Figure KP31
	Surgeon Assistive Tool by Prosthesis Combination*	NT		◆	Figure KP33 Figure KP34
	Position	NT		◆	Figure KP35
	Position and Mobility	NT		◆	Figure KP36

◆ Significant Hazard Ratio difference between categories where p<0.05
NT Not Tested: Insufficient numbers to make statistical comparisons or comparison not relevant
*New analysis for this year’s Annual Report



Knee Replacement

Table K2 Indexing Significant Characteristic Comparisons: Total Knee Replacements

Characteristic	Variable	Total Knee Osteoarthritis		Total Knee All Diagnoses	
		Significant HR	Table/Figure no.	Significant HR	Table/Figure no.
Diagnosis		NT		♦	Figure KT5
Patient					
	Age	♦	Figure KT8	NT	
	Sex	♦	Figure KT9	NT	
	Sex and Revision for Infection	♦	Figure KT11	NT	
	Sex by Age	♦	Figure KT12 Figure KT13	NT	
	ASA Score	♦	Figure KT14	NT	
	ASA by Sex	♦	Figure KT16	NT	
	ASA by Age	♦	Figure KT17	NT	
	BMI	♦	Figure KT18	NT	
	BMI by Sex	♦	Figure KT20	NT	
	BMI by Age	♦	Figure KT21	NT	
Prosthesis					
	Fixed Bearing Type	♦	Figure KT22	NT	
	Bearing Mobility	♦	Figure KT23	NT	
	Stability	♦	Figure KT25 Figure KT30	♦	Figure KT29
	Polyethylene Conformity		Figure KT27	NT	
	Polyethylene Insert Shape and Prosthesis Combinations	♦	Table KT29	NT	
	Patella Component Usage	♦	Figure KT32	NT	
	Patella Type	♦	Figure KT33	NT	
	Patella Component Usage and Stability	♦	Figure KT34 Figure KT35 Figure KT36	NT	
	Patella Component Usage and Prosthesis Combination	♦	Table KT37	NT	
	Stability*	♦	Figure KT37	NT	
	Stability and Fixation	♦	Figure KT38 Figure KT42 Figure KT45	NT	
	Stability and Fixation by Age	♦	Figure KT43	NT	
	Stability and Fixation by Sex	♦	Figure KT41 Figure KT44	NT	
	Polyethylene Type	♦	Figure KT48	NT	
	Polyethylene Type and Revision Diagnosis	♦	Figure KT50 Figure KT51	NT	
	Polyethylene Type and Age	♦	Figure KT52	NT	
	Polyethylene Type and Stability*	♦	Table KT51	NT	
	Polyethylene Type and Prosthesis Combination	♦	Table KT53	NT	
	XLPE by Polyethylene Type	♦	Figure KT54	NT	
	XLPE by Polyethylene Type and Stability*	♦	Table KT56	NT	



Knee Replacement

Characteristic	Variable	Total Knee Osteoarthritis		Total Knee All Diagnoses	
		Significant HR	Table/Figure no.	Significant HR	Table/Figure no.
	Femoral Bearing Surface	♦	Figure KT56	NT	
	Femoral Bearing Surface and Stability	♦	Table KT59	NT	
	Femoral Material	♦	Figure KT58	NT	
	Femoral Material and Loosening	♦	Figure KT60	NT	
	Femoral Bearing Surface and Prosthesis Combination	♦	Table KT63	NT	
Surgeon Assistive Tools					
	Computer Navigation		Figure KT62	NT	
	Computer Navigation and Age	♦	Figure KT64	NT	
	Computer Navigation with Patella by Prosthesis Combination	♦	Table KT67	NT	
	IDI	♦	Figure KT65	NT	
	IDI and Age	♦	Figure KT67	NT	
	IDI by Prosthesis Combination	♦	Table KT71	NT	
	Robotic Assistance		Figure KT68	NT	
	Robotic Assistance and Age	♦	Figure KT70	NT	
	Robotic Assistance by Prosthesis Combination	♦	Table KT75	NT	
	XLPE by Surgeon Assistive Tool		Figure KT71	NT	
	Persona CR/Persona Prosthesis Combination with XLPE by Surgeon Assistive Tool		Figure KT72	NT	
	Triathlon CR/Triathlon Prosthesis Combination with XLPE by Surgeon Assistive Tool		Figure KT73	NT	

♦ Significant Hazard Ratio difference between categories where $p < 0.05$

NT Not Tested: Insufficient numbers to make statistical comparisons or comparison not relevant

*New analysis for this year's Annual Report



Knee Replacement

Use of Knee Replacement

This report analyses 1,287,308 knee replacements with a procedure date up to and including 31 December 2025. This is an additional 81,692 knee procedures since the last report. The relative frequency of each category of knee replacement is provided in Table K3.

For further information on the **closure of the database**, please see the **Glossary** of this report.

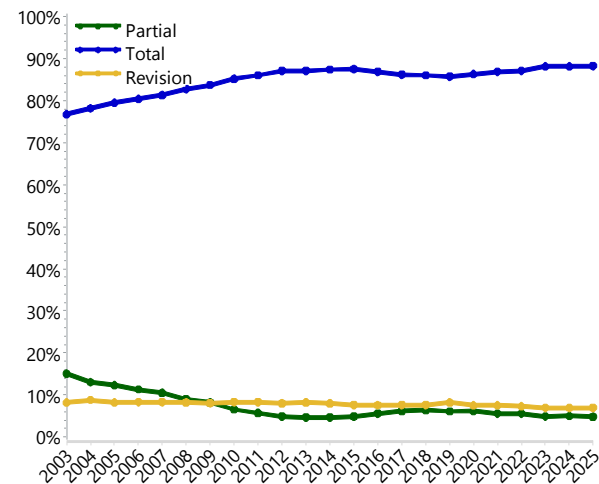
Table K3 Number of Knee Replacements

Knee Category	Number	Percent
Partial	88338	6.9
Total	1098939	85.4
Revision	100031	7.8
TOTAL	1287308	100.0

In 2025, the number of knee replacements undertaken has increased by 787 (1.0%) compared to 2024. During the last year, primary partial knee replacement decreased by 2.7% and primary total knee replacement increased by 1.1%. Revision knee replacement increased by 1.6%.

In 2025, primary total knee replacement accounted for 88.2% of all knee replacement procedures, primary partial knee replacement accounted for 4.8%, and the proportion of revision knee procedures was 6.9%. This equates to 1,514 fewer revision procedures in 2025 than would have been expected if the proportion of revision procedures had remained at the level reported in 2004 (Figure K1).

Figure K1 Proportion of Knee Replacements



Knee Replacement

ASA Score and BMI in Knee Replacement

Data are reported on knee replacement procedures for both the American Society of Anesthesiologists Physical Status Classification (ASA score) and Body Mass Index (BMI). ASA score and BMI are both known to impact the outcome of knee replacement surgery. The Registry commenced the collection of ASA score in 2012 and BMI data in 2015.

There are ASA score data on 856,790 and BMI data on 751,574 knee replacement procedures. Since its initial collection, ASA score has been recorded for 97.9% of procedures. BMI has been recorded for 96.6% of procedures since collection commenced.

ASA SCORE

There are five ASA score classifications:¹²

1. A normal healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation

Overall, in 93.6% of knee replacement procedures, patients have an ASA score of 2 or 3, 5.1% have a score of 1 and 1.3% have a score of 4. Very few procedures are recorded where patients have an ASA score of 5.

There is a difference in ASA score depending on the class of knee replacement. There are more patients undergoing partial knee replacement procedures with ASA scores 1 or 2, than those having primary total knee replacement procedures. For patients undergoing revision knee replacement surgery, there are lower proportions with ASA scores of 1 or 2 (Table K4).

BMI CATEGORY

BMI for adults is classified into six main categories:¹³

Underweight	<18.5
Normal	18.5–24.9
Pre-obese	25.0–29.9
Obese Class 1	30.0–34.9
Obese Class 2	35.0–39.9
Obese Class 3	≥40.0

For all knee replacements, the majority of procedures are undertaken in patients who are in pre-obese and obese class 1 categories. There is very little difference in BMI for patients when primary total and revision knee replacement are compared. However, for partial knee replacement, patients generally have a lower BMI (Table K5)

Table K4 ASA Score for Knee Replacement

ASA Score	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
ASA 1	4980	10.9	36244	5.0	1875	3.0	43099	5.1
ASA 2	27684	60.6	386038	52.8	24513	39.3	438235	52.2
ASA 3	12837	28.1	300943	41.2	33197	53.2	346977	41.4
ASA 4	205	0.4	7519	1.0	2793	4.5	10517	1.3
ASA 5	.	.	29	0.0	23	0.0	52	0.0
TOTAL	45706	100.0	730773	100.0	62401	100.0	838880	100.0

Note: A further 448,428 procedures did not have ASA score recorded.

Table K5 BMI Category for Knee Replacement

BMI Category	Partial		Total		Revision		TOTAL	
	N	Col%	N	Col%	N	Col%	N	Col%
Underweight (<18.5)	88	0.2	1276	0.2	184	0.4	1548	0.2
Normal (18.5–24.9)	6124	15.1	67974	10.7	5729	11.2	79827	11.0
Pre Obese (25.0–29.9)	16368	40.4	198943	31.4	15322	30.0	230633	31.8
Obese Class 1 (30.0–34.9)	12221	30.2	195241	30.8	15601	30.6	223063	30.7
Obese Class 2 (35.0–39.9)	4236	10.5	107071	16.9	8644	16.9	119951	16.5
Obese Class 3 (≥40.0)	1492	3.7	63882	10.1	5532	10.8	70906	9.8
TOTAL	40529	100.0	634387	100.0	51012	100.0	725928	100.0

Note: BMI has not been presented for patients aged ≤19 years. A further 561,380 procedures did not have BMI recorded or the patient is aged ≤19 years.

¹² <https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system>

¹³ <https://www.health.gov.au/topics/overweight-and-obesity/bmi-and-waist>

Primary Partial Knee Replacement

Classes of Partial Knee Replacement

Partial knee replacement is subcategorised into five classes. These are defined by the types of prostheses used.

Partial resurfacing involves the use of one or more button prostheses to replace part of the natural articulating surface on one or more sides of the joint, in one or more articular compartments of the knee.

Unispacer involves the use of a medial or lateral femorotibial compartment articular spacer.

Bicompartmental involves the replacement of the medial femoral and trochlear articular surface of the knee with a single femoral prosthesis, as well as the medial tibial articular surface with a unicompartmental tibial prosthesis. It may also include the use of a patellar prosthesis.

Patella/trochlea involves the use of a trochlear prosthesis to replace the femoral trochlear articular surface and, on most occasions, a patellar prosthesis.

Unicompartmental involves the replacement of the femoral and tibial articular surface of either the medial or lateral femorotibial compartment using unicompartmental femoral and tibial prostheses.

Detailed information on unispacer, bicompartmental and partial resurfacing knee replacement is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website:
<https://registry.aoa.org.au/annual-reports-2026>

Use of Partial Knee Replacement

Unicompartmental knee replacement remains the most common class of primary partial knee replacement, accounting for 92.7% of all partial knee replacement procedures. The second most common class is patella/trochlear replacement (6.8%). For the remaining three classes, only small numbers of procedures have been reported (Table KP1).

Table KP1 Partial Knee Replacement by Class

Partial Knee Class	Number	Percent
Partial Resurfacing	248	0.3
Unispacer	40	0.0
Bicompartmental	165	0.2
Patella/Trochlea	6005	6.8
Unicompartmental	81880	92.7
TOTAL	88338	100.0

Primary Partial Knee Replacement

Patella/Trochlear

DEMOGRAPHICS

There are 6,005 patella/trochlear knee replacement procedures undertaken for all diagnoses. This is an additional 283 procedures compared to the previous report.

For further information on the **closure of the database** please see the **Glossary** of this report.

Patella/trochlear knee replacement accounted for 7.2% of all partial knee replacement procedures performed in 2025. Although the proportion of patella/trochlear knee replacements has increased from 2003 when it was 3.5%, it has changed little since 2016 (Figure KP1).

The principal diagnosis for patella/trochlea procedures is osteoarthritis. The proportion of males and females has remained relatively stable over the years (Figure KP2). The mean age of patients is 58.3 years, with this procedure undertaken more frequently in females (Table KP3). The age distribution has remained relatively stable since 2003 (Figure KP3).

In 2025, there were three resurfacing trochlea prostheses used in patella/trochlear knee replacement: the Restoris, MCK and Gender Solutions prostheses (Table KP4).

The outcomes of patella/trochlea knee prosthesis combinations used in 2025 are presented in Table KP5.

Figure KP1 Primary Patella/Trochlea Knee Replacement by Year (All Diagnoses)

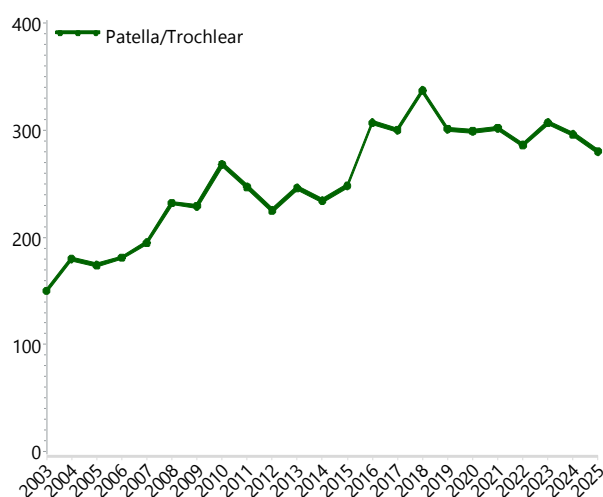


Table KP2 Primary Patella/Trochlea Knee Replacement by Primary Diagnosis

Primary Diagnosis	N	Col%
Osteoarthritis	5940	98.9
Other Inflammatory Arthritis	23	0.4
Rheumatoid Arthritis	9	0.1
Osteonecrosis	6	0.1
Fracture	4	0.1
Tumour	2	0.0
Other	21	0.3
TOTAL	6005	100.0

Figure KP2 Primary Patella/Trochlea Knee Replacement by Sex and Year of Procedure

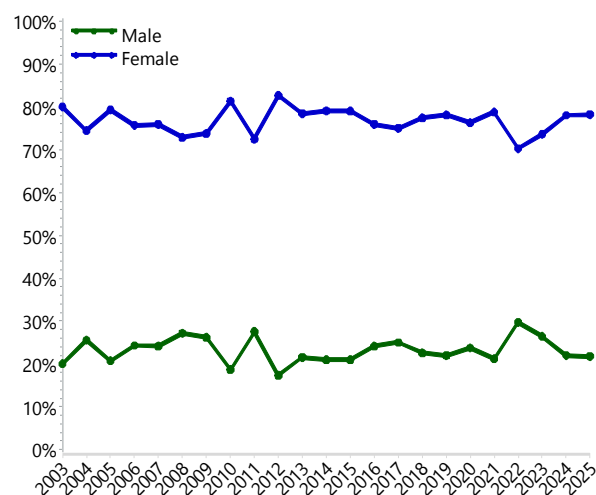
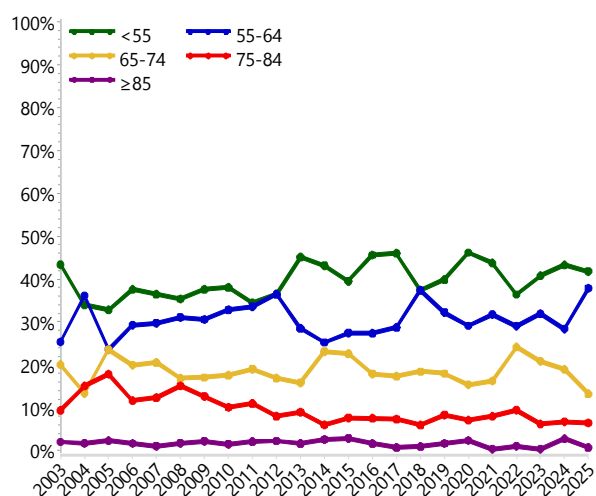


Figure KP3 Primary Patella/Trochlea Knee Replacement by Age and Year of Procedure



Primary Partial Knee Replacement

Table KP3 Age and Sex of Primary Patella/Trochlea Knee Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	1403	23.4%	24	95	60	60.7	12.7
Female	4602	76.6%	21	95	57	57.6	11.7
TOTAL	6005	100.0%	21	95	57	58.3	12.0

Table KP4 Most Used Resurfacing Trochlea Prostheses used in Primary Patella/Trochlea Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
56	LCS	128	Restoris MCK	147	Gender Solutions	126	Gender Solutions	160	Restoris MCK
43	Avon	115	Gender Solutions	113	Restoris MCK	121	Restoris MCK	103	Gender Solutions
29	Lubinus	41	Journey	46	Journey	47	Journey	17	Journey
13	Themis	2	Avon	1	Avon	2	Moto		
8	MOD III								
1	RBK								
Most Used									
150	(6) 100.0%	286	(4) 100.0%	307	(4) 100.0%	296	(4) 100.0%	280	(3) 100.0%

Table KP5 Cumulative Percent Revision of Primary Patella/Trochlea Knee Replacement by Prosthesis Combination

Resurfacing Trochlear	Patella	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Gender Solutions	Persona	12	422	0.5 (0.1, 2.2)	4.7 (2.4, 8.9)	6.8 (3.7, 12.6)			
Journey	Genesis II	201	807	2.5 (1.6, 3.9)	8.5 (6.7, 10.7)	13.0 (10.7, 15.7)	18.7 (15.9, 22.0)	25.7 (22.3, 29.6)	42.2 (37.0, 47.9)
Restoris MCK	Restoris MCK	64	641	1.0 (0.5, 2.3)	6.0 (4.3, 8.5)	10.2 (7.7, 13.5)	16.5 (12.7, 21.3)		
	Triathlon	12	294	2.4 (1.1, 5.2)	5.2 (2.9, 9.3)				
Other (2)		1	13	0.0 (0.0, 0.0)	12.5 (1.9, 61.3)				
TOTAL		290	2177						

Note: Restricted to modern prostheses

Only prostheses with over 20 procedures have been listed



Primary Partial Knee Replacement

OUTCOME FOR OSTEOARTHRITIS - PATIENT CHARACTERISTICS

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified.

There are 285 revisions of the 2,151 primary patella/trochlear knee replacement procedures for osteoarthritis for analysis this year. There are 2,228 patella/trochlear procedures excluded from the analysis as the prosthesis is no longer used or the initial diagnosis was not osteoarthritis.

The cumulative percent revision for patella/trochlear replacement at 15 years is 40.8% (Table KP6 and Figure KP4).

Reasons for Revision

The main reasons for revision of patella/trochlear knee replacement are progression of disease, loosening and pain (Table KP7 and Table KP5). The main type of revision is to a total knee replacement (Table KP8).

Age and Sex

Patient age or sex are not risk factors for revision (Table KP9, Figure KP6, Table KP10 and Figure KP7).

There is no difference in the rate of revision when the outcome by patient age and sex are compared (Table KP10 and Figure KP8).

ASA and BMI

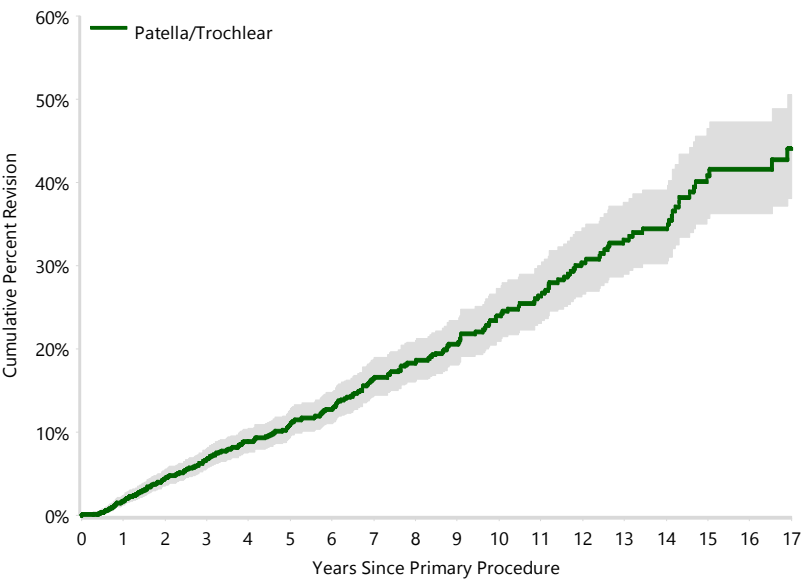
Patient ASA score and BMI are not risk factors for revision (Table KP11, Figure KP9, Table KP12 and Figure KP10).

Table KP6 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement (Primary Diagnosis OA)

Knee Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Patella/Trochlear	285	2151	1.7 (1.2, 2.4)	6.7 (5.6, 8.1)	10.9 (9.3, 12.6)	16.4 (14.4, 18.8)	23.9 (21.0, 27.3)	40.8 (35.6, 46.4)
TOTAL	285	2151						

Note: Restricted to modern prostheses

Figure KP4 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Patella/Trochlear	2151	1835	1247	858	557	268	80

Note: Restricted to modern prostheses

Primary Partial Knee Replacement

Table KP7 Primary Patella/Trochlear Knee Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Progression Of Disease	178	62.5
Loosening	27	9.5
Pain	27	9.5
Wear Patella	8	2.8
Infection	8	2.8
Lysis	7	2.5
Malalignment	4	1.4
Wear Tibial Insert	2	0.7
Implant Breakage Patella	2	0.7
Implant Breakage Femoral	1	0.4
Other	21	7.4
TOTAL	285	100.0

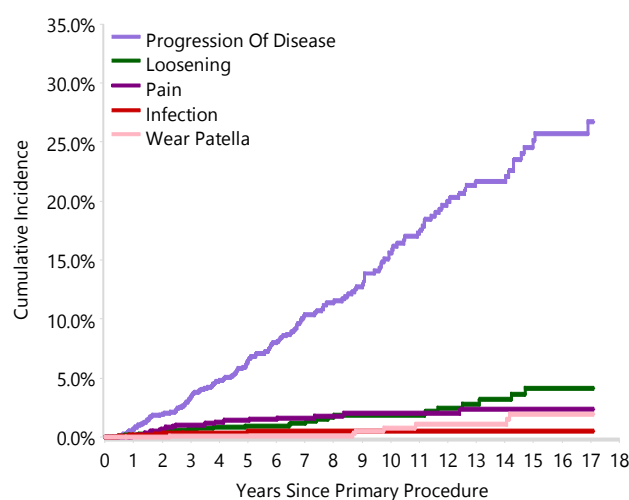
Note: Restricted to modern prostheses

Table KP8 Primary Patella/Trochlear Knee Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
TKR (Tibial/Femoral)	252	88.4
Patella Only	19	6.7
UKR (Uni Tibial/Uni Femoral)	5	1.8
Patella/Trochlear Resurfacing	4	1.4
Cement Spacer	3	1.1
Removal of Prostheses	1	0.4
Femoral Component	1	0.4
TOTAL	285	100.0

Note: Restricted to modern prostheses

Figure KP5 Cumulative Incidence Revision Diagnosis of Primary Patella/Trochlear Knee Replacement by Reason for Revision (Primary Diagnosis OA)





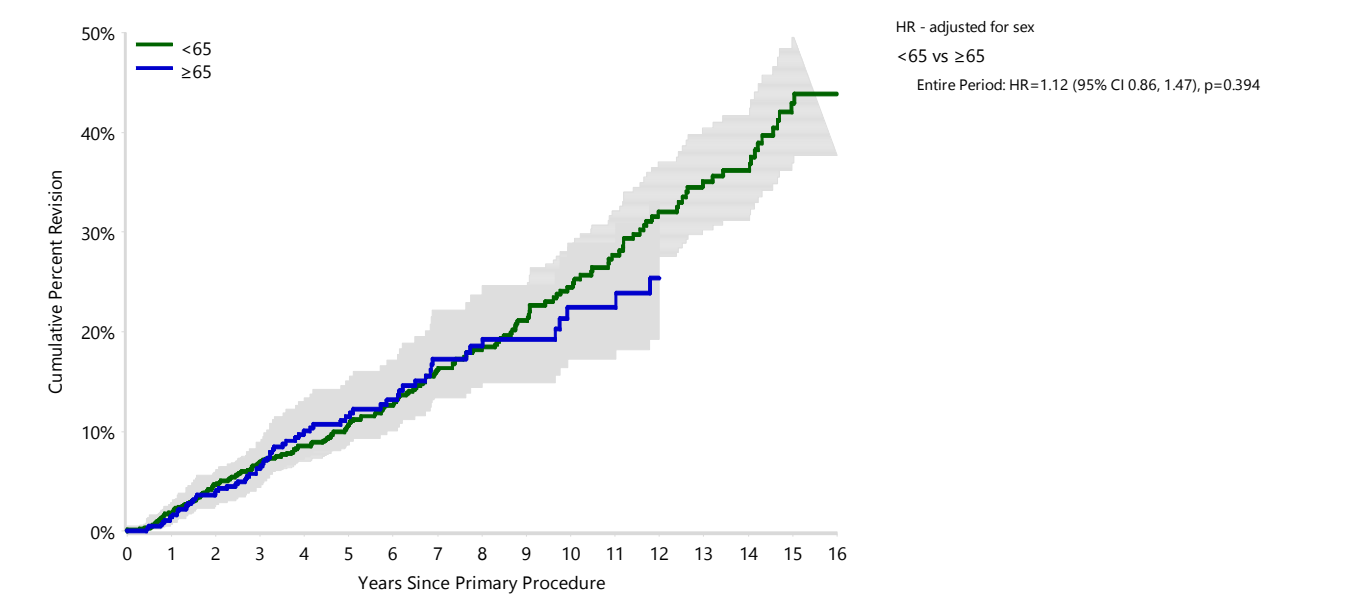
Primary Partial Knee Replacement

Table KP9 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<65	214	1556	1.9 (1.3, 2.7)	6.9 (5.6, 8.5)	10.6 (8.9, 12.7)	16.1 (13.7, 18.9)	24.5 (21.0, 28.5)	42.9 (36.9, 49.5)
≥65	71	595	1.4 (0.7, 2.9)	6.3 (4.4, 8.9)	11.5 (8.7, 15.1)	17.2 (13.3, 22.1)	22.4 (17.2, 28.9)	
TOTAL	285	2151						

Note: Restricted to modern prostheses

Figure KP6 Cumulative Percent Revision of Primary Patella/Trochlea Knee Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<65	1556	1309	894	629	409	199	62
≥65	595	526	353	229	148	69	18

Note: Restricted to modern prostheses

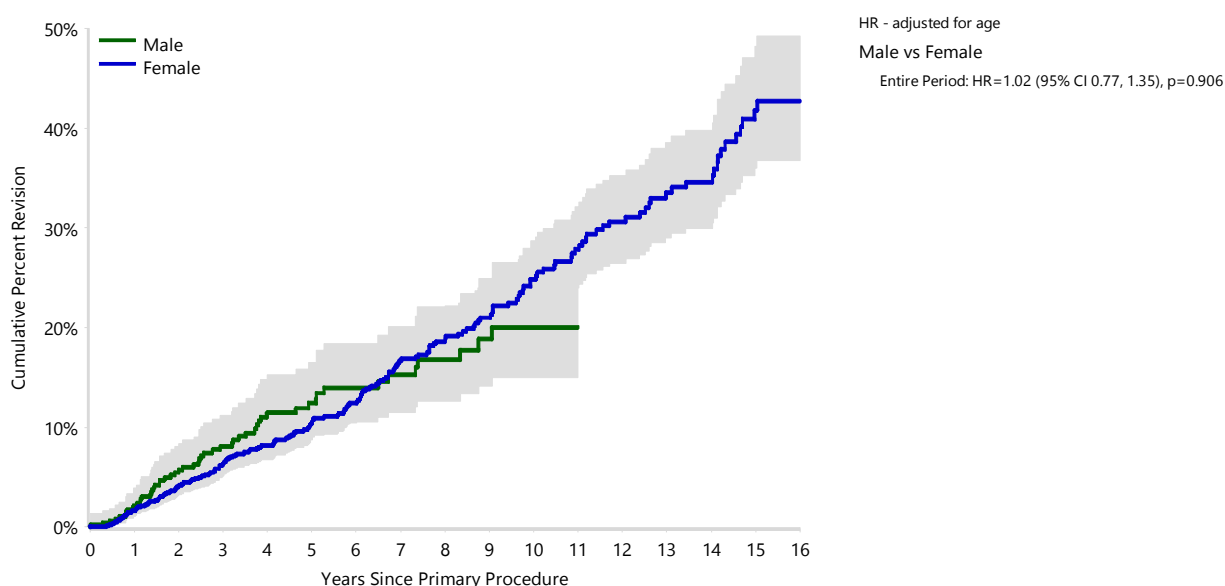
Primary Partial Knee Replacement

Table KP10 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by Sex and Age (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male		63	513	2.1 (1.1, 3.9)	8.1 (5.8, 11.2)	12.4 (9.3, 16.5)	15.3 (11.5, 20.1)	20.0 (14.9, 26.5)	
	<65	42	320	2.0 (0.9, 4.5)	7.9 (5.1, 12.0)	12.3 (8.5, 17.6)	15.1 (10.5, 21.4)		
	≥65	21	193	2.3 (0.9, 5.9)	8.3 (4.9, 14.0)	12.5 (7.8, 19.8)	15.5 (9.8, 24.1)		
Female		222	1638	1.6 (1.1, 2.4)	6.3 (5.1, 7.8)	10.4 (8.7, 12.4)	16.7 (14.3, 19.4)	24.8 (21.4, 28.7)	41.8 (36.0, 48.2)
	<65	172	1236	1.8 (1.2, 2.8)	6.7 (5.3, 8.5)	10.2 (8.3, 12.5)	16.3 (13.6, 19.5)	24.9 (21.0, 29.4)	43.7 (37.0, 51.1)
	≥65	50	402	1.1 (0.4, 2.8)	5.3 (3.3, 8.4)	10.9 (7.7, 15.3)	17.8 (13.1, 24.0)	24.8 (18.2, 33.1)	
TOTAL		285	2151						

Note: Restricted to modern prostheses

Figure KP7 Cumulative Percent Revision of Primary Patella/Trochlea Knee Replacement by Sex (Primary Diagnosis OA)



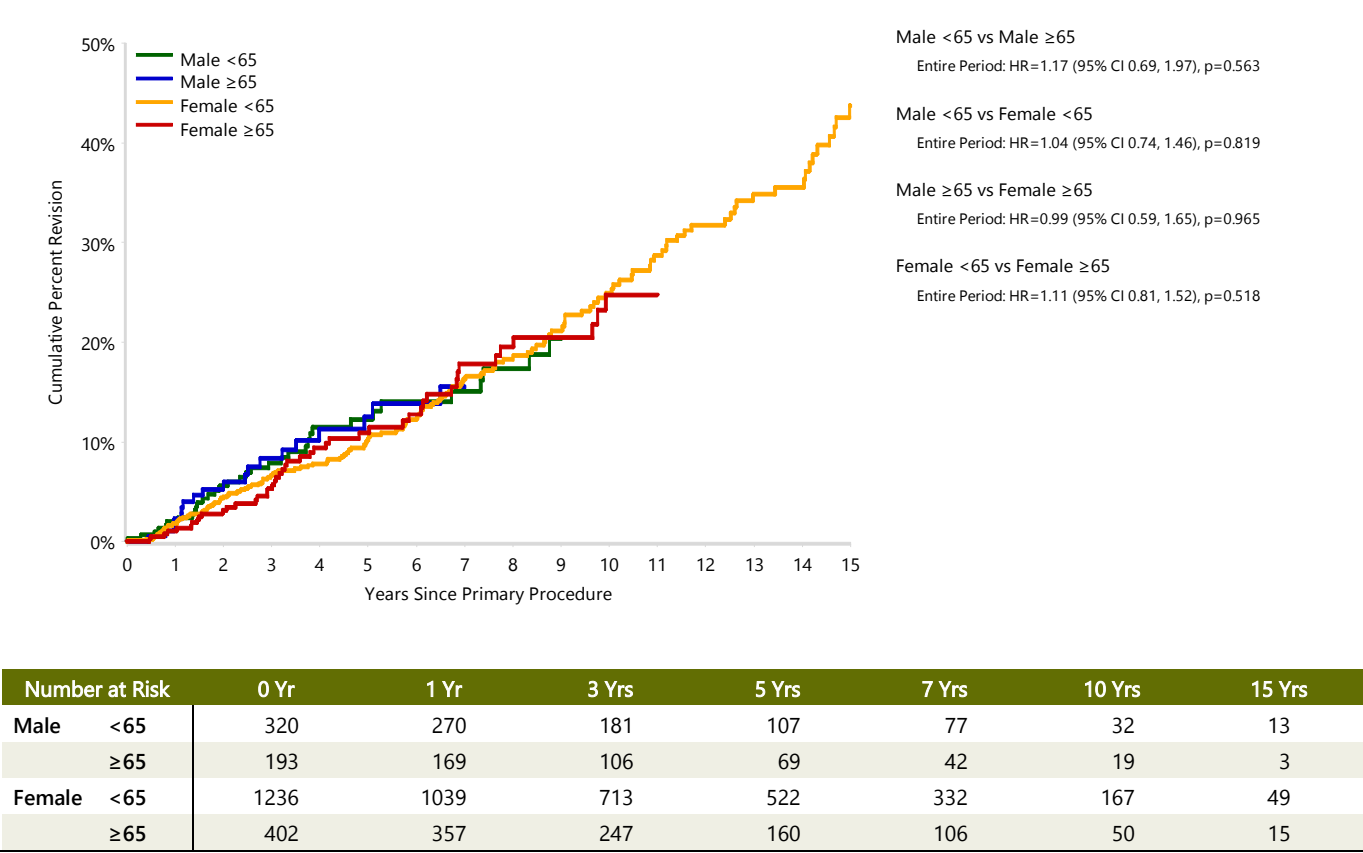
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male	513	439	287	176	119	51	16
Female	1638	1396	960	682	438	217	64

Note: Restricted to modern prostheses



Primary Partial Knee Replacement

Figure KP8 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by Sex and Age (Primary Diagnosis OA)



Note: Restricted to modern prostheses

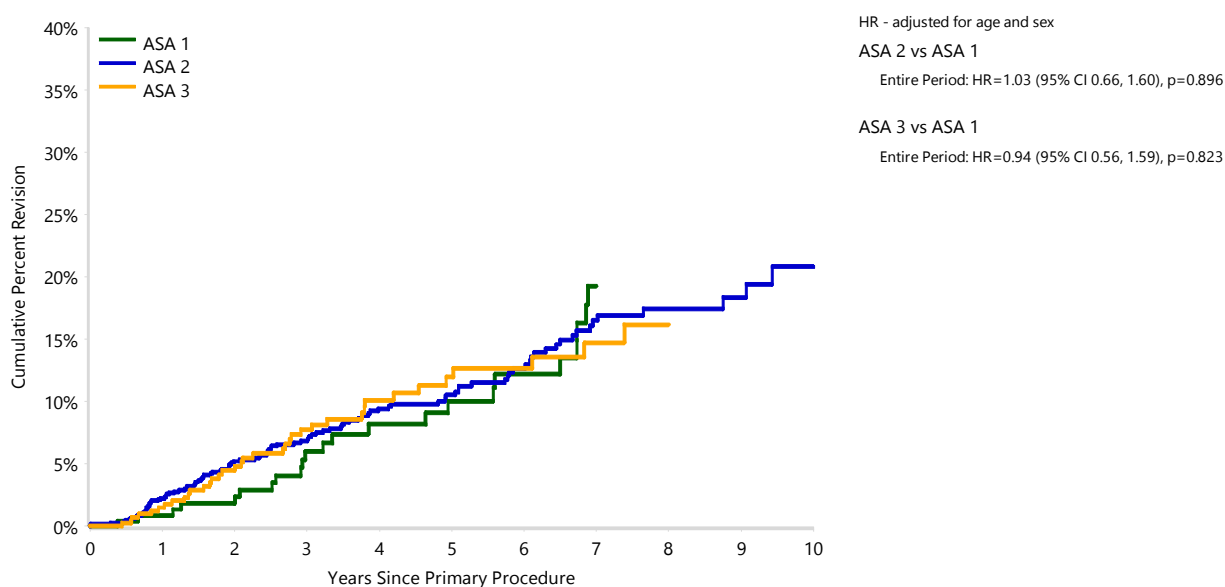
Primary Partial Knee Replacement

Table KP11 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	25	246	0.9 (0.2, 3.5)	6.0 (3.3, 10.6)	10.0 (6.2, 16.1)	19.3 (12.7, 28.6)	
ASA 2	109	1136	2.2 (1.5, 3.4)	6.9 (5.4, 8.8)	10.5 (8.5, 13.0)	16.5 (13.4, 20.2)	20.8 (16.2, 26.5)
ASA 3	38	464	1.5 (0.7, 3.3)	7.7 (5.3, 11.3)	12.0 (8.5, 16.7)	14.7 (10.4, 20.6)	
ASA 4	0	5	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
TOTAL	172	1851					

Note: Excludes 300 procedures with unknown ASA score.
Restricted to modern prostheses.

Figure KP9 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by ASA Score (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
ASA 1	246	216	145	94	50	12
ASA 2	1136	945	596	379	201	42
ASA 3	464	375	229	127	69	11

Note: Excludes 300 procedures with unknown ASA score.
Restricted to modern prostheses.
ASA 4 excluded due to low numbers.

Primary Partial Knee Replacement

Table KP12 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by BMI Category (Primary Diagnosis OA)

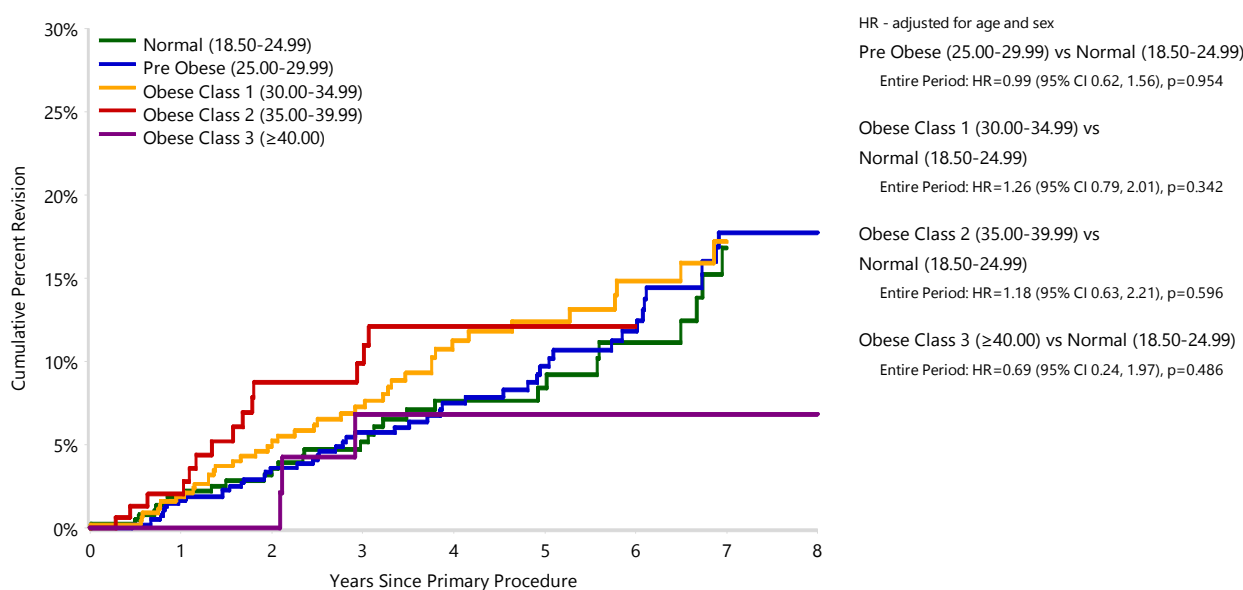
BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Underweight (<18.5)	1	21	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	14.3 (2.1, 66.6)		
Normal (18.5-24.9)	31	402	1.9 (0.9, 4.0)	5.2 (3.2, 8.4)	8.4 (5.5, 12.8)	16.8 (11.1, 25.1)	
Pre Obese (25.0-29.9)	50	625	1.7 (0.9, 3.2)	5.7 (3.9, 8.4)	9.7 (7.0, 13.4)	17.7 (13.1, 23.8)	17.7 (13.1, 23.8)
Obese Class 1 (30.0-34.9)	45	471	1.9 (0.9, 3.7)	7.3 (5.0, 10.5)	12.4 (9.0, 17.0)	17.2 (12.4, 23.7)	
Obese Class 2 (35.0-39.9)	15	164	2.0 (0.7, 6.2)	9.9 (5.7, 16.9)	12.1 (7.3, 19.8)		
Obese Class 3 (≥40.0)	4	70	0.0 (0.0, 0.0)	6.8 (2.2, 19.9)	6.8 (2.2, 19.9)	6.8 (2.2, 19.9)	6.8 (2.2, 19.9)
TOTAL	146	1753					

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Excludes 398 procedures with unknown BMI

Figure KP10 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement by BMI Category (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Normal (18.5-24.9)	402	338	212	114	52	23
Pre Obese (25.0-29.9)	625	513	315	188	92	58
Obese Class 1 (30.0-34.9)	471	387	242	137	63	30
Obese Class 2 (35.0-39.9)	164	127	81	58	26	16
Obese Class 3 (≥40.0)	70	64	35	24	14	9

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Excludes 398 procedures with unknown BMI

Underweight BMI category excluded due to low numbers

Primary Partial Knee Replacement

OUTCOME BY PROSTHESIS CHARACTERISTICS

Surgeon Assistive Tools

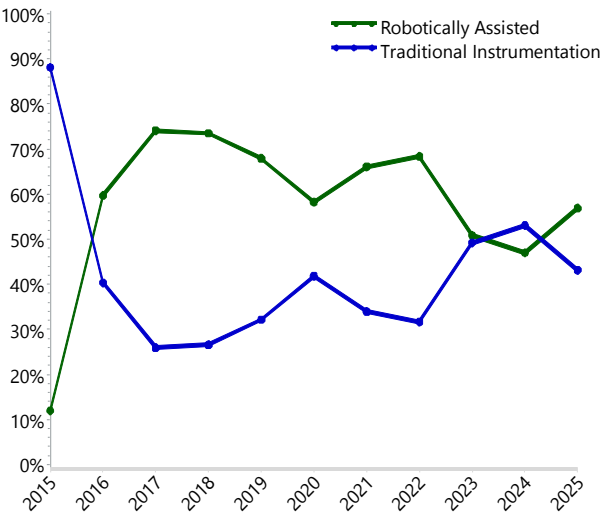
Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as ‘surgeon assistive tools’. Computer navigation and IDI are rarely used with patella/trochlea replacement.

Robotic assistance for patella/trochlea knee replacement was first recorded in 2015.

In 2025, 56.9% of patella/trochlea knee procedures use robotic assistance (Figure KP11). There are 1,051 robotically assisted patella/trochlea knee replacement procedures undertaken for osteoarthritis. There are 9 patella/trochlea combinations that can be used with robotic assistance.

When adjusted for age, sex, ASA and BMI there is no difference in the rate of revision when robotically assisted patella/trochlea knee procedures are compared to procedures using traditional instrumentation (Table KP13 and Figure KP12).

Figure KP11 Primary Patella/Trochlear Knee Replacement by Robotic Assistance (Primary Diagnosis OA)



Note: Restricted to modern prostheses



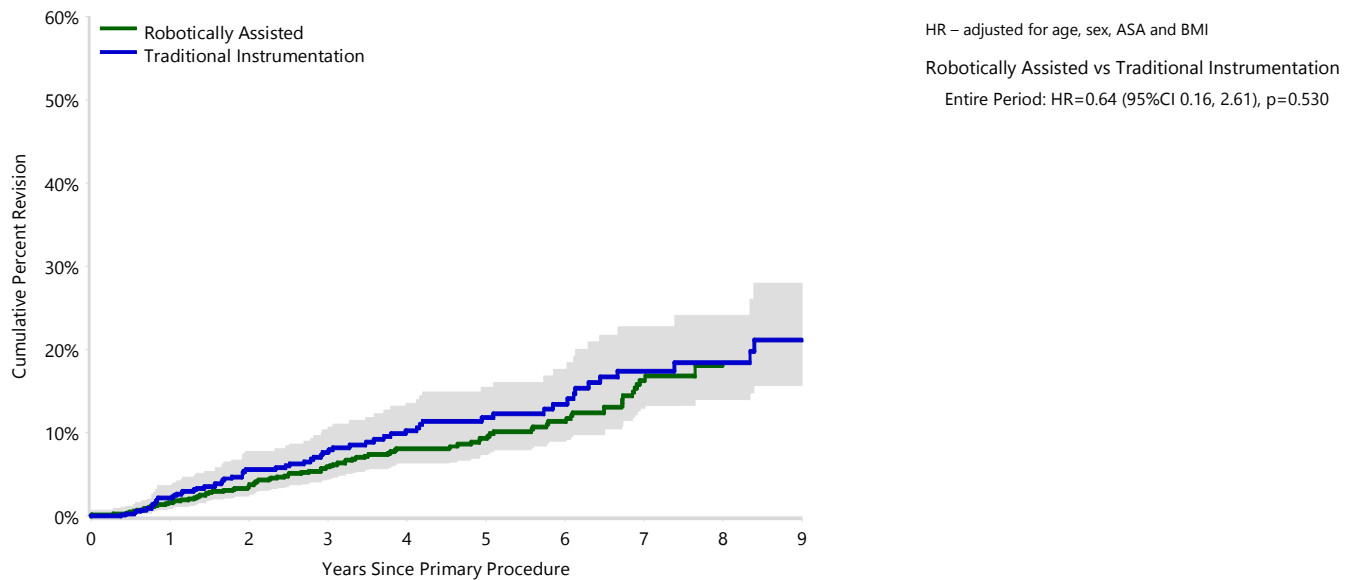
Primary Partial Knee Replacement

Table KP13 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)

Surgeon Assistive Tools	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	90	1051	1.6 (1.0, 2.6)	5.9 (4.5, 7.8)	9.4 (7.4, 11.9)	16.3 (13.0, 20.4)	
Traditional Instrumentation	64	733	2.2 (1.3, 3.6)	7.7 (5.6, 10.4)	11.8 (9.0, 15.5)	17.4 (13.3, 22.7)	21.1 (15.8, 28.0)
TOTAL	154	1784					

Note: Restricted to modern prostheses

Figure KP12 Cumulative Percent Revision of Primary Patella/Trochlear Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	1051	878	603	354	173	34
Traditional Instrumentation	733	600	316	198	97	42

Note: Restricted to modern prostheses



Primary Partial Knee Replacement

Unicompartmental

DEMOGRAPHICS

There are 81,880 primary unicompartmental knee procedures recorded. This is an additional 3,661 procedures compared to the last report.

For further information on the **closure of the database** please see the **Glossary** of this report.

The use of unicompartmental knee replacement has decreased to 4.5% of all knee procedures in 2025. This proportion is considerably less than in 2003 (14.5%).

Osteoarthritis is the principal diagnosis (Table KP14). This procedure is undertaken more often in males (55.6%) (Table KP15). The proportion of males has not changed in 2025 (61.7%) (Figure KP13). Unicompartmental knee replacement is most frequently undertaken in patients aged 55–74 years. The age distribution has remained relatively stable since 2003 (Figure KP14). The mean age of patients is 65.6 years (Table KP15).

Table KP14 Primary Unicompartmental Knee Replacement by Primary Diagnosis

Primary Diagnosis	N	%
Osteoarthritis	81174	99.1
Osteonecrosis	477	0.6
Rheumatoid Arthritis	164	0.2
Other Inflammatory Arthritis	55	0.1
Fracture	5	0.0
Osteochondritis Dissecans	2	0.0
Tumour	1	0.0
Other	2	0.0
TOTAL	81880	100.0

Figure KP13 Primary Unicompartmental Knee Replacement by Sex

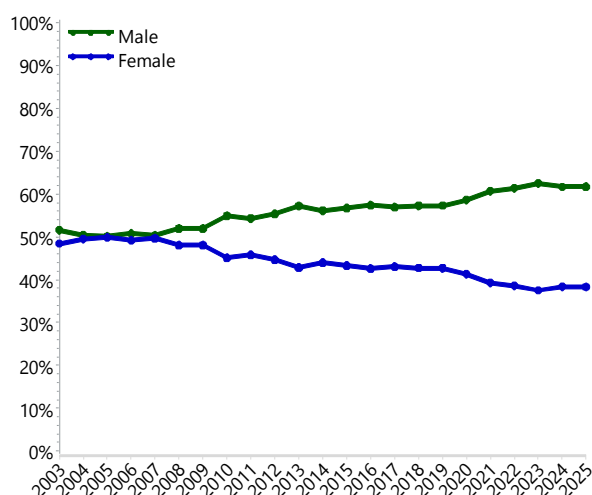
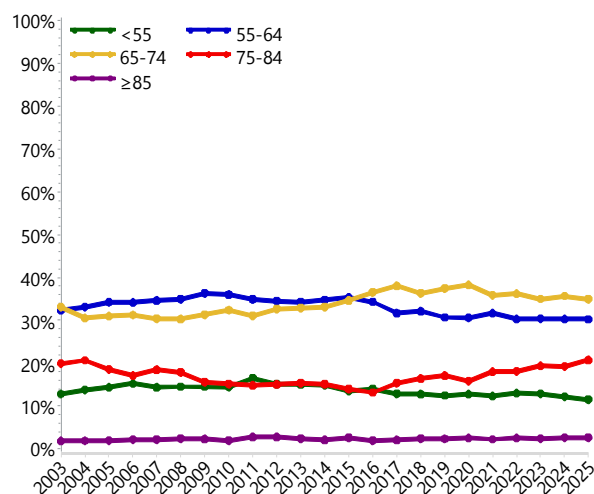


Figure KP14 Primary Unicompartmental Knee Replacement by Age

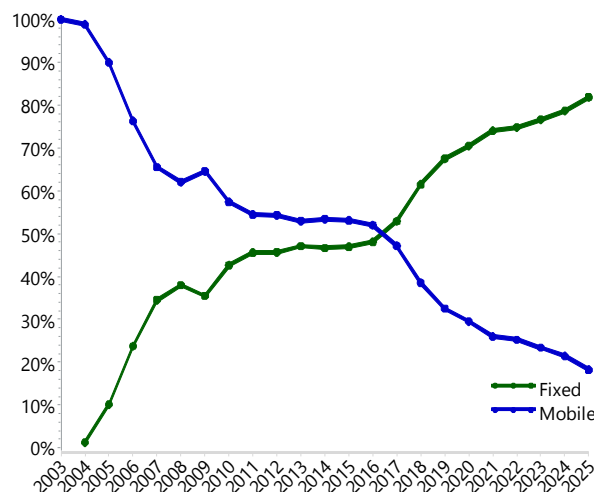


The use of mobile unicompartmental knee replacement has declined over time and in 2025 account for 18.2% of unicompartmental knee procedures (Figure KP15). The proportion of unicompartmental knee replacements using robotic assistance increased to 57.0% in 2025 (Figure KP16).

In 2025, the 10 most used tibial prostheses account for 99.5% of all unicompartmental procedures. The Restoris MCK, Persona and Oxford (cementless) are the most used prostheses in 2025 (Table KP16).

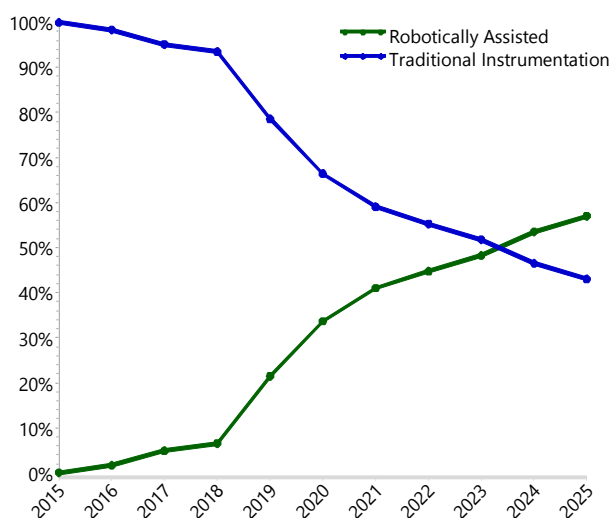
The outcomes of unicompartmental knee prosthesis combinations with >200 procedures are presented in Table KP17.

Figure KP15 Primary Unicompartmental Knee Replacement by Mobility



Primary Partial Knee Replacement

Figure KP16 Primary Unicompartmental Knee Replacement by Robotic Assistance (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Table KP15 Age and Sex of Primary Unicompartmental Knee Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	45565	55.6%	24	98	66	65.9	9.6
Female	36315	44.4%	13	98	65	65.1	10.2
TOTAL	81880	100.0%	13	98	65	65.6	9.9

Table KP16 10 Most Used Tibial Prostheses in Primary Unicompartmental Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1365	Oxford (ctd)	1271	Restoris MCK	1360	Restoris MCK	1637	Restoris MCK	1647	Restoris MCK
444	Repicci II	747	Oxford (cless)	776	Persona	776	Persona	760	Persona
373	Preservation Fixed	698	Persona	751	Oxford (cless)	703	Oxford (cless)	594	Oxford (cless)
353	M/G	146	Journey Uni (v2)	196	Journey Uni (v2)	171	Journey Uni (v2)	167	Journey Uni (v2)
336	Allegretto Uni	134	Sigma HP	134	Sigma HP	110	BalanSys Uni Fixed	115	Genus
321	GRU	125	BalanSys Uni Fixed	116	BalanSys Uni Fixed	100	Sigma HP	108	Sigma HP
275	Genesis	111	Genus	103	Genus	90	Oxford (ctd)	77	BalanSys Uni Fixed
260	Unix	108	Oxford (ctd)	92	Oxford (ctd)	65	Genus	67	Oxford (ctd)
121	Preservation Mobile	31	ZUK	25	ZUK	37	ZUK	49	ZUK
101	Endo-Model Sled	17	Moto	23	Moto	20	Moto	24	Moto
10 Most Used									
3949 (10)	96.2%	3388 (10)	99.6%	3576 (10)	99.8%	3709 (10)	99.8%	3608 (10)	99.5%
Remainder									
158 (7)	3.8%	14 (5)	0.4%	7 (2)	0.2%	7 (2)	0.2%	17 (4)	0.5%
TOTAL									
4107 (17)	100.0%	3402 (15)	100.0%	3583 (12)	100.0%	3716 (12)	100.0%	3625 (14)	100.0%



Primary Partial Knee Replacement

Table KP17 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Prosthesis Combination

Uni Femoral	Uni Tibial	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
BalanSys Uni	BalanSys Uni Fixed	104	1513	1.8 (1.2, 2.6)	3.9 (3.0, 5.0)	5.4 (4.3, 6.8)	9.5 (7.5, 12.0)	13.6 (10.5, 17.7)	
Genus	Genus	38	790	2.8 (1.8, 4.3)	4.2 (3.0, 6.1)	6.3 (4.5, 8.8)			
Journey Uni	Journey Uni (v2)	141	1889	2.4 (1.8, 3.3)	5.4 (4.4, 6.6)	7.2 (6.0, 8.6)	11.8 (9.7, 14.4)		
	Journey Uni All Poly	55	361	1.4 (0.6, 3.3)	6.3 (4.2, 9.4)	9.1 (6.5, 12.6)	15.0 (11.3, 19.6)	19.4 (15.0, 24.9)	
Oxford (cless)	Oxford (cless)	928	11043	2.5 (2.2, 2.8)	4.5 (4.1, 4.9)	5.7 (5.3, 6.2)	10.2 (9.5, 10.9)	18.1 (16.5, 19.9)	
	Oxford (ctd)	70	582	3.0 (1.9, 4.8)	5.9 (4.2, 8.3)	8.8 (6.6, 11.6)	13.2 (10.3, 16.8)		
Oxford (ctd)	Oxford (cless)	25	201	4.0 (2.0, 7.8)	6.1 (3.5, 10.5)	8.4 (5.2, 13.4)	15.0 (10.1, 21.9)		
	Oxford (ctd)	3027	13788	2.2 (1.9, 2.4)	5.7 (5.3, 6.1)	8.1 (7.6, 8.6)	14.5 (13.9, 15.1)	22.0 (21.2, 22.8)	30.3 (29.2, 31.3)
Persona	Persona	94	3610	1.3 (1.0, 1.8)	3.4 (2.7, 4.2)	4.3 (3.4, 5.5)			
Restoris MCK	Restoris MCK	218	8458	0.9 (0.7, 1.2)	2.8 (2.4, 3.3)	4.2 (3.6, 4.9)			
Sigma HP	Sigma HP	130	2123	1.2 (0.8, 1.7)	3.0 (2.3, 3.9)	4.4 (3.6, 5.5)	7.3 (6.0, 8.8)	11.8 (9.5, 14.6)	
Triathlon PKR	Triathlon PKR	44	387	3.4 (2.0, 5.7)	7.0 (4.9, 10.1)	8.4 (6.0, 11.6)	11.5 (8.5, 15.4)		
ZUK	ZUK	837	9721	1.5 (1.3, 1.8)	3.4 (3.1, 3.8)	4.6 (4.2, 5.1)	8.1 (7.5, 8.7)	12.3 (11.4, 13.3)	
Other (6)		3	105	2.3 (0.6, 9.0)					
TOTAL		5258	50910						

Note: Restricted to modern prostheses

Only prostheses with >200 procedures have been listed.



Primary Partial Knee Replacement

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified.

There are 5,659 revisions of 54,120 primary unicompartmental knee replacement procedures with an initial diagnosis of osteoarthritis for analysis this year. There are 27,760 unicompartmental procedures excluded from the analysis as the prosthesis is no longer used or the initial diagnosis was not osteoarthritis.

The cumulative percent revision for primary unicompartmental knee replacement undertaken for osteoarthritis is 11.1% at 10 years and 26.3% at 20 years (Table KP18 and Figure KT16).

Reasons for Revision

The main reasons for revision of unicompartmental knee replacement are progression of disease, loosening and pain (Table KP19 and Figure KP18). The main type of revision is to a total knee replacement (Table KP20).

Age and Sex

Age is an important factor affecting the outcome of primary unicompartmental knee replacement, with the rate of revision decreasing with increasing age (Table KP21 and Figure KP19). Females have a higher rate of revision than males (Table KP22 and Figure KP20). The main reason for this difference is an increased cumulative incidence for progression of disease (Figure KP21). The effect of age on the rate of revision is evident in both males and females (Table KP22, Figure KP22 and Figure KP23).

ASA and BMI

ASA scores have been collected since 2012. There are 36,175 primary unicompartmental knee replacement procedures for osteoarthritis with these scores recorded. When compared to patients with an ASA score of 1, patients with an ASA score of 3 have a higher rate of revision in the first 6 months only. There is no difference in the rate of revision when patients with ASA scores of 2 or 4 are compared to those with an ASA score of 1 (Table KP23 and Figure KP24). The most common reasons for revision by ASA score are shown in Figure KP25.

BMI data have been collected since 2015. There are revision outcomes for 32,389 primary unicompartmental knee replacement procedures for osteoarthritis in relation to BMI category. There is no difference in the rate of revision comparing normal BMI to other categories (Table KP24 and Figure KP26). The most common reasons for revision by BMI category are shown in Figure KP27.

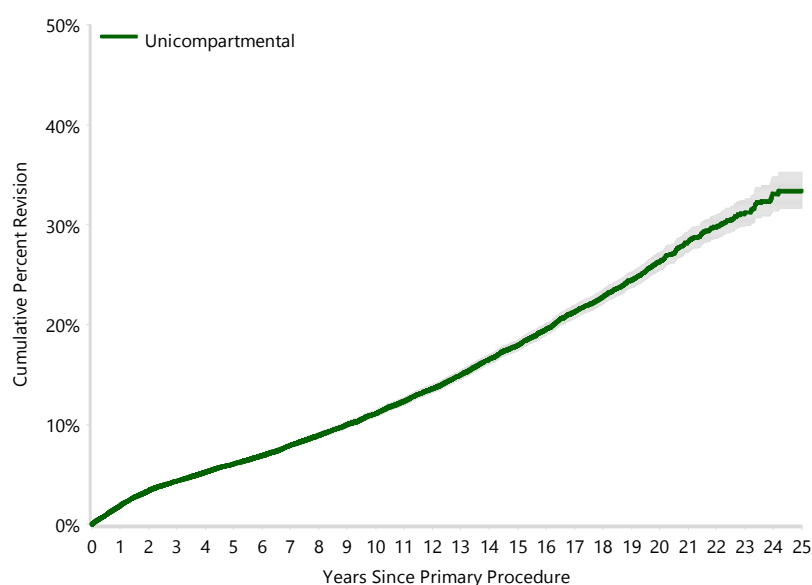
Primary Partial Knee Replacement

Table KP18 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)

Knee Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs	20 Yrs
Unicompartmental	5659	54120	1.9 (1.8, 2.0)	4.3 (4.2, 4.5)	6.0 (5.8, 6.3)	7.9 (7.6, 8.2)	11.1 (10.7, 11.4)	17.9 (17.4, 18.4)	26.3 (25.4, 27.2)
TOTAL	5659	54120							

Note: Restricted to modern prostheses

Figure KP17 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs	20 Yrs
Unicompartmental	54120	49394	40595	32737	25641	17275	7829	2154

Note: Restricted to modern prostheses



Primary Partial Knee Replacement

Table KP19 Primary Unicompartamental Knee Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Progression Of Disease	2198	38.8
Loosening	1690	29.9
Pain	390	6.9
Infection	292	5.2
Bearing Dislocation	209	3.7
Fracture	174	3.1
Instability	120	2.1
Lysis	108	1.9
Wear Tibial Insert	95	1.7
Implant Breakage Tibial Insert	76	1.3
Malalignment	75	1.3
Other (13)	232	4.1
TOTAL	5659	100.0

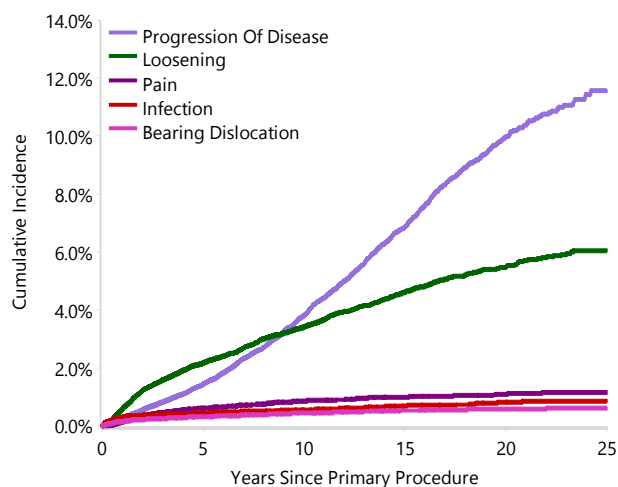
Note: Restricted to modern prostheses

Table KP20 Primary Unicompartamental Knee Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
TKR (Tibial/Femoral)	4780	84.5
Uni Insert Only	623	11.0
Uni Tibial Component	98	1.7
Uni Femoral Component	49	0.9
Cement Spacer	40	0.7
UKR (Uni Tibial/Uni Femoral)	36	0.6
Patella/Trochlear Resurfacing	18	0.3
Femoral Component*	5	0.1
Removal of Prostheses	5	0.1
Reinsertion of Components	4	0.1
Patella Only	1	0.0
TOTAL	5659	100.0

Note: Restricted to modern prostheses. *Bicompartamental component.

Figure KP18 Cumulative Incidence Revision Diagnosis of Primary Unicompartamental Knee Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses

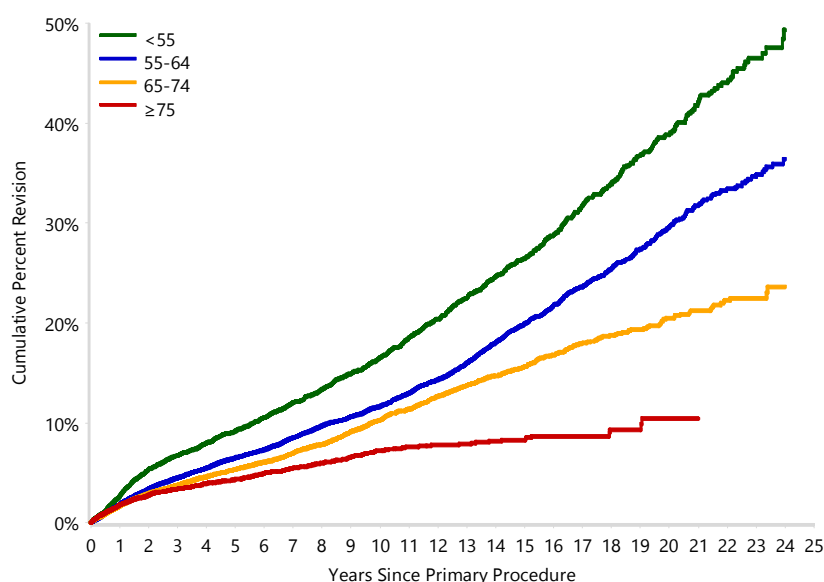
Primary Partial Knee Replacement

Table KP21 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	1225	7001	2.7 (2.3, 3.1)	6.7 (6.2, 7.4)	9.2 (8.5, 9.9)	16.5 (15.5, 17.7)	26.4 (24.9, 28.0)	38.8 (36.5, 41.3)
55-64	2236	17602	1.8 (1.6, 2.0)	4.5 (4.2, 4.8)	6.5 (6.1, 6.9)	11.6 (11.1, 12.2)	19.9 (19.0, 20.8)	29.6 (28.2, 31.1)
65-74	1666	18918	1.6 (1.5, 1.8)	3.8 (3.5, 4.1)	5.3 (5.0, 5.7)	10.3 (9.7, 10.8)	15.6 (14.8, 16.5)	20.5 (19.2, 21.8)
≥75	532	10599	1.8 (1.5, 2.0)	3.4 (3.0, 3.8)	4.3 (3.9, 4.8)	7.2 (6.6, 7.9)	8.3 (7.5, 9.1)	10.4 (8.6, 12.6)
TOTAL	5659	54120						

Note: Restricted to modern prostheses

Figure KP19 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Age (Primary Diagnosis OA)



HR - adjusted for sex

<55 vs ≥75

0 - 6Mth: HR=1.21 (95% CI 0.92, 1.60), p=0.174
 6Mth - 1Yr: HR=1.84 (95% CI 1.42, 2.38), p<0.001
 1Yr - 9Yr: HR=2.60 (95% CI 2.27, 2.97), p<0.001
 9Yr - 10Yr: HR=3.13 (95% CI 2.20, 4.45), p<0.001
 10Yr - 14Yr: HR=9.01 (95% CI 5.55, 14.61), p<0.001
 14Yr+: HR=12.15 (95% CI 6.00, 24.63), p<0.001

55-64 vs ≥75

0 - 6Mth: HR=0.95 (95% CI 0.75, 1.19), p=0.632
 6Mth - 1Yr: HR=1.13 (95% CI 0.89, 1.43), p=0.306
 1Yr - 2Yr: HR=1.64 (95% CI 1.37, 1.97), p<0.001
 2Yr - 6Yr: HR=1.85 (95% CI 1.60, 2.15), p<0.001
 6Yr - 10Yr: HR=1.96 (95% CI 1.64, 2.33), p<0.001
 10Yr - 14Yr: HR=6.59 (95% CI 4.11, 10.58), p<0.001
 14Yr+: HR=8.68 (95% CI 4.31, 17.47), p<0.001

65-74 vs ≥75

0 - 1Yr: HR=0.92 (95% CI 0.77, 1.11), p=0.397
 1Yr - 7Yr: HR=1.44 (95% CI 1.26, 1.64), p<0.001
 7Yr - 10Yr: HR=1.98 (95% CI 1.62, 2.42), p<0.001
 10Yr - 14Yr: HR=4.69 (95% CI 2.90, 7.58), p<0.001
 14Yr+: HR=4.08 (95% CI 2.00, 8.31), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	7001	6412	5261	4298	2380	1170	375
55-64	17602	16185	13548	11195	6536	3281	993
65-74	18918	17317	14304	11535	5933	2629	670
≥75	10599	9480	7482	5709	2426	749	116

Note: Restricted to modern prostheses



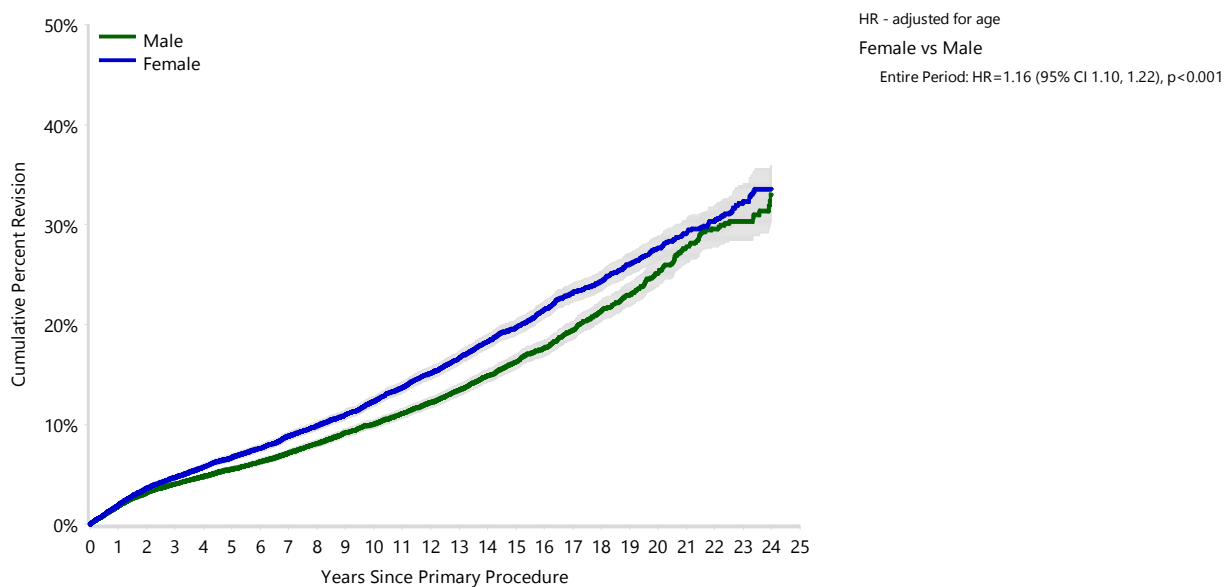
Primary Partial Knee Replacement

Table KP22 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Sex and Age (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		2740	30621	1.8 (1.7, 2.0)	4.0 (3.8, 4.3)	5.5 (5.2, 5.8)	10.0 (9.6, 10.5)	16.2 (15.5, 17.0)	25.1 (23.8, 26.5)
	<55	532	3425	2.8 (2.3, 3.4)	6.4 (5.6, 7.3)	8.4 (7.4, 9.5)	15.9 (14.4, 17.6)	26.1 (23.7, 28.7)	39.6 (35.8, 43.7)
	55-64	1126	10084	1.8 (1.6, 2.1)	4.2 (3.8, 4.7)	6.0 (5.5, 6.6)	11.1 (10.3, 11.9)	18.5 (17.3, 19.8)	28.6 (26.6, 30.7)
	65-74	822	11059	1.5 (1.3, 1.8)	3.6 (3.2, 3.9)	4.9 (4.5, 5.4)	8.8 (8.2, 9.6)	13.5 (12.5, 14.6)	18.9 (17.1, 20.9)
	≥75	260	6053	1.6 (1.3, 2.0)	3.3 (2.8, 3.8)	3.9 (3.4, 4.5)	6.2 (5.4, 7.1)	7.3 (6.2, 8.5)	
Female		2919	23499	1.9 (1.8, 2.1)	4.7 (4.4, 5.0)	6.7 (6.3, 7.0)	12.3 (11.8, 12.8)	19.7 (18.9, 20.5)	27.6 (26.4, 28.9)
	<55	693	3576	2.6 (2.1, 3.2)	7.1 (6.3, 8.0)	9.9 (8.9, 11.0)	17.1 (15.6, 18.6)	26.7 (24.7, 28.8)	38.5 (35.6, 41.6)
	55-64	1110	7518	1.8 (1.5, 2.2)	4.8 (4.4, 5.4)	7.1 (6.5, 7.7)	12.3 (11.5, 13.2)	21.4 (20.1, 22.8)	30.7 (28.8, 32.8)
	65-74	844	7859	1.8 (1.5, 2.1)	4.1 (3.6, 4.5)	5.8 (5.3, 6.4)	12.0 (11.1, 13.0)	18.1 (16.9, 19.5)	22.5 (20.8, 24.4)
	≥75	272	4546	1.9 (1.6, 2.4)	3.6 (3.1, 4.2)	4.8 (4.2, 5.6)	8.3 (7.3, 9.4)	9.4 (8.3, 10.7)	11.5 (9.3, 14.4)
TOTAL		5659	54120						

Note: Restricted to modern prostheses

Figure KP20 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Sex (Primary Diagnosis OA)

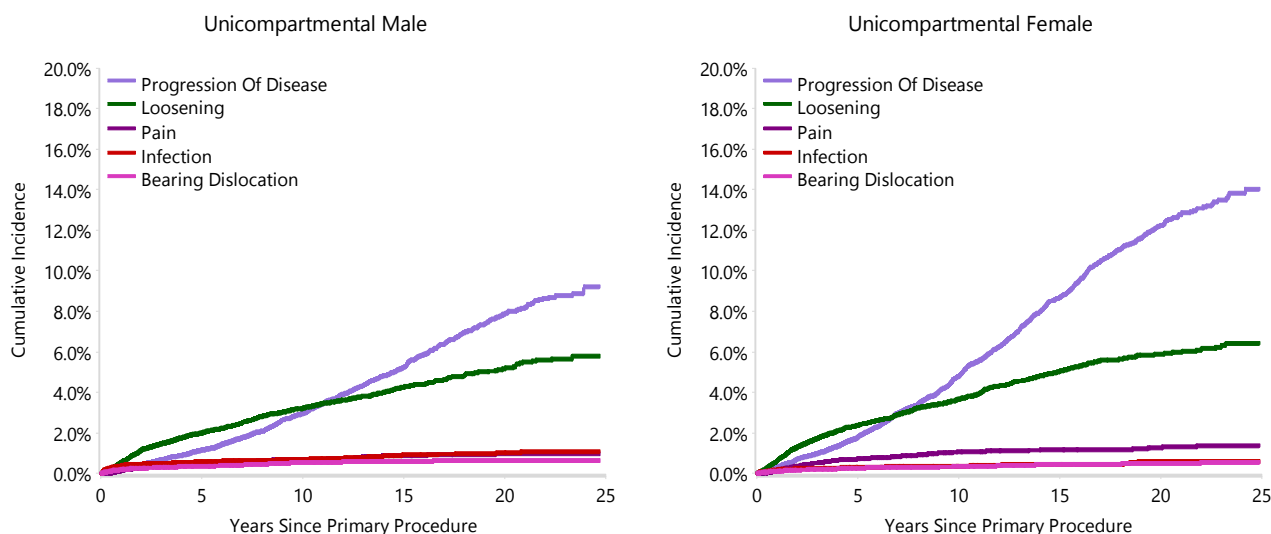


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	30621	27747	22364	17642	8807	3749	942
Female	23499	21647	18231	15095	8468	4080	1212

Note: Restricted to modern prostheses

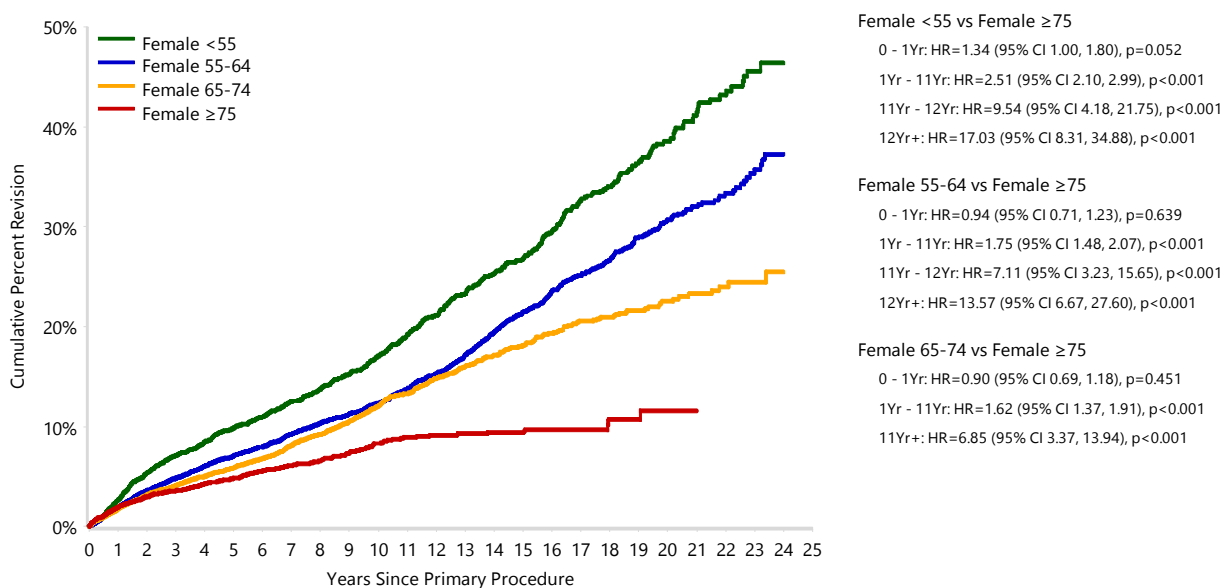
Primary Partial Knee Replacement

Figure KP21 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure KP22 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Females by Age (Primary Diagnosis OA)



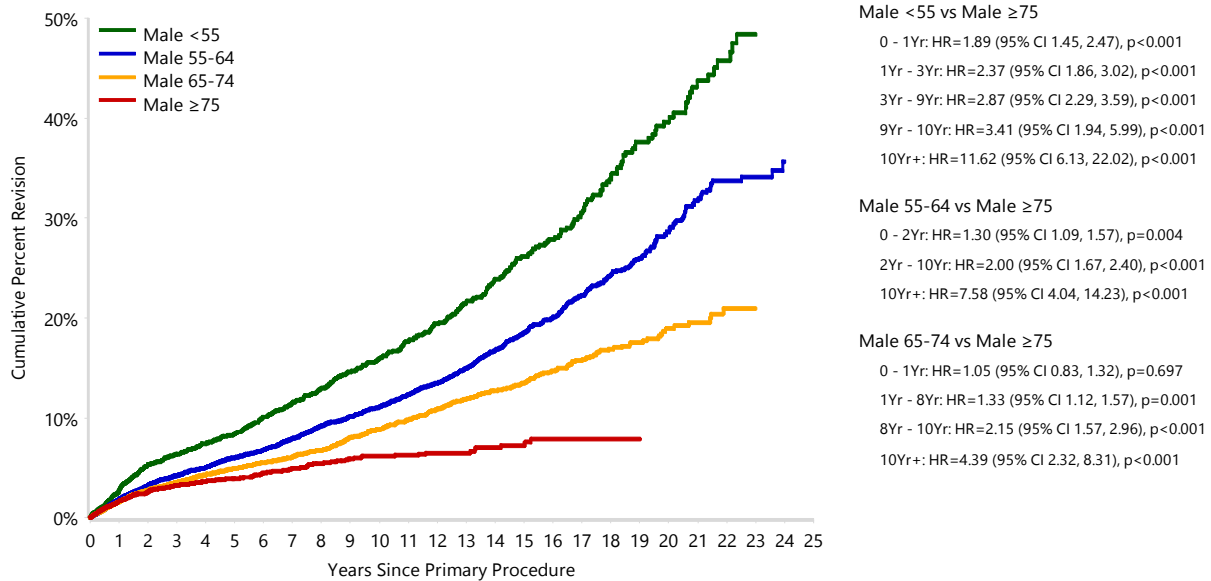
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	<55	3576	3312	2751	2346	1375	710	239
	55-64	7518	7011	6004	5081	3151	1656	529
	65-74	7859	7231	6116	5021	2701	1284	367
	≥75	4546	4093	3360	2647	1241	430	77

Note: Restricted to modern prostheses



Primary Partial Knee Replacement

Figure KP23 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement for Males by Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<55	3425	3100	2510	1952	1005	460	136
	55-64	10084	9174	7544	6114	3385	1625	464
	65-74	11059	10086	8188	6514	3232	1345	303
	≥75	6053	5387	4122	3062	1185	319	39

Note: Restricted to modern prostheses

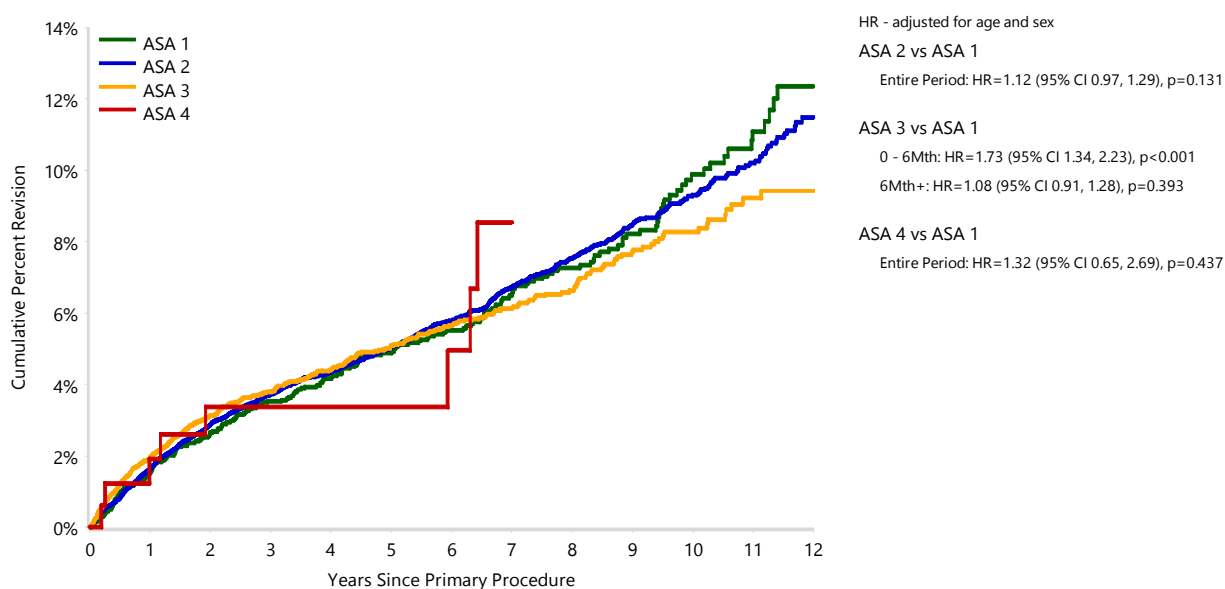
Primary Partial Knee Replacement

Table KP23 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	12 Yrs
ASA 1	226	3620	1.5 (1.2, 2.0)	3.5 (3.0, 4.2)	4.9 (4.2, 5.7)	6.5 (5.6, 7.5)	9.9 (8.5, 11.5)	12.4 (10.4, 14.7)
ASA 2	1204	21939	1.6 (1.5, 1.8)	3.7 (3.5, 4.0)	5.0 (4.7, 5.4)	6.7 (6.3, 7.2)	9.3 (8.7, 9.9)	11.5 (10.6, 12.5)
ASA 3	501	10450	2.0 (1.7, 2.3)	3.8 (3.4, 4.2)	5.1 (4.6, 5.6)	6.1 (5.6, 6.8)	8.3 (7.4, 9.2)	9.4 (8.3, 10.7)
ASA 4	8	166	1.9 (0.6, 5.8)	3.4 (1.4, 7.9)	3.4 (1.4, 7.9)	8.5 (4.0, 17.7)		
TOTAL	1939	36175						

Note: Restricted to modern prostheses
Excludes 17,945 procedures with unknown ASA score

Figure KP24 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)



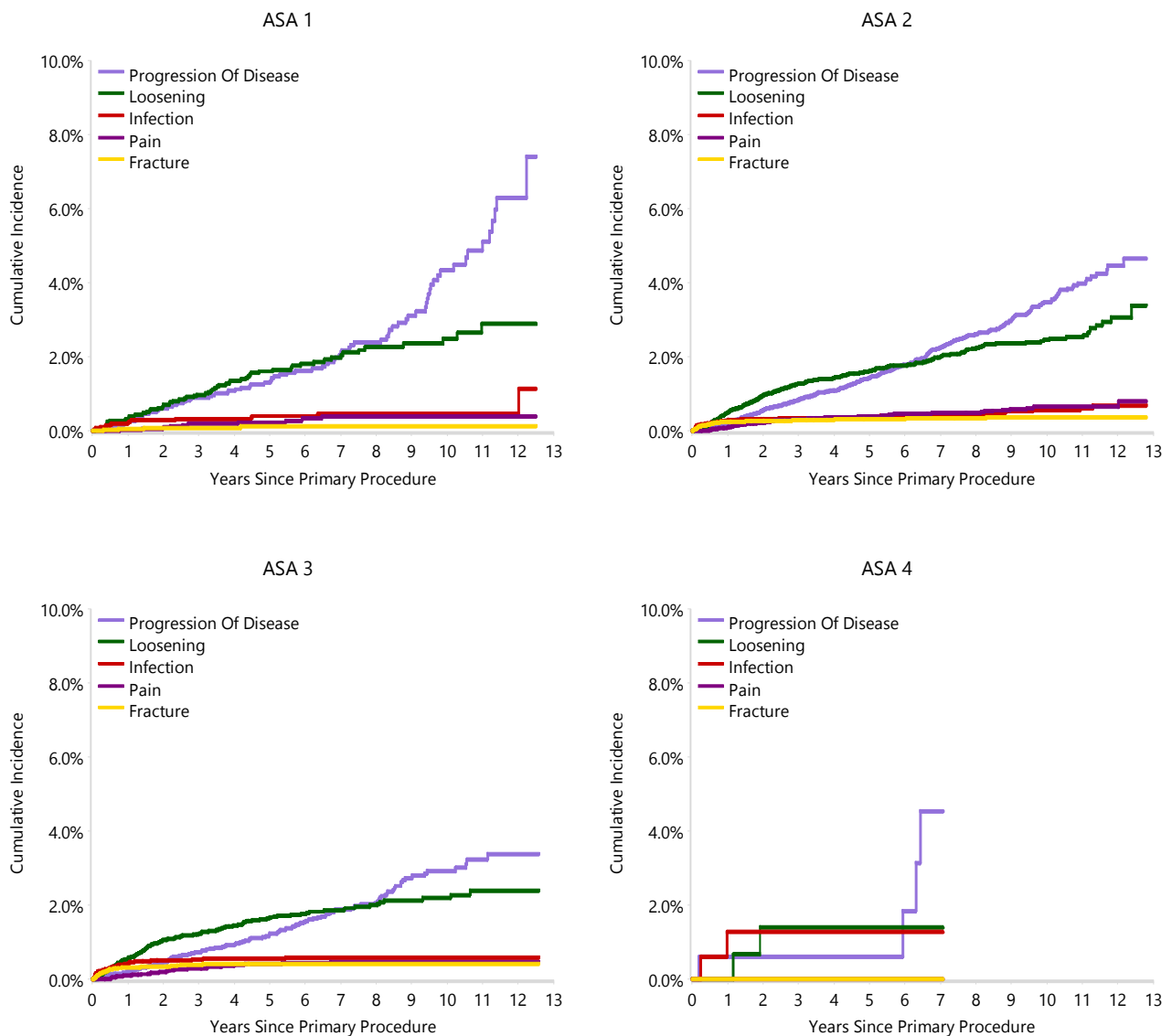
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	12 Yrs
ASA 1	3620	3336	2734	2056	1427	603	122
ASA 2	21939	19423	14743	10522	6704	2524	516
ASA 3	10450	9010	6398	4271	2533	854	192
ASA 4	166	144	110	75	43	14	3

Note: Restricted to modern prostheses
Excludes 17,945 procedures with unknown ASA score



Primary Partial Knee Replacement

Figure KP25 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by ASA Score (Primary Diagnosis OA)



Note: Excludes 17,945 procedures with unknown ASA score.
Restricted to modern prostheses.

Primary Partial Knee Replacement

Table KP24 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by BMI Category (Primary Diagnosis OA)

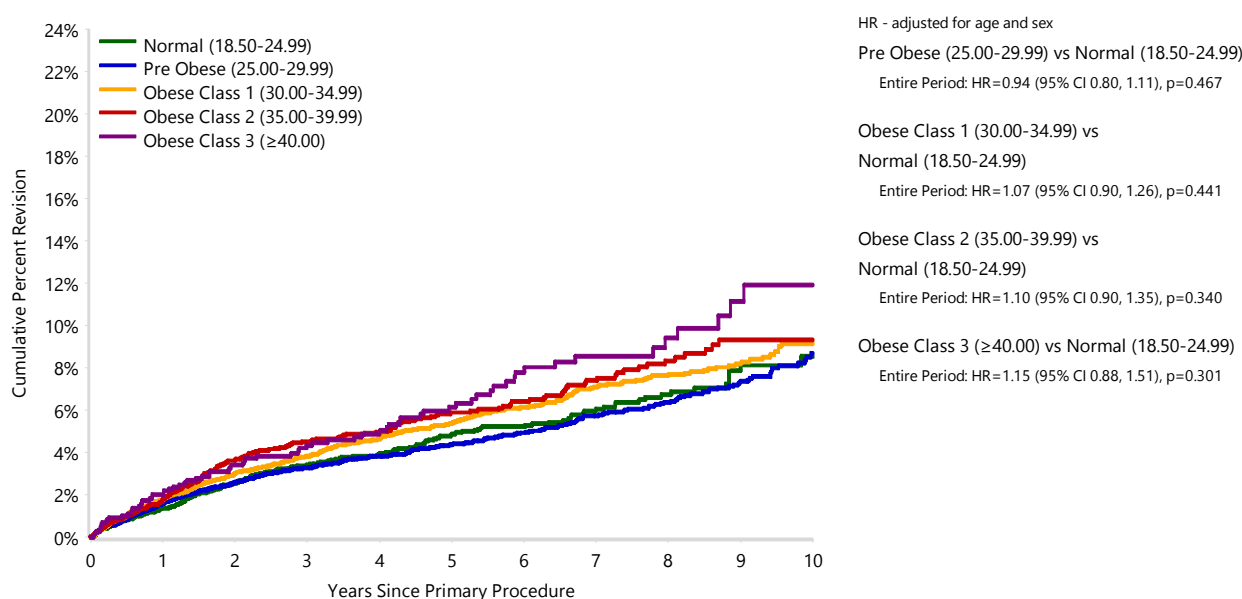
BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Underweight (<18.5)	3	54	1.9 (0.3, 12.6)	4.4 (1.1, 16.7)	4.4 (1.1, 16.7)	4.4 (1.1, 16.7)	
Normal (18.5-24.9)	200	4648	1.4 (1.1, 1.8)	3.4 (2.9, 4.0)	4.8 (4.2, 5.6)	6.1 (5.2, 7.1)	8.1 (6.8, 9.7)
Pre Obese (25.0-29.9)	563	13175	1.6 (1.4, 1.8)	3.3 (3.0, 3.6)	4.4 (4.0, 4.8)	5.8 (5.2, 6.3)	7.4 (6.6, 8.1)
Obese Class 1 (30.0-34.9)	504	9874	1.8 (1.5, 2.1)	3.8 (3.4, 4.3)	5.4 (4.9, 5.9)	7.1 (6.4, 7.8)	8.2 (7.4, 9.1)
Obese Class 2 (35.0-39.9)	188	3450	1.8 (1.4, 2.3)	4.5 (3.8, 5.3)	5.9 (5.0, 6.9)	7.4 (6.3, 8.6)	9.3 (7.9, 11.0)
Obese Class 3 (≥40.0)	74	1188	2.0 (1.3, 3.0)	4.3 (3.2, 5.8)	6.2 (4.7, 8.0)	8.6 (6.7, 10.9)	11.2 (8.4, 14.7)
TOTAL	1532	32389					

Note: Restricted to modern prostheses

Excludes 21,731 procedures with unknown BMI

BMI has not been presented for patients aged ≤19 years

Figure KP26 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by BMI Category (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Normal (18.5-24.9)	4648	4023	2869	1853	956	396
Pre Obese (25.0-29.9)	13175	11484	8348	5553	3122	1263
Obese Class 1 (30.0-34.9)	9874	8640	6332	4204	2369	984
Obese Class 2 (35.0-39.9)	3450	3006	2158	1447	815	347
Obese Class 3 (≥40.0)	1188	1050	754	520	308	120

Note: Restricted to modern prostheses

Excludes 21,731 procedures with unknown BMI

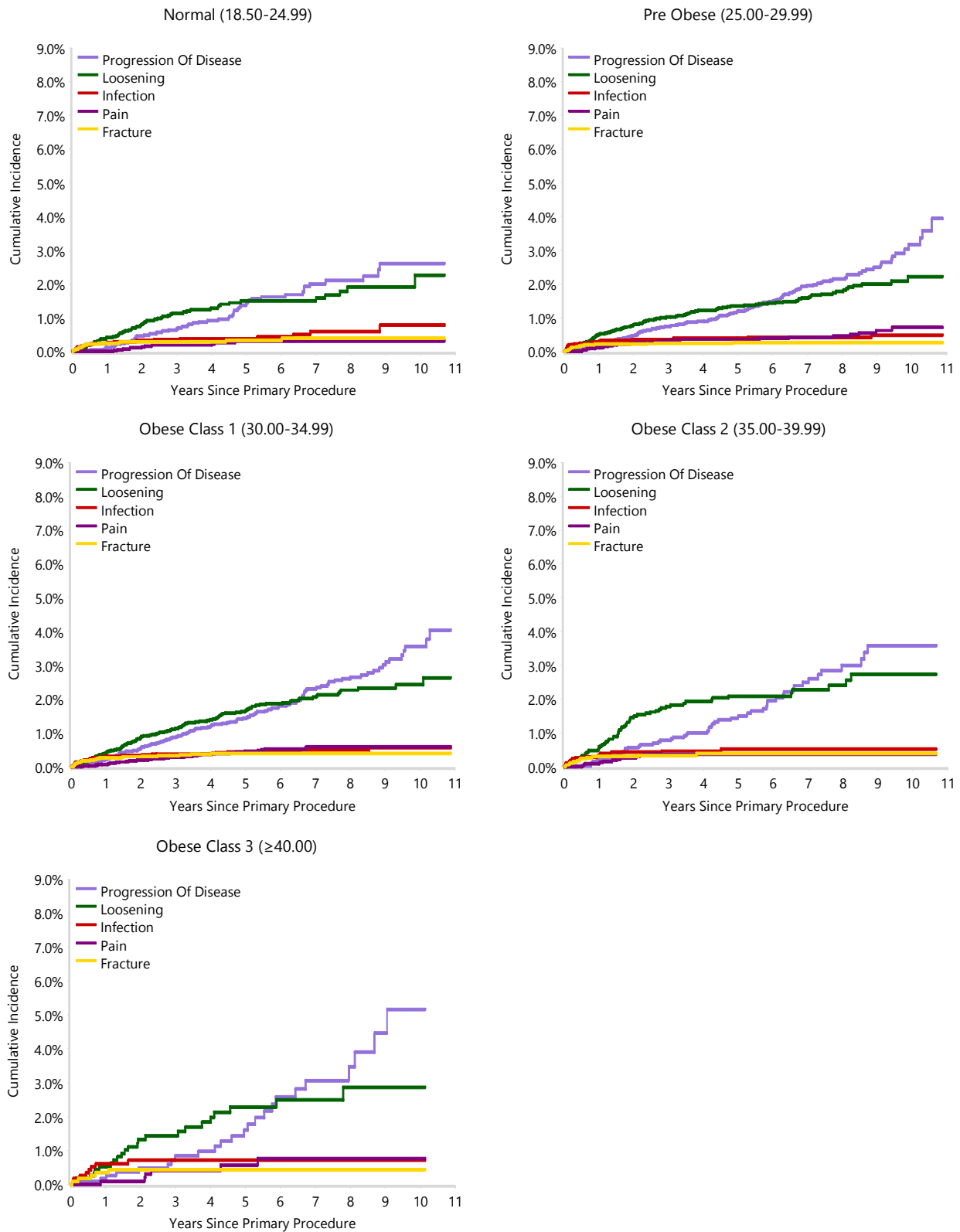
BMI has not been presented for patients aged ≤19 years

Underweight BMI category excluded due to low numbers



Primary Partial Knee Replacement

Figure KP27 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement by BMI Category (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Excludes 21,731 procedures with unknown BMI.

BMI has not been presented for patients aged ≤19 years

Primary Partial Knee Replacement

OUTCOME BY PROSTHESIS CHARACTERISTICS

Bearing Mobility

Fixed bearings have been used in 53.1% of unicompartmental knee replacements, while in the remainder the bearing insert is mobile.

There are two prostheses using mobile bearings in 2025. Fixed bearing prostheses have a lower rate of revision compared to mobile bearing prostheses (Table KP25 and Figure KP28).

Bearing Surface

XLPE is used for 29.3% of unicompartmental procedures. When compared to XLPE, procedures using non XLPE have a higher rate of revision (Table KP26 and Figure KP29).

Fixation

Cemented fixation is used for 76.9% of unicompartmental knee replacements, cementless fixation for 21.5%, with hybrid fixation used rarely. In 2025, there are 2 prostheses used with cementless fixation. The effect of fixation varies with time, but in general there is little difference. In the first 6 months, cemented fixation has a lower rate of revision, but after 1.5 years cementless fixation has a lower rate of revision, then after 11.5 years cemented fixation again has the lower rate of revision (Table KP27 and Figure KP30).

Surgeon Assistive Tools

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. Computer navigation and IDI are rarely used for unicompartmental knee replacement.

There are 9,552 robotically assisted unicompartmental knee replacement procedures undertaken for osteoarthritis recorded since 2015. In 2025, 57.0% of unicompartmental knee procedures use robotic assistance.

When adjusted for age, sex, ASA, BMI, surgeon volume and mobility, unicompartmental knee procedures using robotic

assistance have a lower rate of revision compared to unicompartmental procedures using traditional instrumentation after 3.5 years (Table KP28 and Figure KP31).

The most common reasons for revision with and without robotic assistance are shown in Table KP29 and Figure KP32.

There are only two unicompartmental combinations that can be used both with and without robotic assistance. The results of these combinations are shown in Table KP30, Figure KP33 and Figure KP34.

Position

There are 1,241 lateral unicompartmental knee procedures undertaken for osteoarthritis. For the first 3 months, lateral unicompartmental knee replacement has a higher rate of revision compared to medial unicompartmental knee replacement, but after 3 months, there is no difference (Table KP31 and Figure KP35). When lateral unicompartmental knee replacement is assessed for bearing mobility, fixed bearing prostheses have a lower rate of revision compared to mobile bearings (Table KP32 and Figure KP36).

The most common reasons for revision of both lateral and medial unicompartmental knees are progression of disease and loosening (Table KP33 and Figure KP37).

The results of prosthesis combinations used for lateral unicompartmental knee replacement are shown in Table KP34.



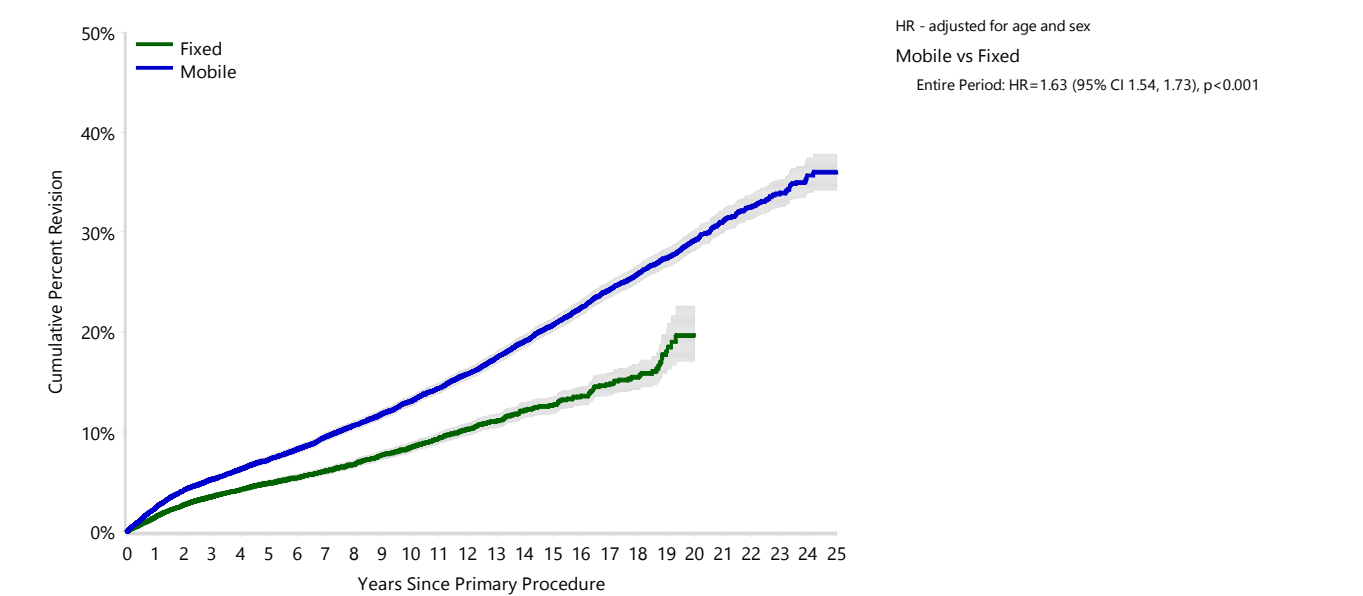
Primary Partial Knee Replacement

Table KP25 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Mobility (Primary Diagnosis OA)

Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	1643	28754	1.4 (1.3, 1.6)	3.5 (3.3, 3.7)	4.8 (4.5, 5.1)	8.4 (7.9, 8.9)	12.6 (11.8, 13.4)	19.6 (17.1, 22.6)
Mobile	4015	25361	2.3 (2.2, 2.5)	5.2 (4.9, 5.5)	7.2 (6.9, 7.5)	13.0 (12.6, 13.5)	20.6 (20.0, 21.3)	29.1 (28.2, 30.1)
TOTAL	5658	54115						

Note: Excludes 5 primary unicompartmental knee procedures with unknown/missing mobility
Restricted to modern prostheses

Figure KP28 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	28754	25361	19149	13838	5484	1780	44
Mobile	25361	24031	21445	18899	11791	6049	2110

Note: Restricted to modern prostheses

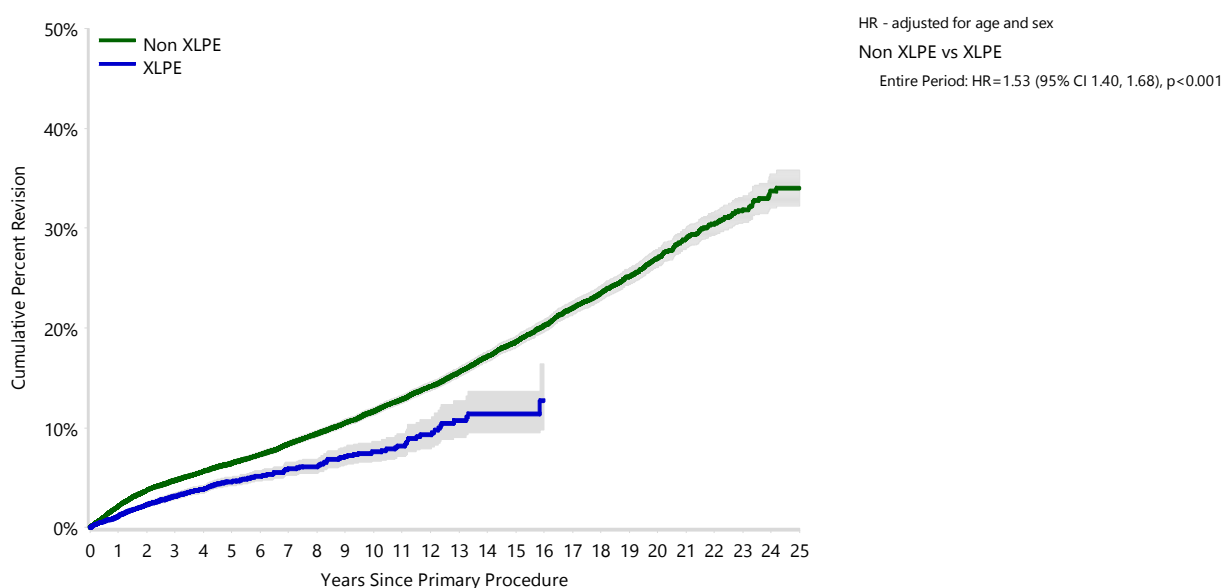
Primary Partial Knee Replacement

Table KP26 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	4974	37014	2.1 (2.0, 2.3)	4.7 (4.5, 5.0)	6.4 (6.2, 6.7)	11.6 (11.3, 12.0)	18.6 (18.0, 19.1)	27.0 (26.1, 27.9)
XLPE	514	15330	1.1 (1.0, 1.3)	3.1 (2.8, 3.5)	4.6 (4.2, 5.1)	7.6 (6.6, 8.6)	11.4 (9.5, 13.6)	
TOTAL	5488	52344						

Note: Excludes 1,776 primary unicompartmental knee procedures with unknown/missing polyethylene type
Restricted to modern prostheses

Figure KP29 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	37014	35220	31817	28360	15973	7453	2154
XLPE	15330	12575	7424	3302	719	117	0

Note: Restricted to modern prostheses



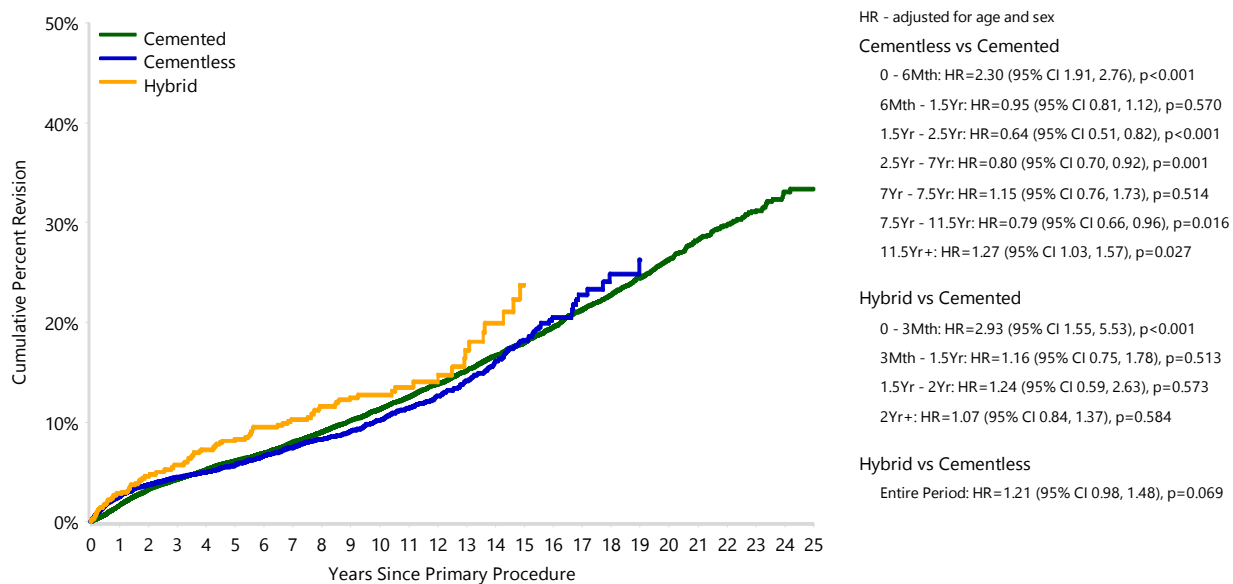
Primary Partial Knee Replacement

Table KP27 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	4609	41631	1.7 (1.5, 1.8)	4.3 (4.1, 4.5)	6.1 (5.8, 6.3)	11.3 (10.9, 11.7)	17.9 (17.4, 18.5)	26.2 (25.3, 27.2)
Cementless	948	11624	2.5 (2.3, 2.8)	4.4 (4.1, 4.9)	5.7 (5.3, 6.2)	10.2 (9.5, 10.9)	18.2 (16.6, 20.0)	
Hybrid	102	865	2.8 (1.9, 4.2)	5.7 (4.3, 7.5)	8.3 (6.5, 10.5)	12.7 (10.4, 15.5)	23.7 (18.0, 30.9)	
TOTAL	5659	54120						

Note: Restricted to modern prostheses

Figure KP30 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	41631	37987	31136	25195	14349	7258	2126
Cementless	11624	10612	8773	6941	2666	517	22
Hybrid	865	795	686	601	260	54	6

Note: Restricted to modern prostheses

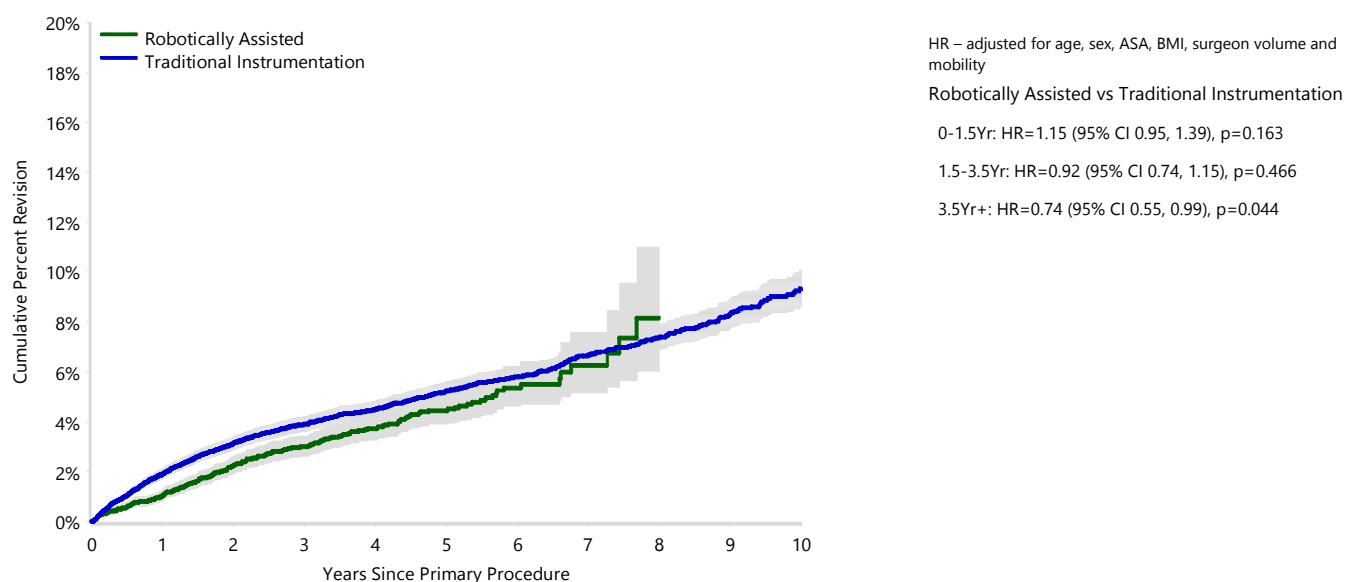
Primary Partial Knee Replacement

Table KP28 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement Since 2015 (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Robotically Assisted	276	9552	1.0 (0.8, 1.3)	2.2 (1.9, 2.6)	3.0 (2.6, 3.4)	3.7 (3.3, 4.2)	4.4 (3.9, 5.1)	5.4 (4.6, 6.2)	6.3 (5.2, 7.6)
Traditional Instrumentation	1045	18865	1.9 (1.7, 2.1)	3.1 (2.9, 3.4)	3.9 (3.6, 4.2)	4.5 (4.2, 4.8)	5.2 (4.9, 5.6)	5.8 (5.4, 6.2)	6.7 (6.2, 7.1)
TOTAL	1321	28417							

Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, surgeon volume and mobility

Figure KP31 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Robotically Assisted	9552	7601	5728	4200	2857	1647	758	229
Traditional Instrumentation	18865	17070	15295	13545	11783	9922	8113	6031

Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, surgeon volume and mobility



Primary Partial Knee Replacement

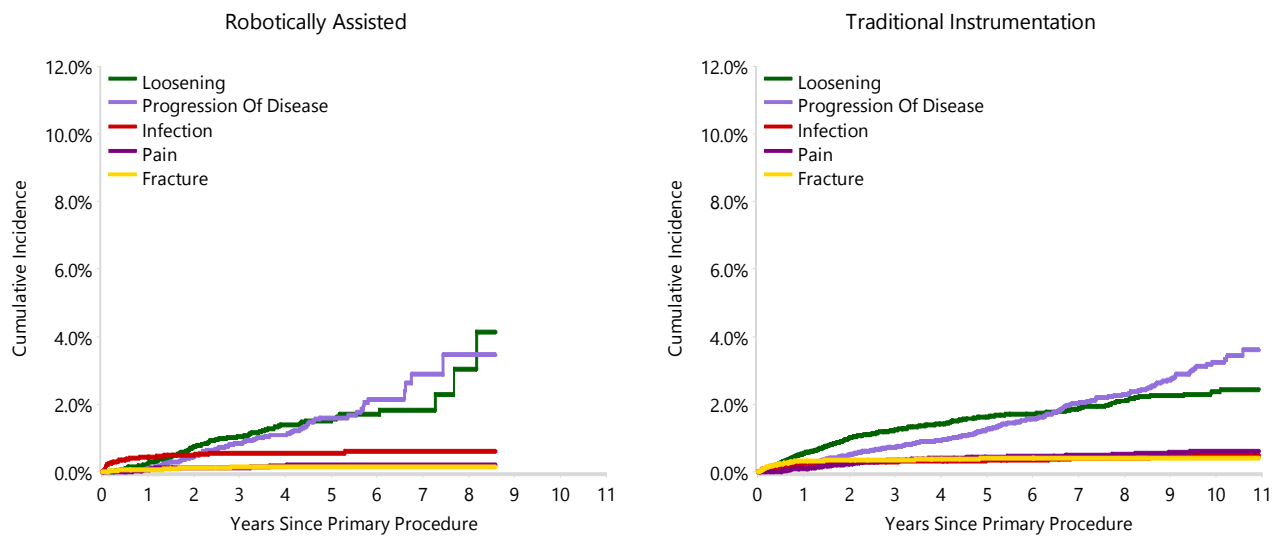
Table KP29 Revision Diagnosis of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)

Revision Diagnosis	Robotically Assisted			Traditional Instrumentation		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Loosening	93	1.0	33.7	305	1.6	29.2
Progression Of Disease	85	0.9	30.8	302	1.6	28.9
Bearing Dislocation				80	0.4	7.7
Pain	13	0.1	4.7	79	0.4	7.6
Fracture	11	0.1	4.0	72	0.4	6.9
Infection	48	0.5	17.4	68	0.4	6.5
Instability	4	0.0	1.4	46	0.2	4.4
Malalignment	8	0.1	2.9	25	0.1	2.4
Lysis	4	0.0	1.4	10	0.1	1.0
Prosthesis Dislocation				8	0.0	0.8
Incorrect Sizing				7	0.0	0.7
Wear Tibial Insert				7	0.0	0.7
Patellofemoral Pain				6	0.0	0.6
Implant Breakage Tibial Insert	1	0.0	0.4	5	0.0	0.5
Metal Related Pathology	1	0.0	0.4	3	0.0	0.3
Osteonecrosis	2	0.0	0.7	3	0.0	0.3
Synovitis				3	0.0	0.3
Arthrofibrosis	2	0.0	0.7	2	0.0	0.2
Implant Breakage Tibial	2	0.0	0.7	2	0.0	0.2
Patella Erosion				1	0.0	0.1
Other	2	0.0	0.7	11	0.1	1.1
N Revision	276	2.9	100.0	1045	5.5	100.0
N Primary	9552			18865		

Note: Restricted to modern prostheses

Primary Partial Knee Replacement

Figure KP32 Cumulative Incidence Revision Diagnosis of Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



Note: Restricted to modern prostheses

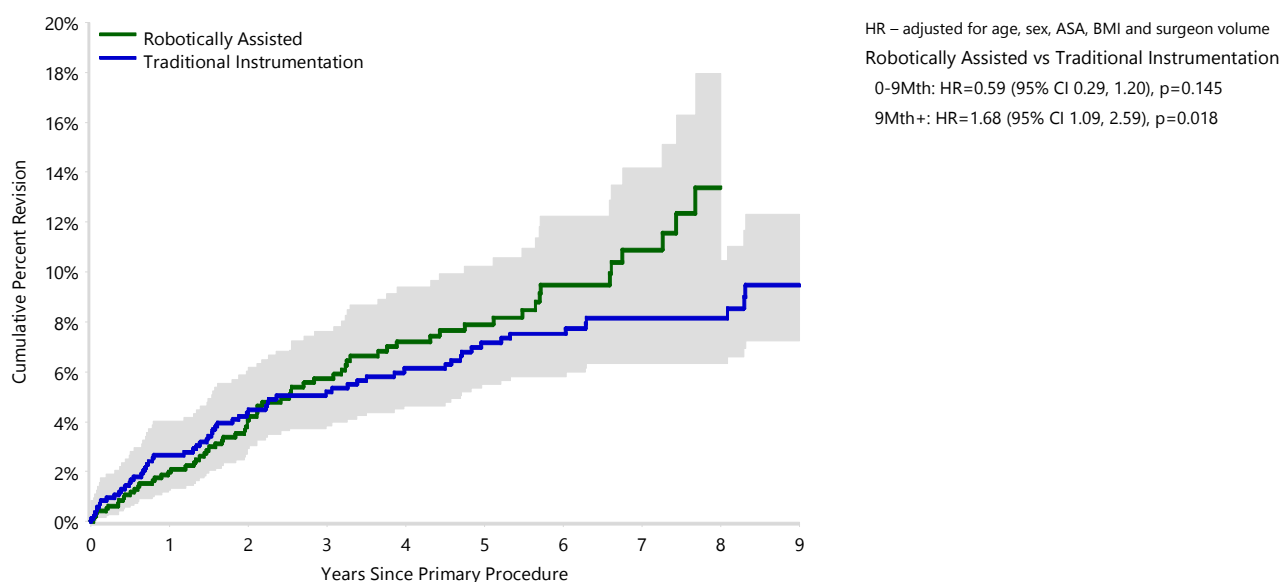
Primary Partial Knee Replacement

Table KP30 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement Since 2015 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Robotic Assistance	N Revised	N Total	1 Yr	2 Yrs	4 Yrs	6 Yrs	7 Yrs	8 Yrs
Journey Uni/ Journey Uni	Robotically Assisted	68	964	2.0 (1.3, 3.1)	4.1 (2.9, 5.7)	7.2 (5.5, 9.4)	9.5 (7.3, 12.2)	10.9 (8.3, 14.2)	13.4 (9.9, 18.0)
	Traditional Instrumentation	62	844	2.7 (1.8, 4.0)	4.4 (3.1, 6.0)	6.1 (4.6, 8.1)	7.5 (5.8, 9.7)	8.1 (6.3, 10.5)	8.1 (6.3, 10.5)
Persona/ Persona	Robotically Assisted	5	235	1.9 (0.6, 5.8)	3.6 (1.5, 8.7)				
	Traditional Instrumentation	66	2216	1.6 (1.1, 2.2)	2.9 (2.2, 3.8)	4.3 (3.3, 5.6)			
TOTAL		201	4259						

Note: Restricted to modern prostheses

Figure KP33 Cumulative Percent Revision of Journey Uni/Journey Uni Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)

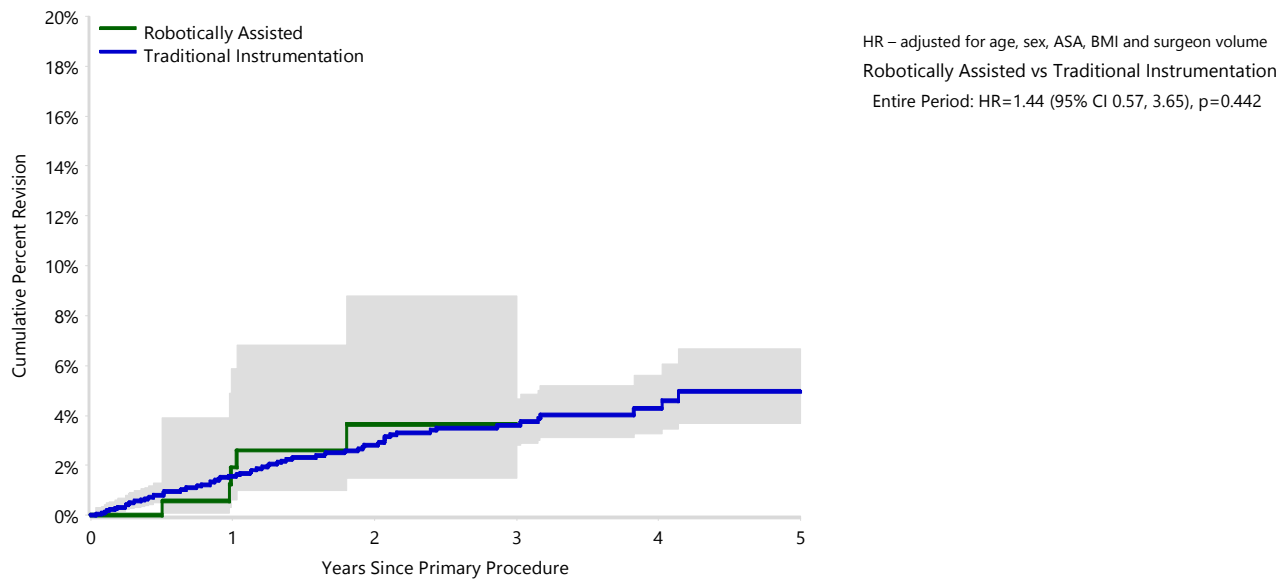


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs
Robotically Assisted	964	820	548	358	159	73	25	0
Traditional Instrumentation	844	775	638	520	364	239	133	33

Note: Restricted to modern prostheses

Primary Partial Knee Replacement

Figure KP34 Cumulative Percent Revision of Persona/Persona Primary Unicompartmental Knee Replacement Since 2015 by Robotic Assistance (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Robotically Assisted	231	144	84	53	38	1
Traditional Instrumentation	2195	1696	1220	766	319	42

Note: Restricted to modern prostheses



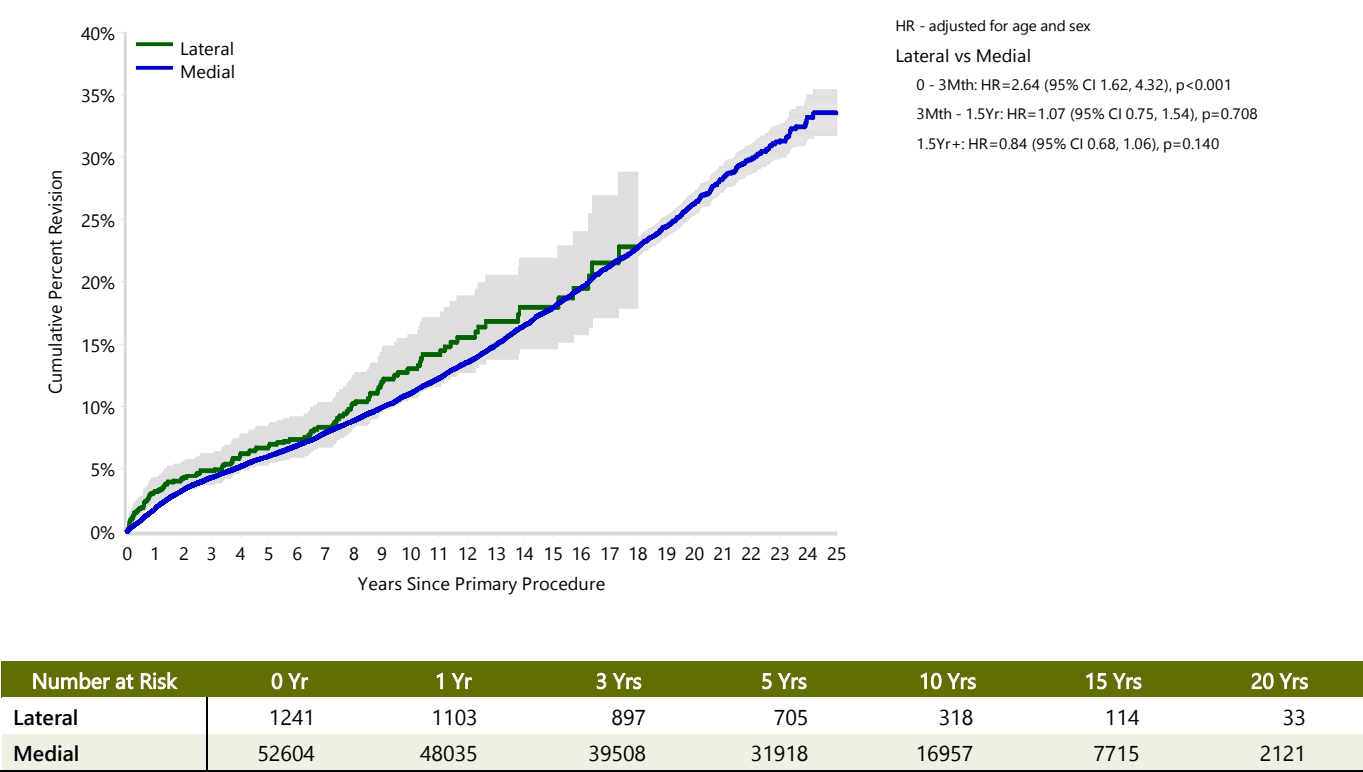
Primary Partial Knee Replacement

Table KP31 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Position (Primary Diagnosis OA)

Position	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Lateral	125	1241	3.2 (2.3, 4.3)	4.9 (3.8, 6.3)	6.8 (5.5, 8.5)	13.0 (10.7, 15.8)	18.0 (14.7, 21.9)	
Medial	5525	52604	1.8 (1.7, 2.0)	4.3 (4.1, 4.5)	6.0 (5.8, 6.3)	11.1 (10.7, 11.4)	17.9 (17.4, 18.4)	26.3 (25.4, 27.2)
TOTAL	5650	53845						

Note: Restricted to modern prostheses
Excludes 275 primary unicompartmental knee procedures with unknown/missing position

Figure KP35 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Position (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Partial Knee Replacement

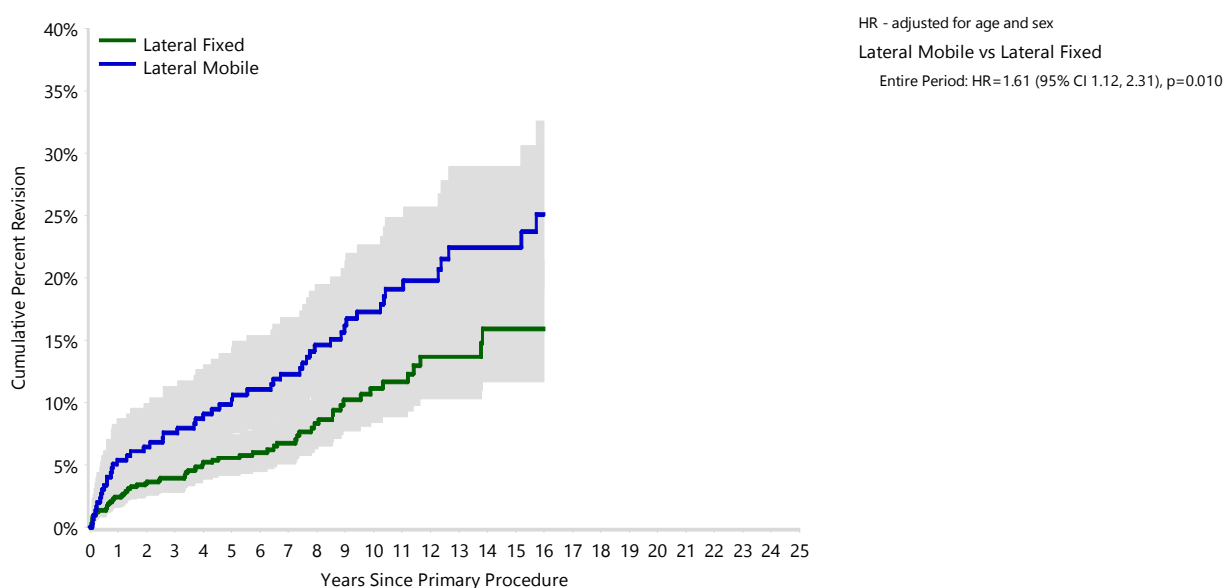
Table KP32 Cumulative Percent Revision of Lateral Primary Unicompartamental Knee Replacement by Mobility (Primary Diagnosis OA)

Position	Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Lateral	Fixed	70	941	2.4 (1.6, 3.7)	3.9 (2.8, 5.5)	5.6 (4.2, 7.5)	11.1 (8.5, 14.6)	15.9 (11.7, 21.4)
	Mobile	55	298	5.4 (3.4, 8.7)	7.6 (5.0, 11.3)	10.3 (7.2, 14.4)	17.3 (13.1, 22.6)	22.4 (17.2, 28.9)
TOTAL		125	1239					

Note: Restricted to modern prostheses

Excludes 280 primary unicompartamental knee procedures with unknown/missing position or mobility

Figure KP36 Cumulative Percent Revision of Lateral Primary Unicompartamental Knee Replacement by Mobility (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Lateral	Fixed	941	826	650	477	181	51	2
	Mobile	298	275	246	228	137	63	31

Note: Restricted to modern prostheses

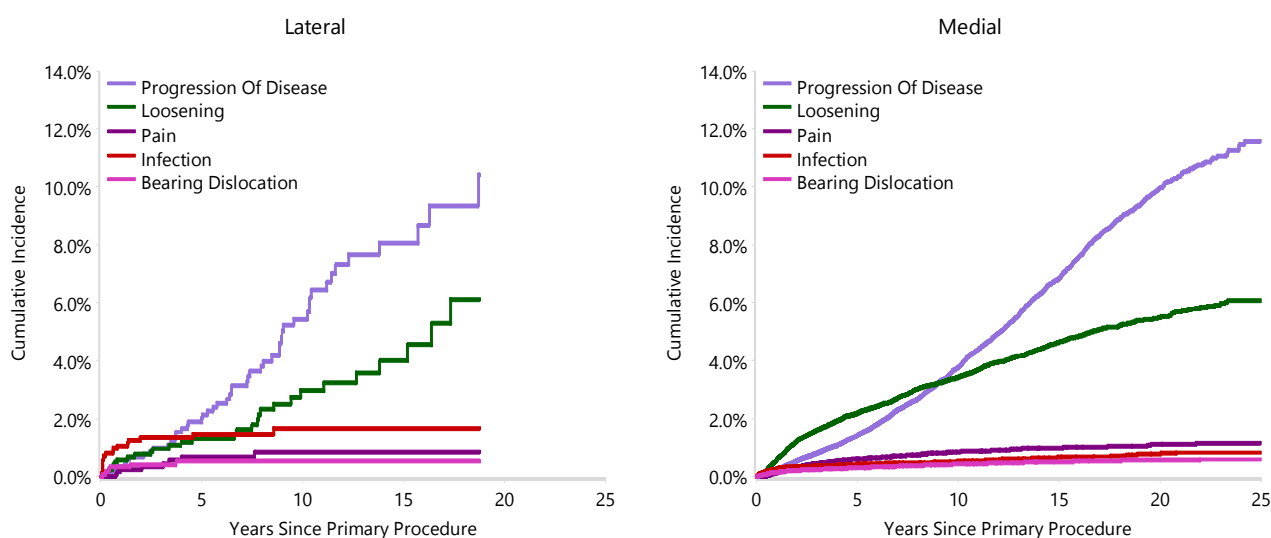
Primary Partial Knee Replacement

Table KP33 Reason for Revision of Primary Unicompartamental Knee Replacement by Position (Primary Diagnosis OA)

Revision Diagnosis	Number	Lateral		Number	Medial	
		% Primaries Revised	% Revisions		% Primaries Revised	% Revisions
Progression Of Disease	52	4.2	41.6	2144	4.1	38.8
Loosening	29	2.3	23.2	1659	3.2	30.0
Pain	8	0.6	6.4	381	0.7	6.9
Infection	18	1.5	14.4	273	0.5	4.9
Bearing Dislocation	6	0.5	4.8	202	0.4	3.7
Fracture	2	0.2	1.6	170	0.3	3.1
Instability	3	0.2	2.4	117	0.2	2.1
Lysis	1	0.1	0.8	107	0.2	1.9
Wear Tibial Insert	1	0.1	0.8	94	0.2	1.7
Malalignment	3	0.2	2.4	72	0.1	1.3
Other	2	0.2	1.6	306	0.6	5.5
N Revision	125	10.1	100.0	5525	10.5	100.0
N Primary	1241			52604		

Note: Restricted to modern prostheses

Figure KP37 Cumulative Incidence Revision Diagnosis of Primary Unicompartamental Knee Replacement by Position (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Partial Knee Replacement

Table KP34 Cumulative Percent Revision of Lateral Primary Unicompartmental Knee Replacement by Prosthesis Combination (Primary Diagnosis OA)

Uni Femoral	Uni Tibial	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
BalanSys Uni	BalanSys Uni Fixed	4	62	0.0 (0.0, 0.0)	1.6 (0.2, 11.1)	1.6 (0.2, 11.1)	4.0 (1.0, 15.3)	4.0 (1.0, 15.3)	11.4 (3.0, 38.2)
Journey Uni	Journey Uni (v2)	6	62	10.2 (4.7, 21.2)	10.2 (4.7, 21.2)	10.2 (4.7, 21.2)	10.2 (4.7, 21.2)	10.2 (4.7, 21.2)	
Oxford (cless)	Oxford (ctd)	10	105	3.9 (1.5, 10.1)	5.1 (2.1, 11.8)	5.1 (2.1, 11.8)	6.4 (2.9, 13.7)		
Oxford (ctd)	Oxford (ctd)	44	176	6.8 (3.9, 11.7)	9.7 (6.2, 15.2)	13.9 (9.6, 20.1)	15.8 (11.1, 22.3)	20.9 (15.3, 28.1)	26.6 (20.0, 34.8)
Restoris MCK	Restoris MCK	7	272	1.9 (0.8, 4.6)	2.9 (1.4, 6.0)	2.9 (1.4, 6.0)			
Sigma HP	Sigma HP	9	78	2.6 (0.7, 10.2)	5.4 (2.1, 13.8)	8.6 (3.9, 18.2)	11.1 (5.3, 22.3)	11.1 (5.3, 22.3)	
ZUK	ZUK	38	388	1.8 (0.9, 3.8)	3.5 (2.1, 6.0)	5.9 (3.8, 9.0)	6.7 (4.4, 10.1)	13.4 (9.6, 18.7)	
Other (9)		7	98	2.2 (0.6, 8.5)	3.4 (1.1, 10.3)	4.9 (1.8, 12.6)	8.7 (3.9, 18.9)	8.7 (3.9, 18.9)	
TOTAL		125	1241						

Note: Restricted to modern prostheses

Only prostheses with over 50 procedures have been listed

* denotes prosthesis combinations with no recorded use in unicompartmental knee replacement in 2025



Primary Total Knee Replacement

Class of Total Knee Replacement

Total knee replacement is defined as a replacement of the entire femorotibial articulation using a single femoral and a single tibial prosthesis. This may or may not be combined with a patella resurfacing replacement.

In this report, the outcome of total knee replacement based on specific patient, prosthesis and technique factors is shown. In addition, the outcome for different types of total knee prostheses is presented.

Most total knee systems have a variety of individual prostheses within the system that vary based on distinguishing prosthesis characteristics. Where possible, knee systems are subdivided into the specific prosthesis types. The initial characteristic used is fixation. Further subdivision is based on stability and bearing mobility. However, subdivision is not uniformly applied to all knee systems and is dependent on the number of procedures reported for each system.

DEMOGRAPHICS

There are 1,098,939 primary total knee replacement procedures recorded. This is an additional 72,004 procedures compared to the last report.

For further information on the **closure of the database** please see the **Glossary** of this report.

In 2025, there is an increase of 1.1% in primary total knee replacement procedures when compared to 2024. As a proportion of all knee replacement procedures, primary total knee replacement increased to 88.2% in 2025.

Osteoarthritis is the most common diagnosis for primary total knee replacement.

Primary total knee replacement remains more common in females (55.7%). This proportion has shown little change from 2003. The mean age of patients is 68.5 years (Table KT1 and Figure KT1).

Figure KT1 Primary Total Knee Replacement by Sex

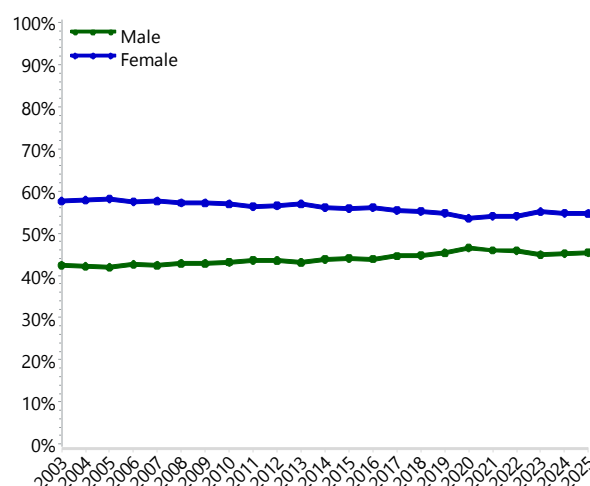


Table KT1 Age and Sex of Primary Total Knee Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	486643	44.3%	8	101	68	68.2	9.0
Female	612296	55.7%	8	107	69	68.8	9.3
TOTAL	1098939	100.0%	8	107	69	68.5	9.1

There are 1,098,939 primary total knee replacement procedures. This is an increase of 72,004 procedures compared to the last report.

Primary Total Knee Replacement

There has been little change in the proportion of patients in different age groups undergoing primary total knee replacement. The proportion of patients aged <55 years remains small (Figure KT2).

Detailed demographic information on shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

Patella resurfacing at the time of the primary total knee replacement has increased to 81.8% in 2025 (Figure KT3).

The most common method of fixation is cemented fixation for both femoral and tibial components. This accounts for 55.7% of procedures in 2025. The use of cementless fixation decreased to 9.8% of all primary total knee replacement in 2018 but has increased to 23.4% in 2025 (Figure KT4). Hybrid fixation for primary total knee replacement (femoral cementless) was used in 20.9% of procedures in 2025.

Cruciate retaining (CR) and posterior stabilised (PS) prostheses are reported separately for the majority of total knee prostheses. This reporting is based on the design of the femoral component. In 2025, the most commonly used femoral prostheses are the Triathlon CR, Persona CR, and GMK Sphere Primary (Table KT2).

The most used cemented and cementless femoral components are listed in Table KT3 and Table KT4, respectively. The most used tibial components in 2025 are the Persona, Triathlon and Triathlon/Tritanium (Table KT5). The most used tibial prostheses are also reported based on fixation in Table KT6 and Table KT7.

Figure KT2 Primary Total Knee Replacement by Age

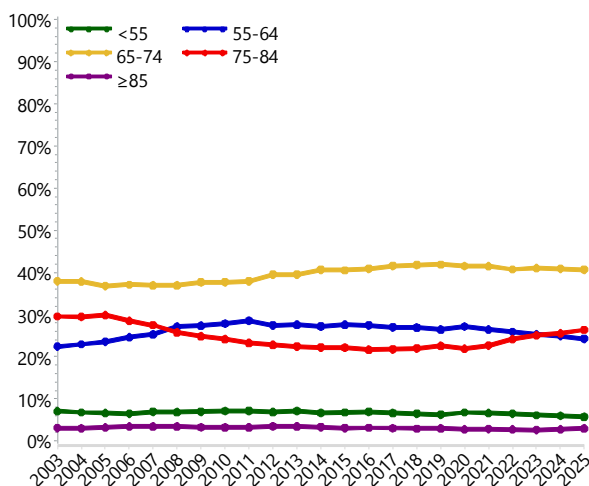


Figure KT4 Primary Total Knee Replacement by Fixation

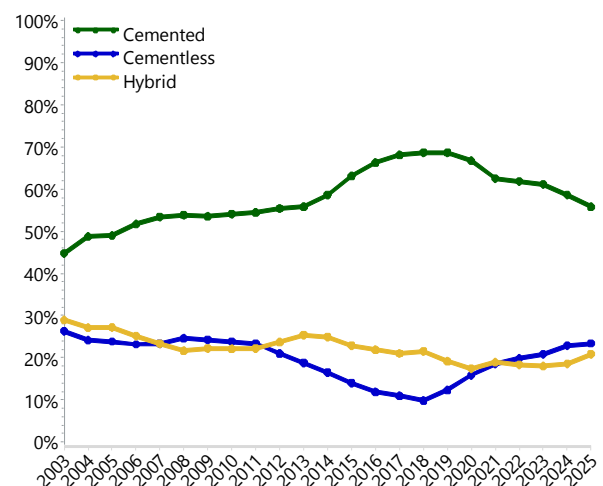
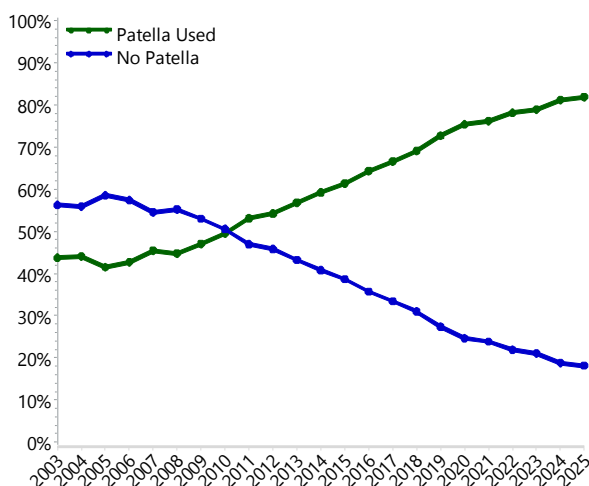


Figure KT3 Primary Total Knee Replacement by Patella Component Usage





Primary Total Knee Replacement

Table KT2 10 Most Used Femoral Prostheses in Primary Total Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3183	LCS CR	17078	Triathlon CR	22614	Triathlon CR	23524	Triathlon CR	23933	Triathlon CR
2846	Duracon	13108	Persona CR	16708	Persona CR	17155	Persona CR	17871	Persona CR
2150	Nexgen CR	4375	Attune CR	5208	Attune CR	5249	Attune CR	5947	GMK Sphere Primary
1419	PFC Sigma CR	3755	GMK Sphere Primary	4845	GMK Sphere Primary	5129	GMK Sphere Primary	5296	Attune CR
1354	Scorpio CR	2056	Attune PS	2365	Attune PS	2193	Attune PS	2492	Journey II Oxinium
1058	Genesis II CR	1521	Apex Knee CR	1699	Apex Knee CR	1723	Apex Knee CR	1881	Attune PS
1002	Natural Knee II	1250	Legion Oxinium CR	1468	Legion Oxinium CR	1720	Journey II Oxinium	1646	Apex Knee CR
902	Nexgen LPS	1121	Legion Oxinium PS	1328	Evolution	1331	Legion Oxinium CR	1132	Legion Oxinium CR
883	Profix	1080	Columbus	1253	Journey II Oxinium	1146	Legion Oxinium PS	953	Legion Oxinium PS
751	Scorpio PS	1061	Evolution	1205	Legion Oxinium PS	1077	Columbus	936	Persona PS
10 Most Used									
15548 (10)	71.5%	46405 (10)	81.1%	58693 (10)	84.1%	60247 (10)	85.4%	62087 (10)	87.1%
Remainder									
6185 (47)	28.5%	10808 (66)	18.9%	11062 (61)	15.9%	10261 (56)	14.6%	9231 (56)	12.9%
TOTAL									
21733 (57)	100.0%	57213 (76)	100.0%	69755 (71)	100.0%	70508 (66)	100.0%	71318 (66)	100.0%

Table KT3 10 Most Used Cemented Femoral Prostheses in Primary Total Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1222	Duracon	7169	Triathlon CR	9545	Triathlon CR	8970	Triathlon CR	8890	Triathlon CR
942	LCS CR	6766	Persona CR	8373	Persona CR	8350	Persona CR	8742	Persona CR
827	Nexgen LPS	3755	GMK Sphere Primary	4845	GMK Sphere Primary	4944	GMK Sphere Primary	4178	GMK Sphere Primary
765	Nexgen CR	2305	Attune CR	2512	Attune CR	2563	Attune CR	2657	Attune CR
693	Nexgen LPS Flex	1927	Attune PS	2220	Attune PS	2043	Attune PS	2492	Journey II Oxinium
645	Genesis II CR	1250	Legion Oxinium CR	1468	Legion Oxinium CR	1720	Journey II Oxinium	1406	Attune PS
515	PFC Sigma PS	1121	Legion Oxinium PS	1307	Evolution	1331	Legion Oxinium CR	1132	Legion Oxinium CR
497	Profix	1080	Columbus	1253	Journey II Oxinium	1146	Legion Oxinium PS	953	Legion Oxinium PS
479	Genesis II Oxinium CR	1020	Evolution	1205	Legion Oxinium PS	1077	Columbus	936	Persona PS
419	Genesis II PS	869	Apex Knee CR	1084	Columbus	983	Apex Knee CR	853	Apex Knee CR
10 Most Used									
7004 (10)	71.6%	27262 (10)	75.9%	33812 (10)	78.7%	33127 (10)	79.4%	32239 (10)	80.6%
Remainder									
2778 (38)	28.4%	8640 (61)	24.1%	9159 (58)	21.3%	8580 (54)	20.6%	7738 (55)	19.4%
TOTAL									
9782 (48)	100.0%	35902 (71)	100.0%	42971 (68)	100.0%	41707 (64)	100.0%	39977 (65)	100.0%



Primary Total Knee Replacement

Table KT4 10 Most Used Cementless Femoral Prostheses in Primary Total Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
2241	LCS CR	9909	Triathlon CR	13069	Triathlon CR	14554	Triathlon CR	15043	Triathlon CR
1624	Duracon	6342	Persona CR	8335	Persona CR	8805	Persona CR	9129	Persona CR
1385	Nexgen CR	2070	Attune CR	2696	Attune CR	2686	Attune CR	2639	Attune CR
1075	PFC Sigma CR	652	Apex Knee CR	775	Apex Knee CR	740	Apex Knee CR	1769	GMK Sphere Primary
1059	Scorpio CR	498	Legion CR	503	Legion CR	445	Legion CR	793	Apex Knee CR
746	Natural Knee II	294	GMK Primary	320	GMK Primary	310	GMK Primary	475	Attune PS
633	Active Knee	281	Nexgen CR Flex	180	ACS	240	Anatomic	388	Legion CR
425	Maxim	205	Genesis II CR	176	Triathlon PS	185	GMK Sphere Primary	242	Anatomic
413	Genesis II CR	184	Triathlon PS	168	Anatomic	162	Triathlon PS	215	GMK Primary
386	Profix	142	BalanSys	145	Attune PS	150	Attune PS	169	Triathlon PS
10 Most Used									
9987 (10) 83.6%		20577 (10) 96.6%		26367 (10) 98.4%		28277 (10) 98.2%		30862 (10) 98.5%	
Remainder									
1964 (28) 16.4%		734 (26) 3.4%		417 (18) 1.6%		524 (12) 1.8%		479 (14) 1.5%	
TOTAL									
11951 (38) 100.0%		21311 (36) 100.0%		26784 (28) 100.0%		28801 (22) 100.0%		31341 (24) 100.0%	

Table KT5 10 Most Used Tibial Components in Primary Total Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3755	Nexgen	13831	Persona	17719	Persona	18146	Persona	18872	Persona
2843	Duracon	11191	Triathlon	14293	Triathlon	13449	Triathlon	13228	Triathlon
2039	Genesis II	6632	Triathlon/Tritanium	9186	Triathlon/Tritanium	10848	Triathlon/Tritanium	11505	Triathlon/Tritanium
1364	MBT	6519	Attune	7647	Attune	7534	Attune	7259	Attune
1362	LCS	5256	Genesis II	5674	Genesis II	5029	GMK Primary	5681	GMK Primary
1360	Series 7000	3642	GMK Primary	4692	GMK Primary	4917	Genesis II	3978	Genesis II
1168	PFC Sigma	2110	Apex Knee	2502	Apex Knee	2402	Apex Knee	2492	Journey
1060	MBT Duofix	1080	Columbus	1299	Evolution	1719	Journey	2238	Apex Knee
1002	Natural Knee II	1029	Evolution	1253	Journey	1077	Columbus	826	Evolution
894	Profix	793	Journey	1084	Columbus	1021	Evolution	805	Columbus
10 Most Used									
16847 (10) 77.5%		52083 (10) 91.0%		65349 (10) 93.7%		66142 (10) 93.8%		66884 (10) 93.8%	
Remainder									
4886 (38) 22.5%		5130 (46) 9.0%		4406 (46) 6.3%		4366 (40) 6.2%		4434 (40) 6.2%	
TOTAL									
21733 (48) 100.0%		57213 (56) 100.0%		69755 (56) 100.0%		70508 (50) 100.0%		71318 (50) 100.0%	



Primary Total Knee Replacement

Table KT6 10 Most Used Cemented Tibial Components in Primary Total Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
3010	Nexgen	11156	Persona	14298	Persona	14928	Persona	15580	Persona
2348	Duracon	10830	Triathlon	13983	Triathlon	13137	Triathlon	12970	Triathlon
1992	Genesis II	5255	Genesis II	5673	Genesis II	5432	Attune	5538	GMK Primary
1168	PFC Sigma	4644	Attune	5667	Attune	4917	Genesis II	5273	Attune
1067	MBT	3426	GMK Primary	4459	GMK Primary	4818	GMK Primary	3978	Genesis II
1033	LCS	2062	Apex Knee	2495	Apex Knee	2400	Apex Knee	2492	Journey
1007	Series 7000	1080	Columbus	1299	Evolution	1719	Journey	2227	Apex Knee
719	Profix	1029	Evolution	1253	Journey	1077	Columbus	826	Evolution
587	AGC	793	Journey	1084	Columbus	1021	Evolution	805	Columbus
478	Natural Knee II	673	Nexgen	651	SAIPH	716	SAIPH	678	GMK Sphere Primary
10 Most Used									
13409 (10) 84.9%		40948 (10) 91.3%		50862 (10) 93.7%		50165 (10) 93.7%		50367 (10) 93.5%	
Remainder									
2382 (31) 15.1%		3916 (42) 8.7%		3444 (41) 6.3%		3400 (38) 6.3%		3513 (38) 6.5%	
TOTAL									
15791 (41) 100.0%		44864 (52) 100.0%		54306 (51) 100.0%		53565 (48) 100.0%		53880 (48) 100.0%	

Table KT7 10 Most Used Cementless Tibial Components in Primary Total Knee Replacement

2003		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
1060	MBT Duofix	6632	Triathlon/Tritanium	9186	Triathlon/Tritanium	10848	Triathlon/Tritanium	11505	Triathlon/Tritanium
745	Nexgen	2675	Persona	3421	Persona	3218	Persona	3292	Persona
524	Natural Knee II	1875	Attune	1980	Attune	2102	Attune	1986	Attune
495	Duracon	361	Triathlon	310	Triathlon	312	Triathlon	258	Triathlon
487	Active Knee	216	GMK Primary	233	GMK Primary	211	GMK Primary	143	GMK Primary
353	Series 7000	126	Nexgen TM CR	129	ACS Fixed	97	ACS Fixed	109	Score
329	LCS	96	Legion	93	Legion	91	Legion	107	Legion
305	RBK	90	Score	72	Score	60	Score	21	ACS Fixed
297	MBT	78	ACS Fixed	8	Nexgen TM CR	2	Apex Knee	11	Apex Knee
242	Profix Mobile	76	Nexgen	7	Apex Knee	1	LCS	5	LCS
10 Most Used									
4837 (10) 81.4%		12225 (10) 99.0%		15439 (10) 99.9%		16942 (10) 100.0%		17437 (10) 100.0%	
Remainder									
1105 (18) 18.6%		124 (11) 1.0%		10 (8) 0.1%		1 (1) 0.0%		1 (1) 0.0%	
TOTAL									
5942 (28) 100.0%		12349 (21) 100.0%		15449 (18) 100.0%		16943 (11) 100.0%		17438 (11) 100.0%	

Primary Total Knee Replacement

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

Usage and availability of knee prostheses change with time. In order to keep data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified. This has resulted in 307,509 (28.0%) procedures being excluded from the analysis for this year's Annual Report. The most common primary diagnosis for total knee replacement is osteoarthritis. Comparisons of revision rates for other primary diagnoses compared to osteoarthritis are shown in Table KT8 and Figure KT5.

There are variations in the rate of revision when comparing osteoarthritis to other primary diagnoses.

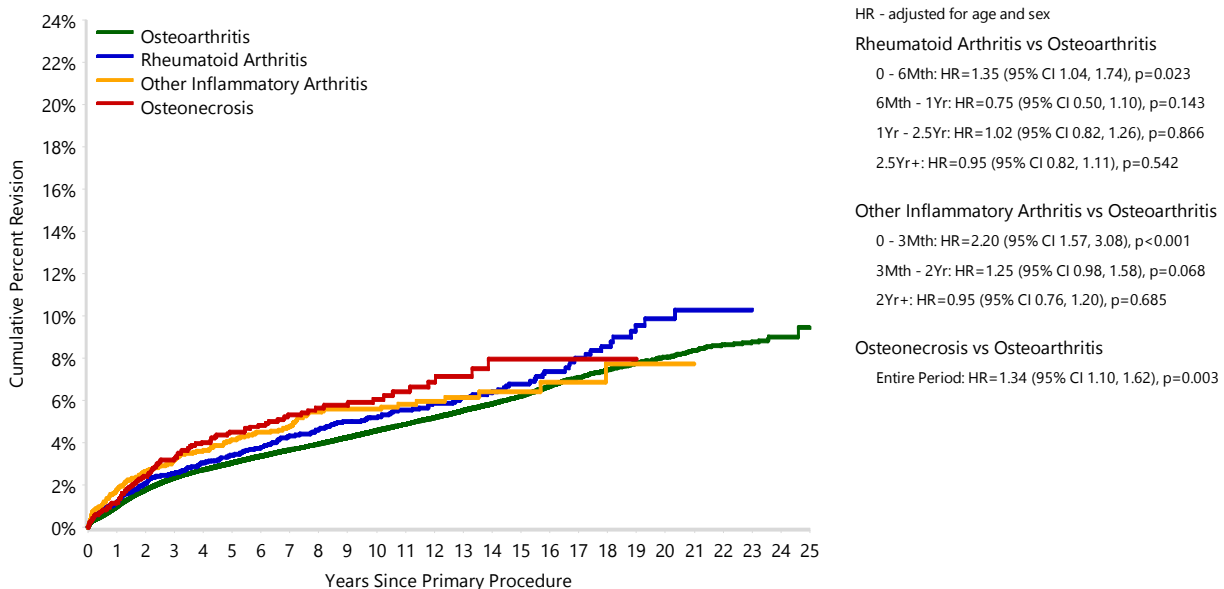
Detailed information on those prostheses that are no longer used is available in the supplementary report 'Comparative Prosthesis Performance' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

Table KT8 Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	26392	775654	1.0 (0.9, 1.0)	2.3 (2.3, 2.4)	3.1 (3.0, 3.1)	4.6 (4.5, 4.6)	6.2 (6.1, 6.3)	8.0 (7.8, 8.2)
Rheumatoid Arthritis	330	7363	1.2 (0.9, 1.4)	2.6 (2.2, 3.0)	3.4 (3.0, 3.9)	5.2 (4.6, 5.9)	6.8 (6.0, 7.7)	9.9 (8.3, 11.8)
Other Inflammatory Arthritis	177	4135	1.8 (1.4, 2.2)	3.2 (2.7, 3.8)	4.1 (3.5, 4.9)	5.6 (4.8, 6.5)	6.4 (5.4, 7.7)	7.7 (5.8, 10.3)
Osteonecrosis	104	2133	1.2 (0.8, 1.8)	3.3 (2.6, 4.2)	4.5 (3.6, 5.6)	6.1 (4.9, 7.4)	8.0 (6.3, 10.1)	
Other (4)	281	2145	4.5 (3.7, 5.5)	9.6 (8.3, 11.1)	13.3 (11.7, 15.2)	20.4 (17.9, 23.1)	29.0 (25.1, 33.3)	
TOTAL	27284	791430						

Note: Restricted to modern prostheses. Only primary diagnoses with >1,500 procedures have been listed. The 'Other' diagnoses include tumour (n=1,111), fracture (n=767) and chondrocalcinosis (n=11). There are 256 procedures with unknown primary diagnoses included as 'Other'

Figure KT5 Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Osteoarthritis	775654	694612	539560	415962	178483	51101	9084
Rheumatoid Arthritis	7363	6801	5610	4603	2384	898	236
Other Inflammatory Arthritis	4135	3646	2885	2217	912	246	57
Osteonecrosis	2133	1961	1606	1251	566	168	30

Note: Restricted to modern prostheses. Only primary diagnoses with >1,500 procedures have been listed



Primary Total Knee Replacement

PROSTHESIS TYPES

Overall, there are 256 femoral and tibial prosthesis combinations that meet the definition of a modern prosthesis in primary total knee replacement.

The cumulative percent revision of the 88 combinations with >400 procedures by fixation are listed in Table KT9 to Table KT11. Although the listed combinations are a small proportion of all possible combinations, they represent 98.9% of all primary total knee replacement procedures. The 'other' group is the combined outcome of the remaining 168 prosthesis combinations with ≤400 procedures per combination.

There are 46 cemented femoral and tibial prosthesis combinations with >400 procedures (Table KT9).

There are 19 cementless femoral and tibial prosthesis combinations with >400 procedures (Table KT10).

There are 23 combinations of primary total knee replacement using hybrid fixation (tibial component cemented) with >400 procedures (Table KT11).

Table KT9 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Prosthesis Combination

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACS	ACS Fixed	33	918	1.8 (1.1, 2.9)	2.8 (1.9, 4.1)	3.3 (2.3, 4.8)	4.3 (3.1, 6.1)		
	ACS Mobile	60	1844	1.2 (0.8, 1.8)	2.1 (1.6, 3.0)	3.3 (2.5, 4.3)	4.2 (3.3, 5.5)		
Active Knee	Active Knee	173	4191	0.8 (0.6, 1.2)	2.6 (2.1, 3.2)	3.5 (3.0, 4.2)	5.2 (4.4, 6.1)	6.7 (5.3, 8.3)	
Anatomic	Anatomic	76	1868	1.4 (0.9, 2.0)	3.5 (2.8, 4.5)	4.3 (3.4, 5.4)			
Apex Knee CR	Apex Knee	142	8568	0.7 (0.5, 0.9)	1.4 (1.1, 1.6)	1.9 (1.6, 2.3)	2.6 (2.1, 3.2)		
Apex Knee PS	Apex Knee	265	8229	0.7 (0.6, 1.0)	2.2 (1.9, 2.5)	3.1 (2.7, 3.6)	5.0 (4.3, 5.7)		
Attune CR	Attune	786	30398	0.9 (0.8, 1.0)	2.0 (1.9, 2.2)	2.6 (2.5, 2.9)	3.8 (3.5, 4.1)		
Attune CRS	Attune	25	418	4.4 (2.8, 7.0)	6.9 (4.7, 10.2)	6.9 (4.7, 10.2)			
Attune PS	Attune	441	17356	0.8 (0.7, 1.0)	2.0 (1.8, 2.3)	2.6 (2.3, 2.8)	4.2 (3.8, 4.8)		
BalanSys	BalanSys	89	2695	0.6 (0.3, 0.9)	1.8 (1.4, 2.5)	2.3 (1.8, 3.0)	3.8 (3.1, 4.7)	4.7 (3.7, 5.9)	
Columbus	Columbus	221	8525	1.0 (0.8, 1.3)	2.2 (1.9, 2.6)	3.1 (2.7, 3.6)	4.5 (3.6, 5.5)	4.5 (3.6, 5.5)	
E.Motion	E.Motion	34	633	1.9 (1.1, 3.3)	3.7 (2.5, 5.5)	3.9 (2.6, 5.7)	6.6 (4.7, 9.3)		
Evolis	Evolis	35	1357	0.4 (0.2, 0.9)	1.0 (0.6, 1.8)	1.6 (1.0, 2.5)	3.3 (2.3, 4.7)	4.0 (2.7, 5.8)	
Evolution	Evolution	415	14042	0.8 (0.7, 1.0)	2.2 (1.9, 2.5)	2.9 (2.6, 3.2)	4.1 (3.7, 4.6)		
GMK Primary	GMK Primary	31	846	1.1 (0.6, 2.1)	2.5 (1.6, 3.8)	3.5 (2.4, 5.1)	4.2 (3.0, 6.0)		
GMK Sphere Primary	GMK Primary	793	29967	1.2 (1.1, 1.3)	2.6 (2.4, 2.8)	3.2 (2.9, 3.4)	4.3 (3.9, 4.8)		
	GMK Sphere Primary	132	4477	0.7 (0.5, 1.0)	2.5 (2.1, 3.1)	3.5 (2.9, 4.2)	4.8 (3.9, 5.8)		
GMRS	MRH	62	442	4.4 (2.8, 6.9)	9.1 (6.5, 12.7)	14.8 (11.2, 19.6)	24.8 (18.8, 32.2)		
Genesis II CR	Genesis II	779	17929	0.9 (0.8, 1.0)	2.2 (2.0, 2.5)	2.9 (2.7, 3.2)	4.4 (4.1, 4.7)	5.4 (5.0, 5.8)	6.6 (6.0, 7.2)
Genesis II Oxinium CR	Genesis II	733	11856	1.1 (0.9, 1.3)	2.7 (2.4, 3.0)	3.5 (3.1, 3.8)	5.9 (5.4, 6.4)	8.2 (7.6, 8.9)	10.8 (9.9, 11.7)
Genesis II Oxinium PS	Genesis II	1685	23645	1.4 (1.3, 1.6)	3.5 (3.3, 3.8)	4.8 (4.5, 5.1)	6.9 (6.6, 7.3)	9.1 (8.7, 9.6)	11.9 (11.1, 12.8)
Genesis II PS	Genesis II	964	20638	1.1 (1.0, 1.3)	2.6 (2.4, 2.8)	3.4 (3.2, 3.7)	4.7 (4.4, 5.0)	5.8 (5.5, 6.3)	7.0 (6.4, 7.7)
Genus	Genus	15	690	1.1 (0.5, 2.3)	3.1 (1.8, 5.3)				
Journey II Oxinium	Journey	75	6459	0.7 (0.5, 1.0)	1.8 (1.4, 2.4)	4.0 (2.3, 7.0)	4.0 (2.3, 7.0)		
LCS CR	LCS	347	3943	1.0 (0.7, 1.4)	3.7 (3.2, 4.4)	5.1 (4.4, 5.8)	7.3 (6.5, 8.2)	9.4 (8.5, 10.5)	10.8 (9.7, 12.0)
	MBT*	704	13326	0.9 (0.7, 1.0)	2.6 (2.4, 2.9)	3.6 (3.3, 3.9)	5.3 (4.9, 5.7)	6.3 (5.8, 6.8)	7.7 (6.9, 8.5)

Primary Total Knee Replacement

Table KT9 **Cont**

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Legion CR	Genesis II	167	5617	1.1 (0.9, 1.4)	2.3 (1.9, 2.7)	3.2 (2.7, 3.7)	4.0 (3.3, 4.8)	5.4 (4.1, 7.2)	
Legion Oxinium CR	Genesis II	421	14041	0.9 (0.7, 1.0)	2.4 (2.1, 2.6)	3.1 (2.8, 3.5)	4.3 (3.8, 4.8)	5.3 (4.6, 6.2)	
Legion Oxinium FS	Legion	41	427	5.2 (3.5, 7.8)	7.9 (5.6, 11.0)	9.4 (6.9, 12.9)	11.7 (8.5, 15.9)		
Legion Oxinium PS	Genesis II	907	20689	1.0 (0.9, 1.2)	2.8 (2.6, 3.1)	3.7 (3.4, 4.0)	5.2 (4.8, 5.5)	7.3 (6.6, 8.1)	
Legion PS	Genesis II	257	6728	1.4 (1.2, 1.7)	2.6 (2.2, 3.0)	3.1 (2.7, 3.6)	4.2 (3.7, 4.8)	5.9 (4.8, 7.1)	
Mutars	Mutars	80	484	7.2 (5.1, 10.0)	16.6 (13.1, 20.8)	22.4 (18.0, 27.7)			
Nexgen LCCK	Nexgen	70	1124	2.1 (1.4, 3.1)	3.7 (2.8, 5.0)	5.0 (3.8, 6.5)	6.2 (4.8, 8.0)	9.1 (6.8, 12.2)	
Nexgen LPS Flex	Nexgen	1535	30442	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	3.1 (2.9, 3.3)	4.9 (4.6, 5.1)	6.4 (6.0, 6.7)	8.0 (7.3, 8.7)
Nexgen RH	Nexgen	59	1046	2.5 (1.7, 3.6)	4.3 (3.2, 5.8)	5.5 (4.1, 7.3)	8.3 (6.3, 10.9)	8.3 (6.3, 10.9)	
ORIGIN	ORIGIN	8	1046	0.6 (0.3, 1.5)					
Persona CR	Persona	813	50265	0.8 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.1, 2.4)	2.6 (2.4, 2.8)		
Persona PS	Persona	190	7678	1.2 (0.9, 1.4)	2.4 (2.0, 2.8)	2.9 (2.5, 3.4)	3.4 (2.9, 4.0)		
SAIPH	SAIPH	143	7476	0.6 (0.4, 0.8)	1.6 (1.3, 1.9)	2.1 (1.7, 2.4)	2.9 (2.3, 3.5)		
Score	Score	63	1651	1.6 (1.1, 2.3)	3.2 (2.4, 4.2)	4.0 (3.1, 5.3)	5.3 (4.1, 6.9)	5.3 (4.1, 6.9)	
Trekking	Trekking	34	436	2.3 (1.2, 4.2)	4.8 (3.1, 7.3)	6.3 (4.4, 9.2)	8.5 (6.1, 11.8)		
Triathlon CR	Triathlon	2353	98083	0.7 (0.7, 0.8)	1.7 (1.7, 1.8)	2.3 (2.2, 2.4)	3.3 (3.2, 3.5)	4.4 (4.2, 4.7)	7.0 (5.8, 8.6)
Triathlon PS	Triathlon	545	12066	1.4 (1.2, 1.6)	2.9 (2.6, 3.2)	3.7 (3.3, 4.0)	5.2 (4.8, 5.7)	6.6 (6.0, 7.3)	
Triathlon TS	Triathlon	38	609	2.5 (1.5, 4.1)	5.3 (3.7, 7.6)	6.4 (4.6, 8.9)	7.8 (5.5, 10.9)		
Unity Knee	Unity Knee	13	1300	0.6 (0.3, 1.3)	0.8 (0.4, 1.5)	1.1 (0.6, 2.0)			
Vanguard CR	Vanguard	569	12384	0.7 (0.6, 0.9)	2.1 (1.9, 2.4)	2.7 (2.4, 3.0)	4.4 (4.0, 4.8)	6.9 (6.3, 7.7)	
Other (82)		297	4533	2.5 (2.1, 3.0)	5.6 (4.8, 6.4)	7.2 (6.3, 8.2)	10.6 (9.3, 12.1)	15.8 (13.0, 19.1)	
TOTAL		17718	513385						

Note: Restricted to modern prostheses

Some cementless components have been cemented

Only combinations with >400 procedures have been listed

* denotes prosthesis combinations that have not had any reported use in primary total knee procedures in 2025



Primary Total Knee Replacement

Table KT10 Cumulative Percent Revision of Cementless Primary Total Knee Replacement by Prosthesis Combination

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACS	ACS Fixed	72	1418	1.4 (0.9, 2.2)	3.9 (3.0, 5.1)	4.5 (3.5, 5.8)	5.8 (4.6, 7.3)		
Active Knee	Active Knee	648	4899	1.3 (1.1, 1.7)	4.0 (3.4, 4.5)	5.6 (5.0, 6.3)	9.6 (8.8, 10.5)	13.2 (12.3, 14.3)	16.4 (15.1, 17.7)
Apex Knee CR	Apex Knee	32	538	2.5 (1.4, 4.2)	5.0 (3.4, 7.2)	5.6 (3.9, 7.9)	6.4 (4.5, 8.9)		
Attune CR	Attune	129	8075	0.9 (0.7, 1.1)	1.9 (1.6, 2.3)	2.3 (1.9, 2.7)			
Attune PS	Attune	13	858	0.8 (0.3, 1.7)	2.2 (1.2, 3.9)	2.2 (1.2, 3.9)			
Columbus	Columbus	72	500	3.2 (2.0, 5.2)	7.7 (5.6, 10.4)	9.7 (7.4, 12.7)	13.1 (10.4, 16.5)	15.6 (12.5, 19.4)	
GMK Primary	GMK Primary	92	2265	1.1 (0.7, 1.6)	2.8 (2.2, 3.7)	3.5 (2.8, 4.4)	6.0 (4.8, 7.6)		
Genesis II CR	Genesis II	51	749	1.5 (0.8, 2.6)	3.8 (2.6, 5.4)	4.7 (3.4, 6.5)	6.8 (5.1, 8.9)	7.9 (5.9, 10.4)	
Genesis II PS	Genesis II	37	420	1.7 (0.8, 3.5)	3.3 (2.0, 5.6)	4.1 (2.5, 6.5)	6.3 (4.3, 9.1)	9.4 (6.8, 13.0)	
LCS CR	LCS	178	2393	1.4 (1.0, 2.0)	3.4 (2.7, 4.2)	4.4 (3.6, 5.3)	6.2 (5.3, 7.3)	7.4 (6.3, 8.6)	8.7 (7.5, 10.1)
	MBT*	567	9395	1.1 (0.9, 1.3)	3.4 (3.1, 3.8)	4.2 (3.8, 4.6)	5.4 (5.0, 5.9)	7.2 (6.6, 7.9)	9.7 (8.6, 10.9)
Nexgen LPS Flex	Nexgen	55	1199	2.6 (1.8, 3.7)	3.9 (3.0, 5.2)	4.2 (3.2, 5.5)	4.7 (3.6, 6.1)		
Persona CR	Persona	302	14255	1.1 (1.0, 1.3)	2.6 (2.3, 2.9)	3.1 (2.7, 3.5)			
Score	Score	277	2990	1.5 (1.1, 2.0)	4.7 (4.0, 5.5)	6.3 (5.5, 7.3)	9.8 (8.7, 11.1)	12.3 (10.9, 14.0)	
Triathlon CR	Triathlon	839	18893	1.1 (1.0, 1.2)	2.3 (2.1, 2.6)	3.0 (2.8, 3.3)	4.3 (4.0, 4.7)	5.7 (5.3, 6.2)	
	Triathlon/Tritanium	810	50367	1.0 (0.9, 1.1)	1.9 (1.8, 2.1)	2.4 (2.2, 2.6)			
Triathlon PS	Triathlon	70	1072	2.1 (1.4, 3.2)	3.8 (2.8, 5.2)	4.9 (3.8, 6.4)	6.0 (4.7, 7.6)	7.0 (5.6, 8.9)	
	Triathlon/Tritanium	11	613	1.2 (0.6, 2.5)	2.1 (1.1, 3.7)	2.1 (1.1, 3.7)			
Vanguard CR	Vanguard	126	1695	1.4 (1.0, 2.1)	4.1 (3.3, 5.2)	4.8 (3.9, 6.0)	6.4 (5.3, 7.7)	9.6 (7.8, 12.0)	
Other (31)		147	1876	2.3 (1.7, 3.1)	6.0 (5.0, 7.3)	7.4 (6.2, 8.7)	9.0 (7.6, 10.6)	10.1 (8.5, 12.0)	
TOTAL		4528	124470						

Note: Restricted to modern prostheses

Only combinations with >400 procedures have been listed

* denotes prosthesis combinations that have not had any reported use in primary total knee procedures in 2025



Primary Total Knee Replacement

Table KT11 Cumulative Percent Revision of Hybrid Primary Total Knee Replacement by Prosthesis Combination

Femoral Component	Tibial Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ACS	ACS Fixed	82	1646	1.2 (0.8, 1.9)	3.4 (2.6, 4.4)	4.2 (3.3, 5.3)	5.7 (4.5, 7.1)		
Active Knee	Active Knee	190	2491	0.6 (0.4, 1.0)	2.7 (2.1, 3.4)	3.8 (3.1, 4.7)	6.7 (5.7, 7.8)	10.1 (8.7, 11.8)	12.8 (10.7, 15.4)
Anatomic	Anatomic	23	1002	1.5 (0.9, 2.6)	2.8 (1.8, 4.3)	3.1 (2.0, 4.8)			
Apex Knee CR	Apex Knee	151	7110	0.9 (0.7, 1.1)	1.8 (1.5, 2.2)	2.3 (1.9, 2.7)	3.3 (2.7, 4.0)		
Attune CR	Attune	58	4569	0.7 (0.5, 1.0)	1.7 (1.3, 2.2)	2.0 (1.5, 2.8)			
Attune PS	Attune	59	1512	1.8 (1.2, 2.6)	4.1 (3.1, 5.4)	5.1 (3.9, 6.6)			
BalanSys	BalanSys	77	2687	1.0 (0.6, 1.4)	2.0 (1.5, 2.7)	2.6 (2.0, 3.3)	3.6 (2.8, 4.6)		
Evolution	Evolution	8	434	0.2 (0.0, 1.6)	2.3 (1.0, 5.2)	3.5 (1.7, 7.0)			
GMK Primary	GMK Primary	45	1157	1.4 (0.9, 2.3)	3.5 (2.6, 4.9)	3.9 (2.9, 5.3)	4.6 (3.4, 6.2)		
GMK Sphere Primary	GMK Primary	9	1709	0.8 (0.4, 1.7)					
Genesis II CR	Genesis II	569	8913	1.0 (0.8, 1.2)	3.3 (2.9, 3.7)	4.3 (3.9, 4.8)	6.0 (5.5, 6.5)	7.3 (6.7, 8.0)	9.0 (8.1, 9.9)
Genesis II PS	Genesis II	72	707	1.7 (1.0, 3.0)	4.4 (3.1, 6.2)	5.6 (4.1, 7.6)	8.9 (7.0, 11.4)	10.7 (8.5, 13.4)	12.1 (9.6, 15.2)
LCS CR	LCS	156	2364	1.0 (0.7, 1.5)	2.7 (2.1, 3.5)	3.8 (3.1, 4.7)	5.5 (4.6, 6.6)	6.9 (5.8, 8.1)	8.1 (6.9, 9.5)
	MBT*	462	11102	0.7 (0.6, 0.9)	2.2 (1.9, 2.5)	2.7 (2.5, 3.1)	4.0 (3.6, 4.4)	5.0 (4.5, 5.5)	6.7 (5.8, 7.7)
Legion CR	Genesis II	252	5450	1.3 (1.0, 1.6)	3.3 (2.9, 3.9)	4.2 (3.7, 4.8)	6.4 (5.5, 7.3)		
Nexgen LPS Flex	Nexgen	58	933	2.3 (1.5, 3.4)	4.3 (3.2, 5.8)	5.4 (4.1, 7.1)	6.6 (5.1, 8.5)	6.9 (5.3, 8.9)	
Persona CR	Persona	484	30894	0.8 (0.7, 1.0)	1.8 (1.7, 2.0)	2.3 (2.1, 2.6)	4.0 (2.3, 6.7)		
Score	Score	146	2193	1.2 (0.8, 1.8)	3.5 (2.8, 4.5)	5.4 (4.4, 6.5)	8.8 (7.5, 10.4)		
Trekking	Trekking	27	564	1.1 (0.5, 2.4)	2.8 (1.8, 4.6)	3.4 (2.2, 5.3)	4.9 (3.3, 7.3)		
Triathlon CR	Triathlon	1105	46594	0.6 (0.6, 0.7)	1.6 (1.5, 1.7)	2.1 (2.0, 2.2)	3.1 (2.9, 3.3)	4.5 (4.1, 4.9)	
	Triathlon/Tritanium	9	617	0.9 (0.4, 2.1)	1.6 (0.8, 3.1)	1.9 (1.0, 3.8)			
Triathlon PS	Triathlon	147	3308	1.6 (1.2, 2.1)	2.7 (2.2, 3.3)	3.6 (3.0, 4.3)	4.9 (4.2, 5.8)	5.5 (4.7, 6.6)	
Vanguard CR	Vanguard	639	13484	0.8 (0.6, 0.9)	2.2 (2.0, 2.5)	2.9 (2.6, 3.2)	4.6 (4.2, 5.0)	6.8 (6.2, 7.5)	
Other (55)		210	2135	3.5 (2.8, 4.5)	7.5 (6.3, 8.8)	9.1 (7.8, 10.5)	11.6 (10.1, 13.3)	13.5 (11.8, 15.5)	14.4 (12.3, 16.8)
TOTAL		5038	153575						

Note: Restricted to modern prostheses

Only combinations with >400 procedures have been listed

* denotes prosthesis combinations that have not had any reported use in primary total knee procedures in 2025



Primary Total Knee Replacement

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

Primary total knee replacement has the lowest rate of revision compared to all other classes of primary knee replacement. At 20 years, the cumulative percent revision of all primary total knee replacement procedures undertaken for osteoarthritis is 8.0% (Table KT12 and Figure KT6).

Reasons for Revision

Infection is the most common reason for revision, followed by loosening, instability, patella erosion, and pain (Table KT13 and Figure KT7).

Types of Revision

The most common types of revision are insert only, both femoral and tibial components, and patella only (Table KT14).

Age and Sex

The rate of revision decreases with increasing age. This difference becomes more evident with time. Compared to patients aged ≥ 75 years, patients aged < 55 years have over twice the rate of revision after 6 months and this increases to nearly 6 times after 11 years (Table KT15 and Figure KT8).

Males have a higher rate of revision compared to females (Table KT16 and Figure KT9). Loosening is the most common reason for revision in females. Males have a higher incidence of revision for infection (Figure KT10, Table KT17 and Figure KT11).

Age-related differences in the rate of revision are evident for both males and females (Table KT16, Figure KT12 and Figure KT13).

ASA and BMI

ASA scores are an indication of comorbidity and have been collected since 2012. There are 623,824 primary total knee replacement procedures for osteoarthritis with these scores. When compared to patients with an ASA score of 1, patients in all other ASA groups have a higher rate of revision (Table KT18 and Figure KT14). The difference in the rate of revision for each ASA score is partially due to an increase in the cumulative incidence of infection with increasing ASA score (Figure KT15).

Males have a higher rate of revision than females where there is no or little comorbidity (ASA 1 or 2) and also where there is significant comorbidity (ASA 3-5) (Table KT19 and Figure KT16).

Patients aged < 65 years have higher rates of revision compared to patients ≥ 65 years when compared by grouped comorbidity scores ASA 1-2 and ASA 3-5 (Table KT20 and Figure KT17).

BMI data have been collected since 2015. There are revision outcomes for 560,326 primary total knee replacement procedures for osteoarthritis in relation to BMI category. When compared to patients with normal BMI, there is no difference in the rate of revision for patients who are underweight, pre-obese or obese class 1. However, there is an early increase in the rate of revision for patients in obese class 2 and obese class 3 (Table KT20 and Figure KT18). The most common reasons for revision are shown in Figure KT19.

Compared to patients who have BMI < 30 , patients in obese classes 1-3 have an increased rate of revision irrespective of sex. There is an increased rate of revision for obese male patients compared to obese female patients (Table KT22 and Figure KT20).

Patients aged < 65 years have higher rates of revision than patients aged ≥ 65 years irrespective of obesity (Table KT23 and Figure KT21).

Males have a higher rate of revision which is largely due to an increased incidence of infection.

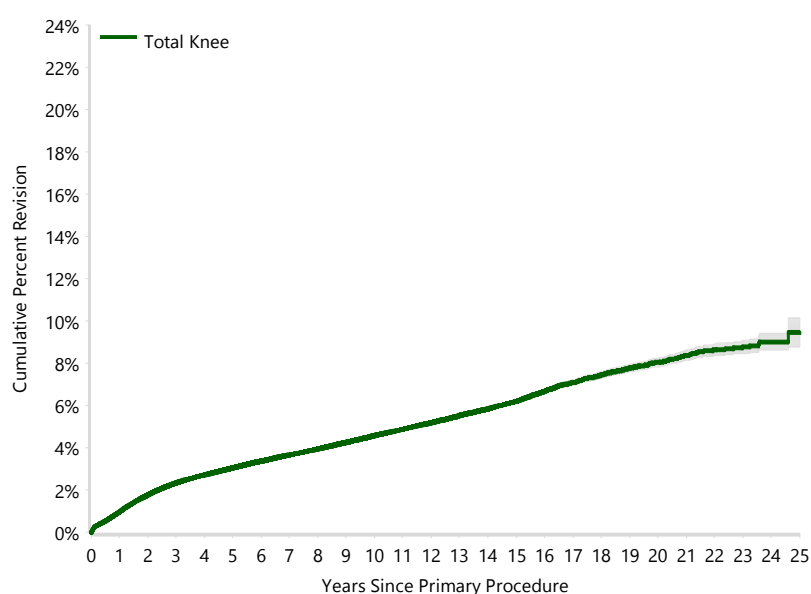
Primary Total Knee Replacement

Table KT12 Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)

Knee Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	26392	775654	1.0 (0.9, 1.0)	2.3 (2.3, 2.4)	3.1 (3.0, 3.1)	4.6 (4.5, 4.6)	6.2 (6.1, 6.3)	8.0 (7.8, 8.2)
TOTAL	26392	775654						

Note: Restricted to modern prostheses

Figure KT6 Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	775654	694612	539560	415962	178483	51101	9084

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT13 Primary Total Knee Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Infection	7585	28.7
Loosening	5587	21.2
Instability	2799	10.6
Patella Erosion	1991	7.5
Pain	1829	6.9
Patellofemoral Pain	1512	5.7
Arthrofibrosis	1169	4.4
Fracture	1082	4.1
Malalignment	491	1.9
Wear Tibial Insert	362	1.4
Lysis	283	1.1
Incorrect Sizing	210	0.8
Metal Related Pathology	110	0.4
Other	1382	5.2
TOTAL	26392	100.0

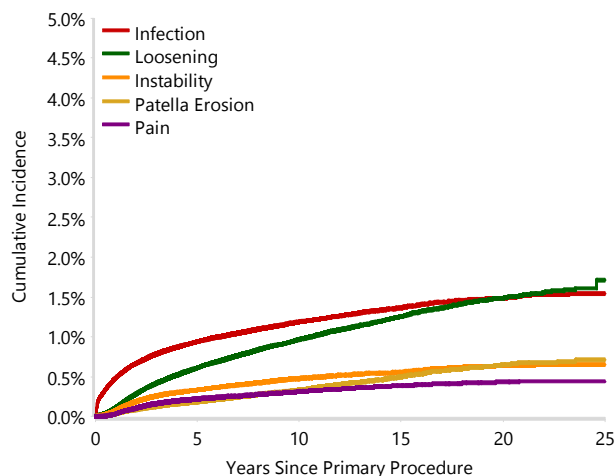
Note: Restricted to modern prostheses

Table KT14 Primary Total Knee Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Insert Only	8315	31.5
TKR (Tibial/Femoral)	6479	24.5
Patella Only	4376	16.6
Insert/Patella	2880	10.9
Tibial Component	1842	7.0
Femoral Component	1199	4.5
Cement Spacer	1096	4.2
Removal of Prostheses	124	0.5
Minor Components	52	0.2
Total Femoral	15	0.1
Reinsertion of Components	8	0.0
Cement Only	6	0.0
TOTAL	26392	100.0

Note: Restricted to modern prostheses

Figure KT7 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses

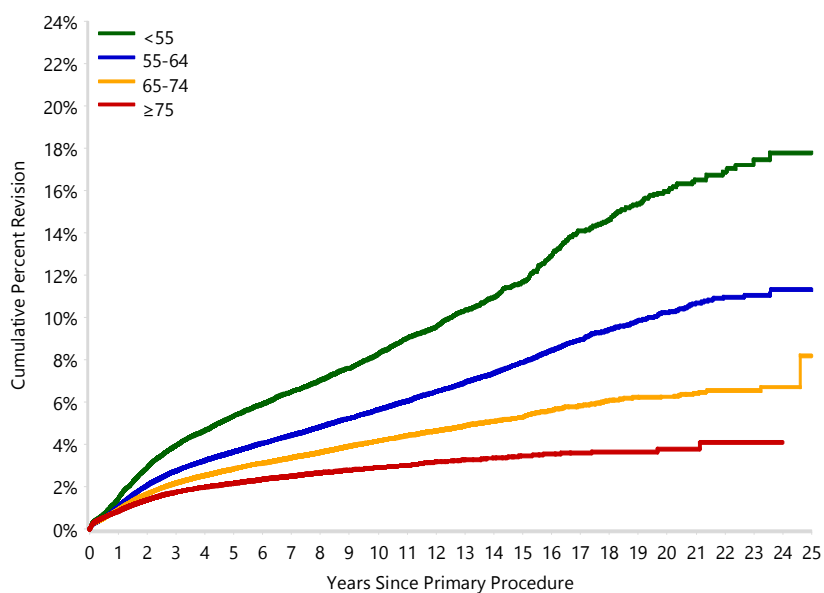
Primary Total Knee Replacement

Table KT15 Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	3330	49383	1.4 (1.3, 1.6)	3.9 (3.8, 4.1)	5.4 (5.1, 5.6)	8.3 (8.0, 8.6)	11.7 (11.2, 12.2)	16.0 (15.1, 16.8)
55-64	9063	204131	1.0 (1.0, 1.1)	2.7 (2.7, 2.8)	3.7 (3.6, 3.7)	5.6 (5.5, 5.8)	7.9 (7.7, 8.1)	10.2 (9.9, 10.6)
65-74	9660	314235	0.9 (0.9, 1.0)	2.2 (2.1, 2.2)	2.8 (2.8, 2.9)	4.2 (4.1, 4.3)	5.3 (5.2, 5.4)	6.3 (6.0, 6.5)
≥75	4339	207905	0.8 (0.8, 0.9)	1.7 (1.7, 1.8)	2.2 (2.1, 2.2)	2.9 (2.8, 3.0)	3.5 (3.3, 3.6)	3.8 (3.5, 4.1)
TOTAL	26392	775654						

Note: Restricted to modern prostheses

Figure KT8 Cumulative Percent Revision of Primary Total Knee Replacement by Age (Primary Diagnosis OA)



HR - adjusted for sex

<55 vs ≥75

0 - 3Mth: HR=1.17 (95% CI 1.01, 1.35), p=0.042
 3Mth - 6Mth: HR=1.53 (95% CI 1.27, 1.84), p<0.001
 6Mth - 1.5Yr: HR=2.53 (95% CI 2.30, 2.79), p<0.001
 1.5Yr - 2.5Yr: HR=2.89 (95% CI 2.58, 3.23), p<0.001
 2.5Yr - 4Yr: HR=3.28 (95% CI 2.92, 3.69), p<0.001
 4Yr - 11Yr: HR=3.96 (95% CI 3.63, 4.32), p<0.001
 11Yr+: HR=5.86 (95% CI 5.11, 6.72), p<0.001

55-64 vs ≥75

0 - 6Mth: HR=0.93 (95% CI 0.86, 1.02), p=0.114
 6Mth - 1.5Yr: HR=1.81 (95% CI 1.68, 1.95), p<0.001
 1.5Yr - 2Yr: HR=1.98 (95% CI 1.78, 2.20), p<0.001
 2Yr - 2.5Yr: HR=1.72 (95% CI 1.53, 1.93), p<0.001
 2.5Yr - 3Yr: HR=2.12 (95% CI 1.83, 2.44), p<0.001
 3Yr - 4Yr: HR=2.26 (95% CI 2.03, 2.50), p<0.001
 4Yr - 4.5Yr: HR=2.29 (95% CI 1.97, 2.67), p<0.001
 4.5Yr - 10Yr: HR=2.50 (95% CI 2.32, 2.70), p<0.001
 10Yr - 12Yr: HR=3.05 (95% CI 2.66, 3.51), p<0.001
 12Yr - 13Yr: HR=3.29 (95% CI 2.64, 4.10), p<0.001
 13Yr+: HR=3.63 (95% CI 3.16, 4.19), p<0.001

65-74 vs ≥75

0 - 6Mth: HR=0.92 (95% CI 0.86, 1.00), p=0.044
 6Mth - 1.5Yr: HR=1.35 (95% CI 1.26, 1.45), p<0.001
 1.5Yr - 2.5Yr: HR=1.40 (95% CI 1.28, 1.53), p<0.001
 2.5Yr - 3Yr: HR=1.60 (95% CI 1.39, 1.84), p<0.001
 3Yr+: HR=1.66 (95% CI 1.56, 1.78), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<55	49383	44698	35601	28127	13785	4893	1220
55-64	204131	184669	146710	116263	55393	18684	3873
65-74	314235	281799	219504	170118	73645	20856	3388
≥75	207905	183446	137745	101454	35660	6668	603

Note: Restricted to modern prostheses

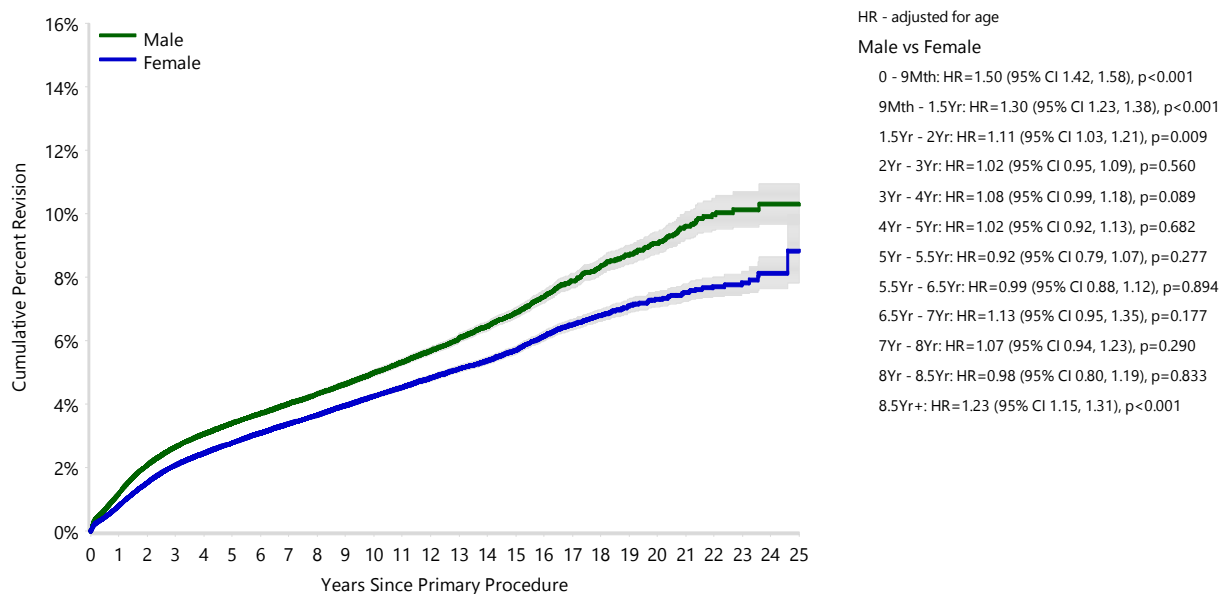
Primary Total Knee Replacement

Table KT16 Cumulative Percent Revision of Primary Total Knee Replacement by Sex and Age (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		12840	346650	1.2 (1.1, 1.2)	2.7 (2.6, 2.7)	3.4 (3.3, 3.5)	5.0 (4.9, 5.1)	6.9 (6.7, 7.0)	9.1 (8.7, 9.4)
	<55	1530	21424	1.8 (1.6, 2.0)	4.4 (4.1, 4.7)	5.7 (5.4, 6.1)	8.7 (8.2, 9.2)	12.1 (11.4, 12.9)	16.8 (15.5, 18.2)
	55-64	4542	97062	1.2 (1.2, 1.3)	3.0 (2.9, 3.2)	4.0 (3.8, 4.1)	6.0 (5.8, 6.2)	8.6 (8.3, 8.9)	11.3 (10.7, 11.9)
	65-74	4784	142709	1.1 (1.1, 1.2)	2.5 (2.4, 2.6)	3.2 (3.1, 3.3)	4.6 (4.4, 4.7)	5.8 (5.6, 6.1)	6.9 (6.5, 7.3)
	≥75	1984	85455	1.0 (1.0, 1.1)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.2 (3.1, 3.4)	3.8 (3.6, 4.1)	4.4 (3.5, 5.5)
Female		13552	429004	0.8 (0.8, 0.8)	2.1 (2.0, 2.1)	2.8 (2.7, 2.8)	4.2 (4.2, 4.3)	5.7 (5.6, 5.8)	7.3 (7.1, 7.5)
	<55	1800	27959	1.2 (1.1, 1.3)	3.6 (3.4, 3.8)	5.1 (4.8, 5.4)	8.0 (7.6, 8.4)	11.3 (10.7, 12.0)	15.3 (14.2, 16.5)
	55-64	4521	107069	0.9 (0.8, 0.9)	2.5 (2.4, 2.6)	3.4 (3.3, 3.5)	5.4 (5.2, 5.5)	7.3 (7.1, 7.6)	9.4 (9.0, 9.9)
	65-74	4876	171526	0.7 (0.7, 0.8)	1.9 (1.9, 2.0)	2.6 (2.5, 2.7)	3.9 (3.7, 4.0)	4.9 (4.7, 5.1)	5.8 (5.5, 6.1)
	≥75	2355	122450	0.7 (0.7, 0.8)	1.5 (1.5, 1.6)	1.9 (1.9, 2.0)	2.7 (2.6, 2.8)	3.2 (3.1, 3.4)	3.5 (3.2, 3.7)
TOTAL		26392	775654						

Note: Restricted to modern prostheses

Figure KT9 Cumulative Percent Revision of Primary Total Knee Replacement by Sex (Primary Diagnosis OA)



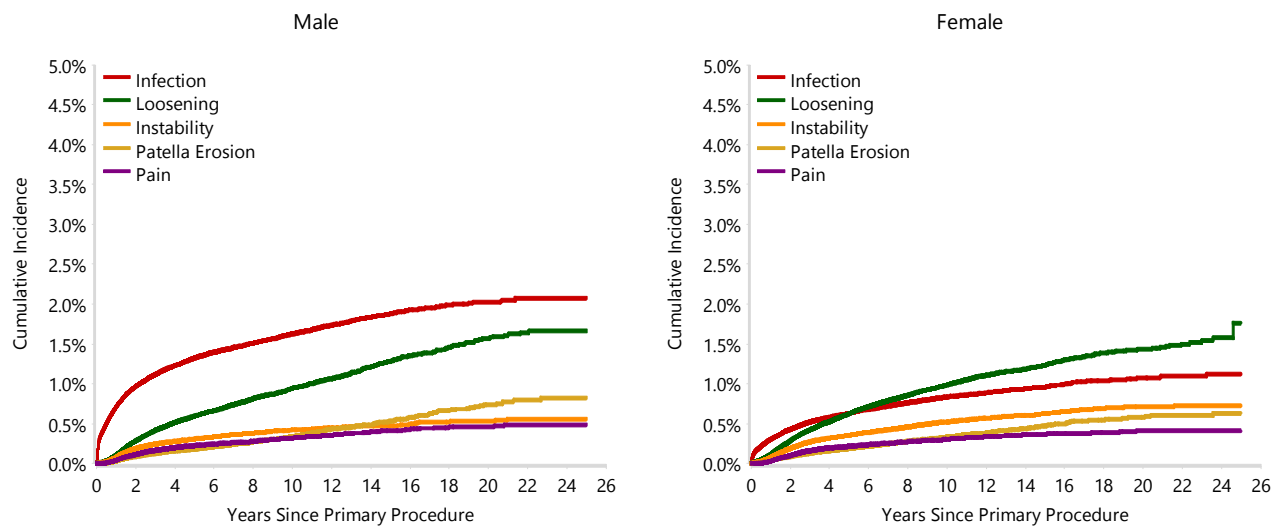
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	346650	308756	237592	180153	73858	20408	3484
Female	429004	385856	301968	235809	104625	30693	5600

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT10 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses



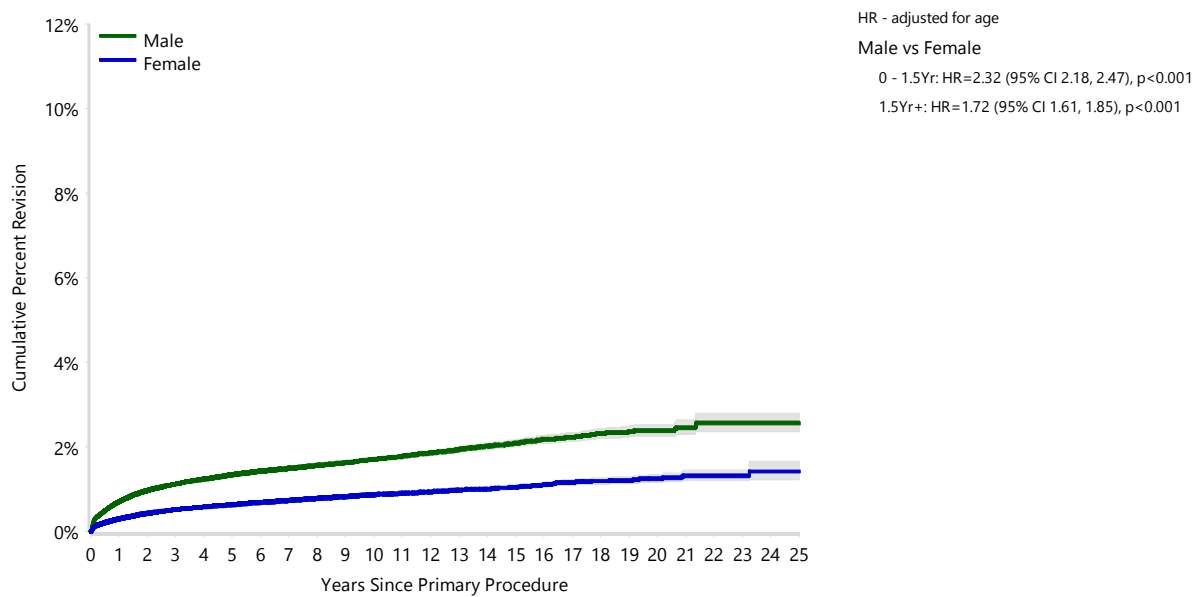
Primary Total Knee Replacement

Table KT17 Cumulative Percent Revision of Primary Total Knee Replacement by Sex (Primary Diagnosis OA, Revision for Infection)

Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	4682	346650	0.7 (0.7, 0.7)	1.1 (1.1, 1.2)	1.4 (1.3, 1.4)	1.7 (1.7, 1.8)	2.1 (2.0, 2.2)	2.4 (2.3, 2.5)
Female	2903	429004	0.3 (0.3, 0.3)	0.5 (0.5, 0.5)	0.6 (0.6, 0.7)	0.9 (0.8, 0.9)	1.0 (1.0, 1.1)	1.3 (1.2, 1.4)
TOTAL	7585	775654						

Note: Restricted to modern prostheses

Figure KT11 Cumulative Percent Revision of Primary Total Knee Replacement by Sex (Primary Diagnosis OA, Revision for Infection)

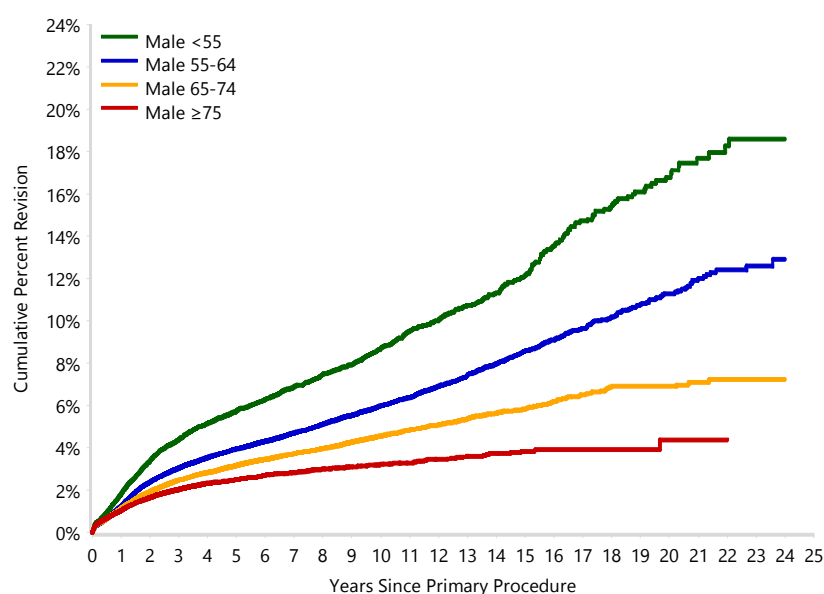


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	346650	308756	237592	180153	73858	20408	3484
Female	429004	385856	301968	235809	104625	30693	5600

Note: Restricted to modern prostheses

Primary Total Knee Replacement

Figure KT12 Cumulative Percent Revision of Primary Total Knee Replacement in Males by Age (Primary Diagnosis OA)



Male <55 vs Male ≥75

0 - 3Mth: HR=1.19 (95% CI 0.97, 1.45), p=0.090
 3Mth - 1.5Yr: HR=2.22 (95% CI 1.98, 2.50), p<0.001
 1.5Yr - 2Yr: HR=2.97 (95% CI 2.41, 3.65), p<0.001
 2Yr - 4Yr: HR=2.74 (95% CI 2.37, 3.17), p<0.001
 4Yr - 6Yr: HR=3.55 (95% CI 2.90, 4.35), p<0.001
 6Yr - 9.5Yr: HR=4.28 (95% CI 3.53, 5.18), p<0.001
 9.5Yr+: HR=5.89 (95% CI 4.87, 7.11), p<0.001

Male 55-64 vs Male ≥75

0 - 6Mth: HR=0.96 (95% CI 0.86, 1.08), p=0.492
 6Mth - 1.5Yr: HR=1.71 (95% CI 1.55, 1.88), p<0.001
 1.5Yr - 2Yr: HR=1.95 (95% CI 1.67, 2.27), p<0.001
 2Yr - 2.5Yr: HR=1.67 (95% CI 1.41, 1.96), p<0.001
 2.5Yr - 4Yr: HR=1.77 (95% CI 1.54, 2.04), p<0.001
 4Yr - 4.5Yr: HR=2.57 (95% CI 2.03, 3.27), p<0.001
 4.5Yr - 7Yr: HR=2.45 (95% CI 2.11, 2.85), p<0.001
 7Yr - 9Yr: HR=3.09 (95% CI 2.57, 3.71), p<0.001
 9Yr - 13Yr: HR=3.44 (95% CI 2.89, 4.08), p<0.001
 13Yr+: HR=4.05 (95% CI 3.27, 5.02), p<0.001

Male 65-74 vs Male ≥75

0 - 6Mth: HR=0.97 (95% CI 0.88, 1.07), p=0.550
 6Mth - 1.5Yr: HR=1.29 (95% CI 1.17, 1.42), p<0.001
 1.5Yr - 2.5Yr: HR=1.32 (95% CI 1.17, 1.50), p<0.001
 2.5Yr - 3Yr: HR=1.61 (95% CI 1.34, 1.94), p<0.001
 3Yr - 4Yr: HR=1.29 (95% CI 1.09, 1.52), p=0.002
 4Yr+: HR=1.91 (95% CI 1.69, 2.16), p<0.001

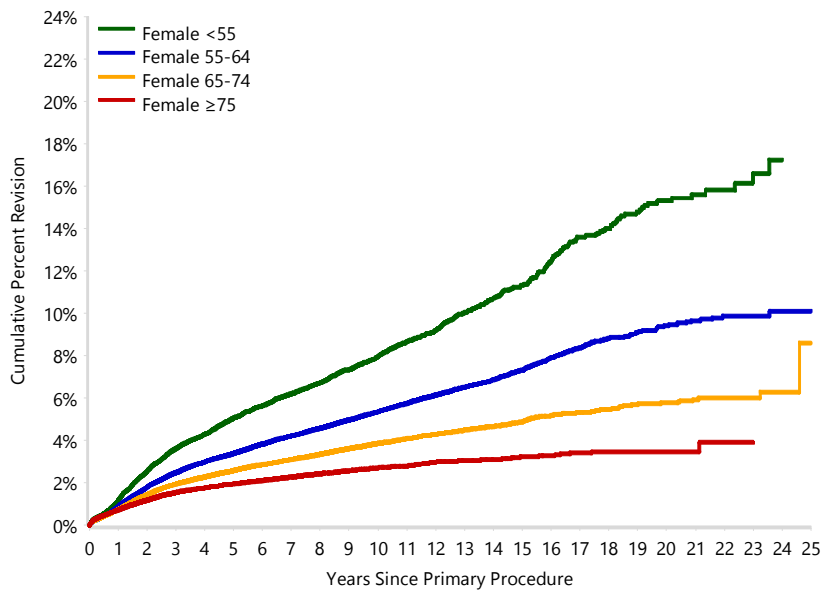
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	<55	21424	19263	15367	12063	5807	2120	528
	55-64	97062	87389	68668	53682	24515	7976	1567
	65-74	142709	127257	98312	75034	31055	8306	1225
	≥75	85455	74847	55245	39374	12481	2006	164

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT13 Cumulative Percent Revision of Primary Total Knee Replacement in Females by Age (Primary Diagnosis OA)



Female <55 vs Female ≥75

0 - 6Mth: HR=1.17 (95% CI 0.98, 1.40), p=0.085
6Mth - 2.5Yr: HR=2.77 (95% CI 2.51, 3.07), p<0.001
2.5Yr - 4Yr: HR=3.33 (95% CI 2.86, 3.89), p<0.001
4Yr - 5Yr: HR=4.54 (95% CI 3.74, 5.50), p<0.001
5Yr - 6.5Yr: HR=3.86 (95% CI 3.18, 4.68), p<0.001
6.5Yr - 10Yr: HR=3.92 (95% CI 3.33, 4.61), p<0.001
10Yr - 12Yr: HR=5.21 (95% CI 4.06, 6.69), p<0.001
12Yr+: HR=7.64 (95% CI 6.23, 9.37), p<0.001

Female 55-64 vs Female ≥75

0 - 6Mth: HR=0.90 (95% CI 0.80, 1.02), p=0.102
6Mth - 1.5Yr: HR=1.87 (95% CI 1.69, 2.07), p<0.001
1.5Yr - 2Yr: HR=2.02 (95% CI 1.74, 2.35), p<0.001
2Yr - 2.5Yr: HR=1.71 (95% CI 1.46, 2.00), p<0.001
2.5Yr - 5.5Yr: HR=2.33 (95% CI 2.11, 2.57), p<0.001
5.5Yr - 6.5Yr: HR=2.97 (95% CI 2.49, 3.54), p<0.001
6.5Yr - 10Yr: HR=2.53 (95% CI 2.23, 2.87), p<0.001
10Yr - 13Yr: HR=3.22 (95% CI 2.70, 3.84), p<0.001
13Yr+: HR=3.96 (95% CI 3.24, 4.84), p<0.001

Female 65-74 vs Female ≥75

0 - 6Mth: HR=0.88 (95% CI 0.79, 0.99), p=0.026
6Mth - 1.5Yr: HR=1.39 (95% CI 1.27, 1.53), p<0.001
1.5Yr - 2Yr: HR=1.50 (95% CI 1.30, 1.73), p<0.001
2Yr - 2.5Yr: HR=1.40 (95% CI 1.20, 1.63), p<0.001
2.5Yr - 3.5Yr: HR=1.48 (95% CI 1.30, 1.69), p<0.001
3.5Yr+: HR=1.70 (95% CI 1.56, 1.85), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Female	<55	27959	25435	20234	16064	7978	2773	692
	55-64	107069	97280	78042	62581	30878	10708	2306
	65-74	171526	154542	121192	95084	42590	12550	2163
	≥75	122450	108599	82500	62080	23179	4662	439

Note: Restricted to modern prostheses

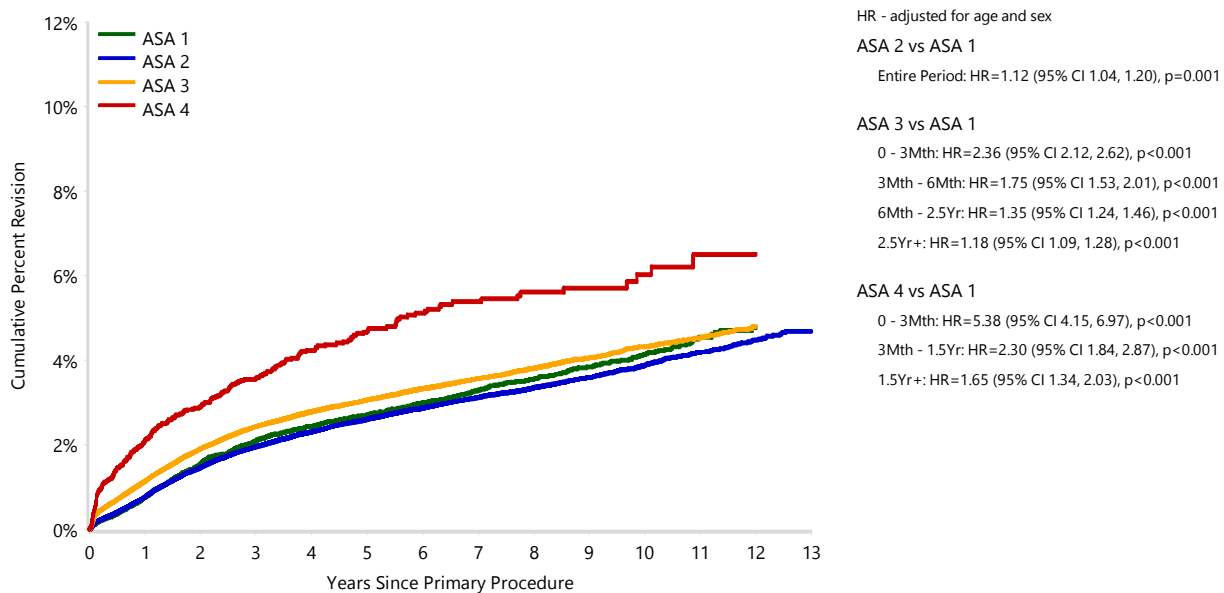
Primary Total Knee Replacement

Table KT18 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	12 Yrs
ASA 1	886	30578	0.8 (0.7, 0.9)	2.1 (1.9, 2.3)	2.7 (2.5, 2.9)	3.3 (3.1, 3.5)	3.8 (3.6, 4.1)	4.8 (4.4, 5.2)
ASA 2	8178	328907	0.8 (0.7, 0.8)	2.0 (1.9, 2.0)	2.6 (2.5, 2.7)	3.1 (3.0, 3.2)	3.6 (3.5, 3.7)	4.5 (4.3, 4.6)
ASA 3	6949	258168	1.1 (1.1, 1.2)	2.4 (2.4, 2.5)	3.1 (3.0, 3.1)	3.6 (3.5, 3.7)	4.1 (4.0, 4.2)	4.8 (4.6, 5.0)
ASA 4	251	6145	2.1 (1.8, 2.5)	3.6 (3.1, 4.1)	4.7 (4.1, 5.3)	5.4 (4.7, 6.1)	5.7 (5.0, 6.5)	6.5 (5.5, 7.7)
ASA 5	1	26	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	8.3 (1.2, 46.1)	8.3 (1.2, 46.1)	8.3 (1.2, 46.1)	
TOTAL	16265	623824						

Note: Restricted to modern prostheses
Excludes 151,830 procedures with unknown ASA score

Figure KT14 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)



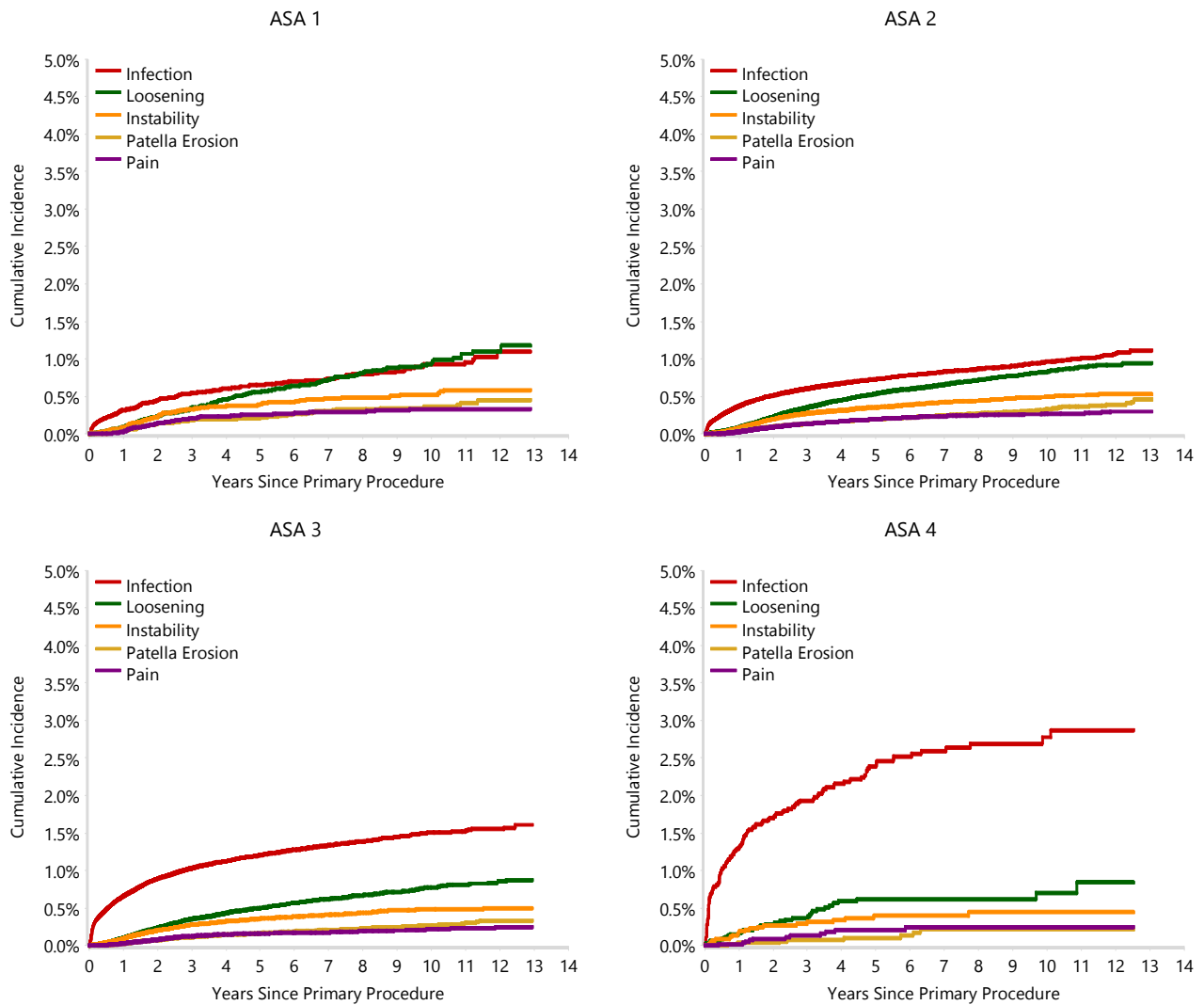
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1	30578	28145	22702	17336	12043	7125	2866
ASA 2	328907	290910	217555	157284	104739	59255	22495
ASA 3	258168	221352	153169	103342	63693	32515	11214
ASA 4	6145	5267	3650	2372	1473	774	302

Note: Restricted to modern prostheses
Excludes 151,830 procedures with unknown ASA score; ASA 5 excluded due to low numbers



Primary Total Knee Replacement

Figure KT15 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by ASA Score (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Excludes 151,830 procedures with unknown ASA score; ASA 5 excluded due to low numbers

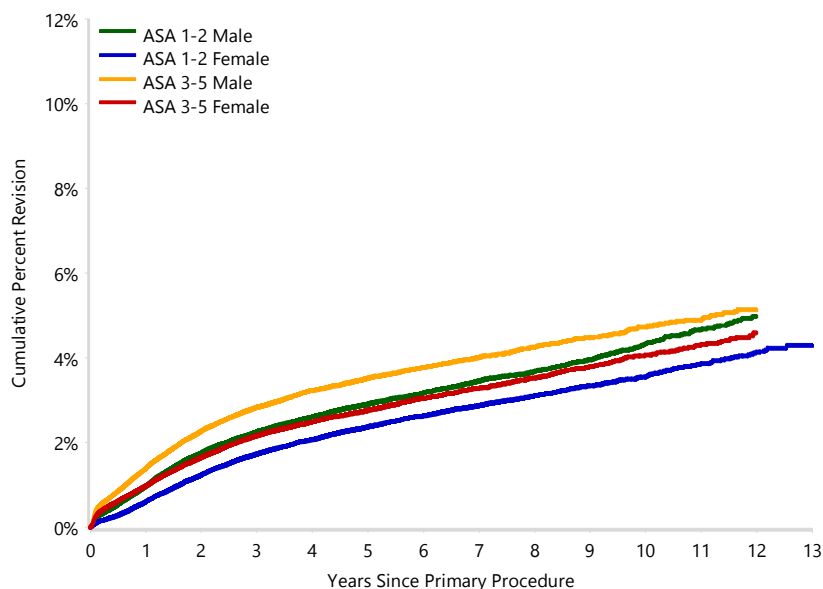
Primary Total Knee Replacement

Table KT19 Cumulative Percent Revision of Primary Total Knee Replacement by Sex and ASA Score (Primary Diagnosis OA)

ASA Category	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	Male	4572	163746	1.0 (0.9, 1.0)	2.3 (2.2, 2.3)	2.9 (2.8, 3.0)	3.5 (3.4, 3.6)	4.0 (3.8, 4.1)	4.7 (4.5, 4.8)
	Female	4492	195739	0.6 (0.6, 0.6)	1.7 (1.7, 1.8)	2.4 (2.3, 2.5)	2.9 (2.8, 3.0)	3.3 (3.2, 3.5)	3.9 (3.7, 4.0)
ASA 3-5	Male	3569	117684	1.4 (1.3, 1.5)	2.8 (2.7, 2.9)	3.5 (3.4, 3.6)	4.0 (3.9, 4.2)	4.5 (4.3, 4.7)	4.9 (4.7, 5.1)
	Female	3632	146655	1.0 (0.9, 1.0)	2.2 (2.1, 2.2)	2.8 (2.7, 2.9)	3.3 (3.2, 3.4)	3.8 (3.7, 3.9)	4.3 (4.1, 4.5)
TOTAL		16265	623824						

Note: Restricted to modern prostheses
Excludes 151,830 procedures with unknown ASA score

Figure KT16 Cumulative Percent Revision of Primary Total Knee Replacement by Sex and ASA Score (Primary Diagnosis OA)



HR - adjusted for age

ASA 1-2 Male vs ASA 1-2 Female

0 - 6Mth: HR=1.72 (95% CI 1.55, 1.90), $p<0.001$
6Mth - 1.5Yr: HR=1.31 (95% CI 1.22, 1.41), $p<0.001$
1.5Yr+: HR=1.05 (95% CI 1.00, 1.11), $p=0.047$

ASA 1-2 Male vs ASA 3-5 Male

0 - 3Mth: HR=0.52 (95% CI 0.47, 0.57), $p<0.001$
3Mth - 9Mth: HR=0.68 (95% CI 0.61, 0.76), $p<0.001$
9Mth - 1.5Yr: HR=0.81 (95% CI 0.74, 0.88), $p<0.001$
1.5Yr - 4Yr: HR=0.82 (95% CI 0.76, 0.88), $p<0.001$
4Yr - 4.5Yr: HR=0.96 (95% CI 0.79, 1.16), $p=0.660$
4.5Yr - 5Yr: HR=0.79 (95% CI 0.64, 0.99), $p=0.043$
5Yr - 5.5Yr: HR=0.91 (95% CI 0.72, 1.14), $p=0.399$
5.5Yr - 6Yr: HR=0.79 (95% CI 0.61, 1.02), $p=0.066$
6Yr - 9.5Yr: HR=0.97 (95% CI 0.86, 1.10), $p=0.633$
9.5Yr+: HR=1.17 (95% CI 0.93, 1.46), $p=0.171$

ASA 1-2 Female vs ASA 3-5 Female

0 - 3Mth: HR=0.41 (95% CI 0.36, 0.46), $p<0.001$
3Mth - 6Mth: HR=0.56 (95% CI 0.48, 0.65), $p<0.001$
6Mth+: HR=0.89 (95% CI 0.85, 0.94), $p<0.001$

ASA 3-5 Male vs ASA 3-5 Female

0 - 1.5Yr: HR=1.42 (95% CI 1.33, 1.51), $p<0.001$
1.5Yr - 2Yr: HR=1.21 (95% CI 1.06, 1.38), $p=0.004$
2Yr+: HR=1.09 (95% CI 1.01, 1.17), $p=0.029$

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	Male	163746	144700	108320	77710	50981	28421	10625
	Female	195739	174355	131937	96910	65801	37959	14736
ASA 3-5	Male	117684	100375	68819	45450	27177	13520	4594
	Female	146655	126265	88013	60272	37995	19773	6923

Note: Restricted to modern prostheses
Excludes 151,830 procedures with unknown ASA score

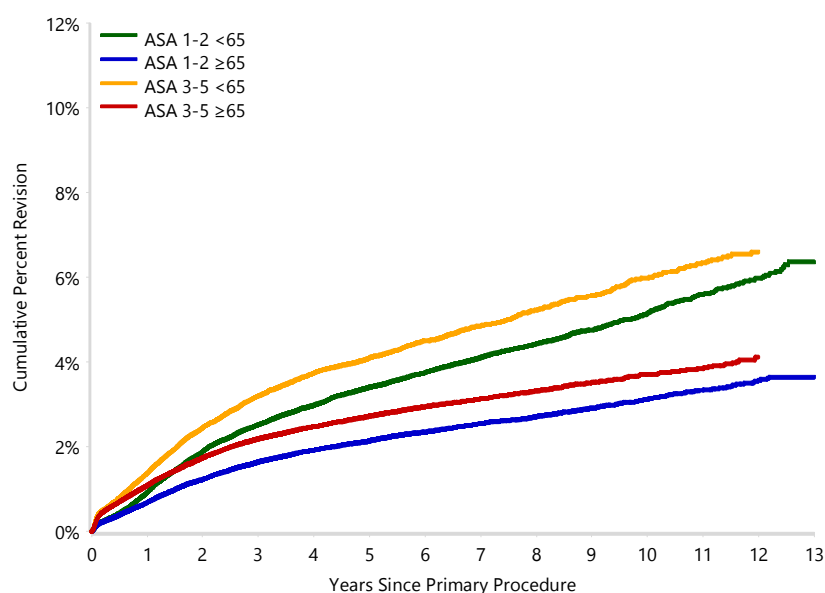
Primary Total Knee Replacement

Table KT20 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score and Age (Primary Diagnosis OA)

ASA Score	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	<65	4487	132674	0.9 (0.9, 1.0)	2.5 (2.4, 2.6)	3.4 (3.3, 3.5)	4.1 (4.0, 4.2)	4.8 (4.6, 4.9)	5.6 (5.4, 5.8)
	≥65	4577	226811	0.7 (0.7, 0.7)	1.6 (1.6, 1.7)	2.1 (2.1, 2.2)	2.5 (2.5, 2.6)	2.9 (2.8, 3.0)	3.3 (3.2, 3.5)
ASA 3-5	<65	2626	70170	1.4 (1.3, 1.5)	3.2 (3.1, 3.3)	4.1 (3.9, 4.3)	4.9 (4.7, 5.1)	5.6 (5.3, 5.8)	6.3 (6.0, 6.7)
	≥65	4575	194169	1.1 (1.0, 1.1)	2.2 (2.1, 2.3)	2.7 (2.6, 2.8)	3.1 (3.0, 3.2)	3.5 (3.4, 3.6)	3.9 (3.7, 4.0)
TOTAL		16265	623824						

Note: Restricted to modern prostheses
Excludes 151,830 procedures with unknown ASA score

Figure KT17 Cumulative Percent Revision of Primary Total Knee Replacement by ASA Score and Age (Primary Diagnosis OA)



HR - adjusted for sex

ASA 1-2 <65 vs ASA 1-2 ≥65 years

0 - 6Mth: HR=1.06 (95% CI 0.96, 1.17), p=0.232
6Mth - 1.5Yr: HR=1.68 (95% CI 1.56, 1.81), p<0.001
1.5Yr - 2Yr: HR=1.80 (95% CI 1.60, 2.02), p<0.001
2Yr - 2.5Yr: HR=1.48 (95% CI 1.31, 1.68), p<0.001
2.5Yr+: HR=1.78 (95% CI 1.68, 1.90), p<0.001

ASA 1-2 <65 vs ASA 3-5 <65

0 - 6Mth: HR=0.55 (95% CI 0.49, 0.60), p<0.001
6Mth - 9Mth: HR=0.76 (95% CI 0.66, 0.87), p<0.001
9Mth - 4Yr: HR=0.86 (95% CI 0.81, 0.91), p<0.001
4Yr+: HR=0.97 (95% CI 0.90, 1.05), p=0.495

ASA 1-2 ≥65 years vs ASA 3-5 ≥65 years

0 - 3Mth: HR=0.52 (95% CI 0.47, 0.57), p<0.001
3Mth - 6Mth: HR=0.68 (95% CI 0.60, 0.78), p<0.001
6Mth - 1.5Yr: HR=0.81 (95% CI 0.75, 0.87), p<0.001
1.5Yr - 2Yr: HR=0.83 (95% CI 0.74, 0.94), p=0.002
2Yr+: HR=0.93 (95% CI 0.87, 0.99), p=0.023

ASA 3-5 <65 vs ASA 3-5 ≥65 years

0 - 2Wk: HR=1.17 (95% CI 0.94, 1.45), p=0.165
2Wk - 1Mth: HR=0.98 (95% CI 0.84, 1.13), p=0.769
1Mth - 3Mth: HR=0.98 (95% CI 0.87, 1.12), p=0.806
3Mth - 6Mth: HR=1.33 (95% CI 1.17, 1.52), p<0.001
6Mth - 2Yr: HR=1.61 (95% CI 1.51, 1.73), p<0.001
2Yr+: HR=1.79 (95% CI 1.67, 1.91), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
ASA 1-2	<65	120190	106208	80131	56883	36631	18892	4319
	≥65	202548	176870	130434	91001	56005	27581	5694
ASA 3-5	<65	61921	52662	37071	25098	15115	7187	1602
	≥65	169542	142610	97322	63132	35128	15282	2785

Note: Restricted to modern prostheses
Excludes 151,830 procedures with unknown ASA score

Primary Total Knee Replacement

Table KT21 Cumulative Percent Revision of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)

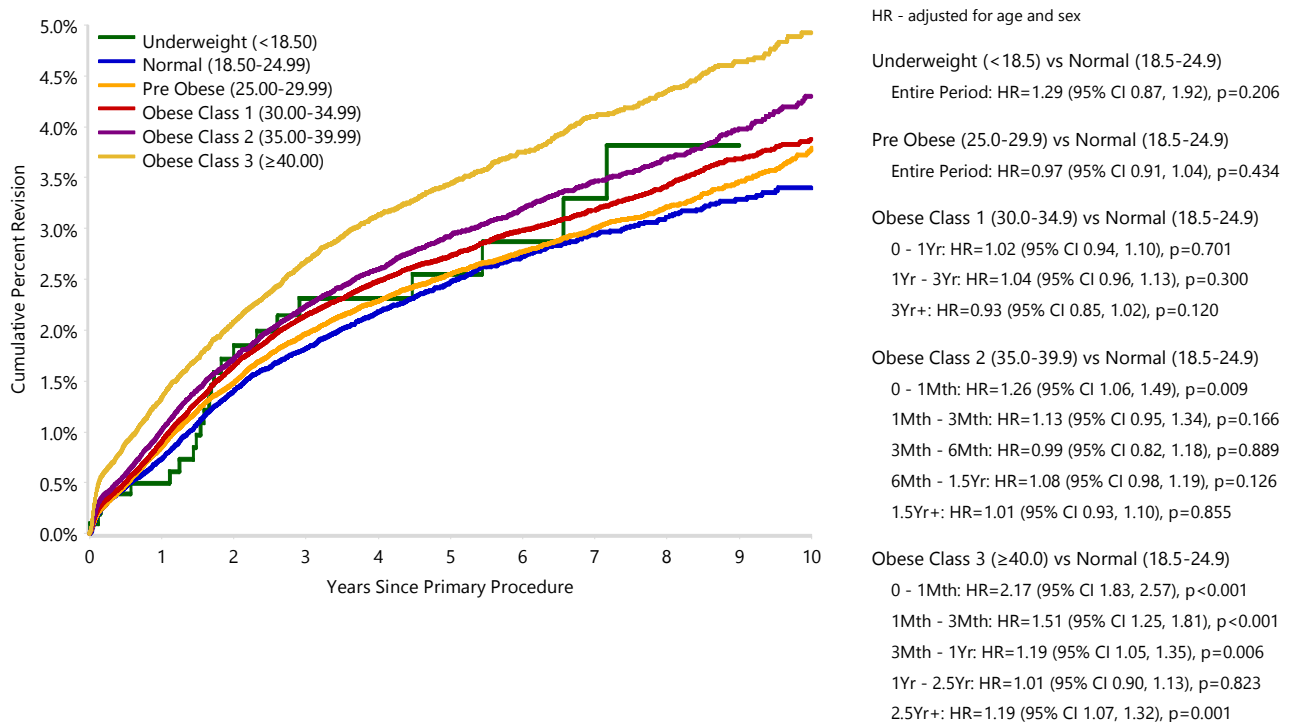
BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Underweight (<18.5)	25	1036	0.5 (0.2, 1.2)	2.3 (1.5, 3.6)	2.6 (1.6, 4.0)	3.3 (2.1, 5.2)	3.8 (2.4, 6.2)	3.8 (2.4, 6.2)
Normal (18.5-24.9)	1228	59840	0.7 (0.7, 0.8)	1.8 (1.7, 1.9)	2.5 (2.3, 2.6)	2.9 (2.8, 3.1)	3.1 (2.9, 3.3)	3.3 (3.1, 3.5)
Pre Obese (25.0-29.9)	3856	175975	0.9 (0.8, 0.9)	2.0 (1.9, 2.0)	2.6 (2.5, 2.6)	3.0 (2.9, 3.1)	3.2 (3.1, 3.3)	3.5 (3.3, 3.6)
Obese Class 1 (30.0-34.9)	4082	173007	0.9 (0.9, 1.0)	2.1 (2.1, 2.2)	2.7 (2.6, 2.8)	3.2 (3.1, 3.3)	3.4 (3.3, 3.5)	3.7 (3.6, 3.8)
Obese Class 2 (35.0-39.9)	2385	94299	1.0 (1.0, 1.1)	2.2 (2.1, 2.3)	2.9 (2.8, 3.1)	3.5 (3.3, 3.6)	3.7 (3.5, 3.9)	4.0 (3.8, 4.2)
Obese Class 3 (≥40.0)	1717	56169	1.3 (1.2, 1.4)	2.7 (2.5, 2.8)	3.4 (3.3, 3.6)	4.1 (3.9, 4.3)	4.4 (4.1, 4.6)	4.6 (4.4, 4.9)
TOTAL	13293	560326						

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Excludes 215,328 procedures with an unknown BMI

Figure KT18 Cumulative Percent Revision of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Underweight (<18.5)	1036	889	566	353	193	137	89
Normal (18.5-24.9)	59840	51247	35318	22911	12865	8742	5323
Pre Obese (25.0-29.9)	175975	151827	106061	70075	40320	27635	16615
Obese Class 1 (30.0-34.9)	173007	149434	104931	69760	40312	27708	16622
Obese Class 2 (35.0-39.9)	94299	81449	56727	37858	22134	15065	9047
Obese Class 3 (≥40.0)	56169	48675	34355	23322	13847	9474	5658

Note: Restricted to modern prostheses

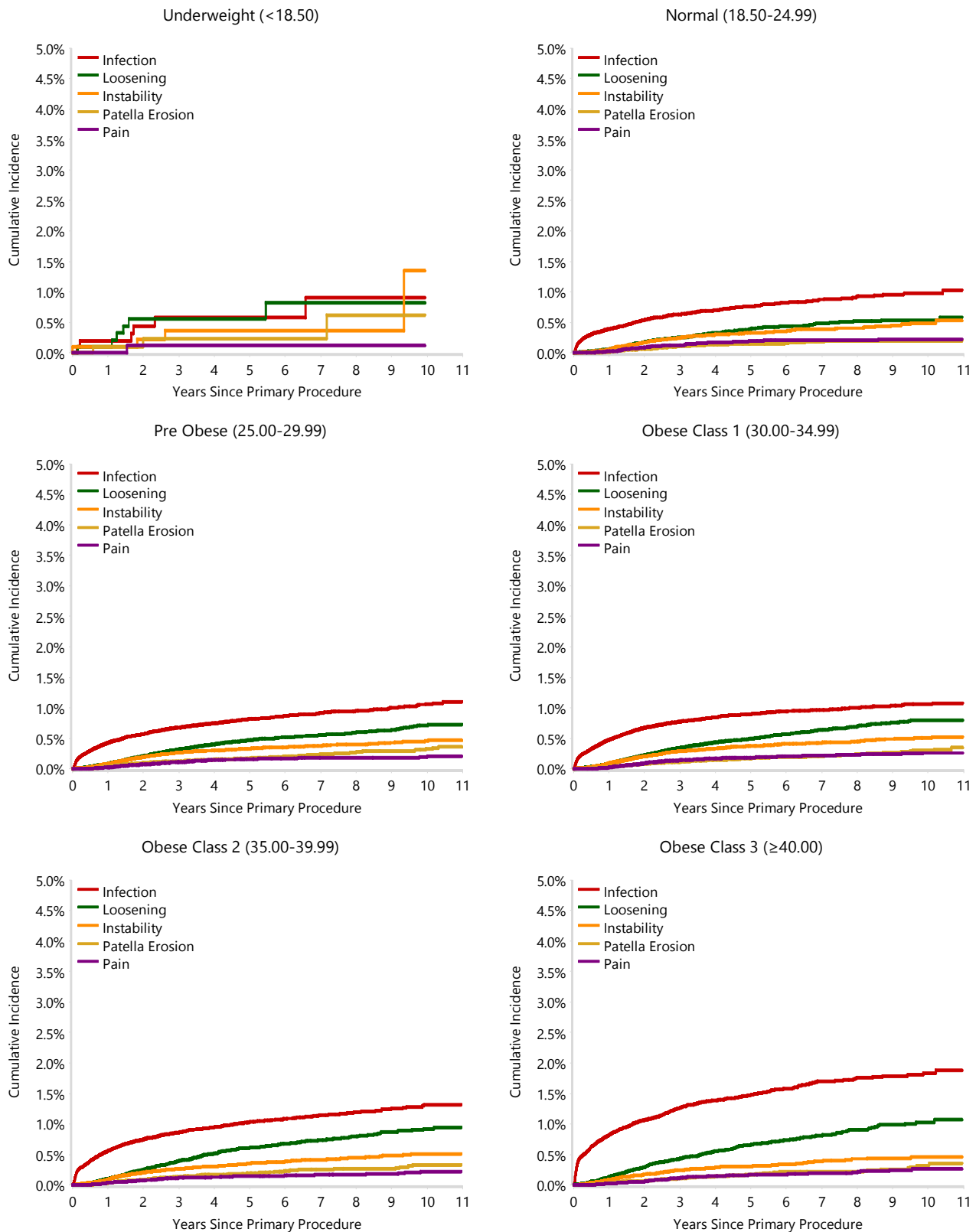
BMI has not been presented for patients aged ≤19 years

Excludes 215,328 procedures with an unknown BMI



Primary Total Knee Replacement

Figure KT19 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)



Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤ 19 years
Excludes 215,328 procedures with an unknown BMI

Primary Total Knee Replacement

Table KT22 Cumulative Percent Revision of Primary Total Knee Replacement by Obesity and Sex (Primary Diagnosis OA)

Obesity	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Not Obese	Male	2751	116585	1.0 (0.9, 1.0)	2.1 (2.0, 2.2)	2.7 (2.6, 2.8)	3.2 (3.1, 3.4)	3.7 (3.6, 3.9)	4.1 (3.8, 4.3)
	Female	2358	120266	0.7 (0.6, 0.7)	1.7 (1.7, 1.8)	2.3 (2.2, 2.4)	2.8 (2.6, 2.9)	3.1 (3.0, 3.3)	3.4 (3.2, 3.5)
Obese	Male	4012	137380	1.3 (1.2, 1.3)	2.7 (2.6, 2.8)	3.4 (3.3, 3.5)	3.9 (3.8, 4.1)	4.4 (4.3, 4.6)	4.7 (4.5, 4.9)
	Female	4172	186095	0.8 (0.8, 0.9)	1.9 (1.9, 2.0)	2.6 (2.5, 2.7)	3.1 (3.0, 3.2)	3.6 (3.5, 3.7)	3.8 (3.7, 4.0)
TOTAL		13293	560326						

Note: Restricted to modern prostheses

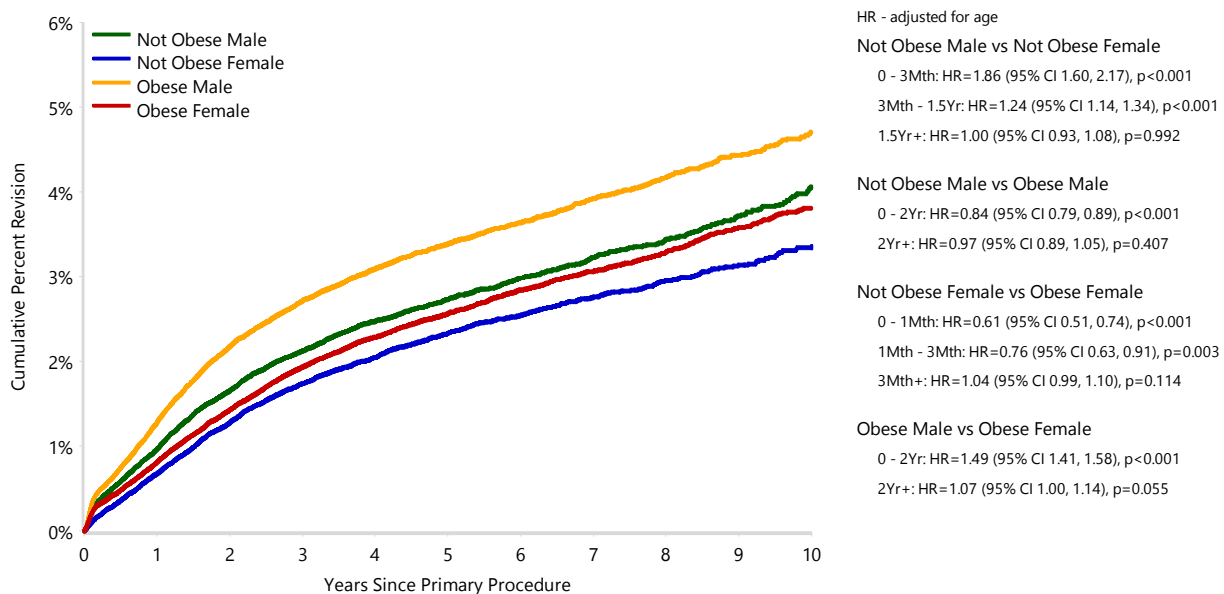
BMI has not been presented for patients aged ≤19 years

Excludes 215,328 procedures with an unknown BMI

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Figure KT20 Cumulative Percent Revision of Primary Total Knee Replacement by Obesity and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Not obese	Male	116585	100275	69710	45580	25679	10515	4613
	Female	120266	103688	72235	47759	27699	11512	5194
Obese	Male	137380	118001	82094	53777	30407	12109	5315
	Female	186095	161557	113919	77163	45886	19218	8437

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Excludes 215,328 procedures with an unknown BMI

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Primary Total Knee Replacement

Table KT23 Cumulative Percent Revision of Primary Total Knee Replacement by Obesity and Age (Primary Diagnosis OA)

Obesity	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Not Obese	<65	1790	58211	1.0 (0.9, 1.1)	2.6 (2.5, 2.7)	3.5 (3.3, 3.7)	4.1 (3.9, 4.4)	4.8 (4.5, 5.0)	5.2 (4.9, 5.5)
	≥65	3319	178640	0.8 (0.7, 0.8)	1.7 (1.6, 1.8)	2.2 (2.1, 2.3)	2.6 (2.5, 2.7)	2.9 (2.8, 3.1)	3.2 (3.0, 3.3)
Obese	<65	3905	123208	1.1 (1.0, 1.2)	2.7 (2.6, 2.8)	3.6 (3.4, 3.7)	4.2 (4.1, 4.4)	4.9 (4.7, 5.1)	5.3 (5.1, 5.5)
	≥65	4279	200267	1.0 (0.9, 1.0)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	2.9 (2.8, 3.0)	3.3 (3.2, 3.4)	3.4 (3.3, 3.6)
TOTAL		13293	560326						

Note: Restricted to modern prostheses

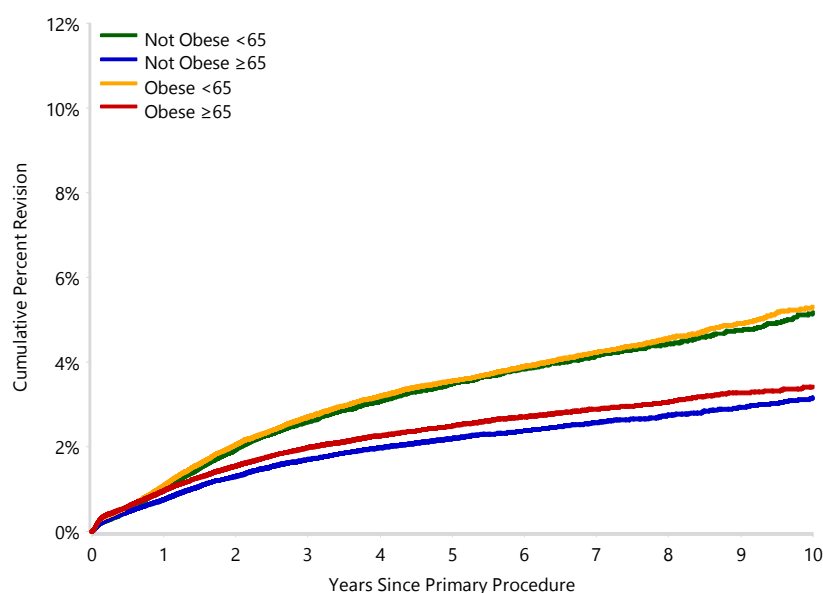
BMI has not been presented for patients aged ≤ 19 years

Excludes 215,328 procedures with unknown BMI

Not obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Figure KT21 Cumulative Percent Revision of Primary Total Knee Replacement by Obesity and Age (Primary Diagnosis OA)



HR - adjusted for sex

Not Obese <65 vs Not Obese ≥65

0 - 6Mth: HR=1.02 (95% CI 0.89, 1.16), p=0.825

6Mth - 1.5Yr: HR=1.67 (95% CI 1.50, 1.86), p<0.001

1.5Yr+: HR=1.75 (95% CI 1.62, 1.89), p<0.001

Not Obese <65 vs Obese <65

0 - 6Mth: HR=0.78 (95% CI 0.68, 0.90), p<0.001

6Mth - 9Mth: HR=1.15 (95% CI 0.96, 1.38), p=0.131

9Mth - 2Yr: HR=0.94 (95% CI 0.85, 1.04), p=0.229

2Yr+: HR=0.98 (95% CI 0.90, 1.07), p=0.700

Not Obese ≥65 vs Obese ≥65

0 - 1Mth: HR=0.63 (95% CI 0.55, 0.74), p<0.001

1Mth - 3Mth: HR=0.77 (95% CI 0.67, 0.88), p<0.001

3Mth - 6Mth: HR=0.95 (95% CI 0.82, 1.10), p=0.477

6Mth - 1Yr: HR=0.78 (95% CI 0.70, 0.87), p<0.001

1Yr - 1.5Yr: HR=0.94 (95% CI 0.83, 1.05), p=0.247

1.5Yr+: HR=0.92 (95% CI 0.86, 0.99), p=0.020

Obese <65 vs Obese ≥65

0 - 3Mth: HR=0.94 (95% CI 0.84, 1.04), p=0.213

3Mth - 9Mth: HR=1.18 (95% CI 1.07, 1.31), p=0.001

9Mth - 2Yr: HR=1.58 (95% CI 1.47, 1.71), p<0.001

2Yr - 2.5Yr: HR=1.53 (95% CI 1.34, 1.75), p<0.001

2.5Yr+: HR=1.67 (95% CI 1.55, 1.81), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Not Obese	<65	58211	50844	36805	25096	15006	6579	3032
	≥65	178640	153119	105140	68243	38372	15448	6775
Obese	<65	123208	107668	77139	52742	31717	13633	6053
	≥65	200267	171890	118874	78198	44576	17694	7699

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤ 19 years

Excludes 215,328 procedures with unknown BMI

Not obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Primary Total Knee Replacement

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Bearing Mobility

Tibial prostheses are either modular or non-modular. Modular prostheses have a metal baseplate and tibial insert, which may be fixed or mobile. Non-modular prostheses are either all-polyethylene or polyethylene moulded to a metal baseplate. In 2025, few all-polyethylene and non-modular tibial components were used. Moulded non-modular components have a lower rate of revision for the first 3 months compared to all polyethylene prostheses and for the first 1.5 years compared to fixed modular designs, with no

differences outside of these time periods (Table KT24 and Figure KT22).

Mobile bearing prostheses have a modular design where the tibial insert is designed to move relative to the baseplate. Fixed bearings include non-modular tibial prostheses, as well as modular designs with fixed inserts that do not move relative to the baseplate.

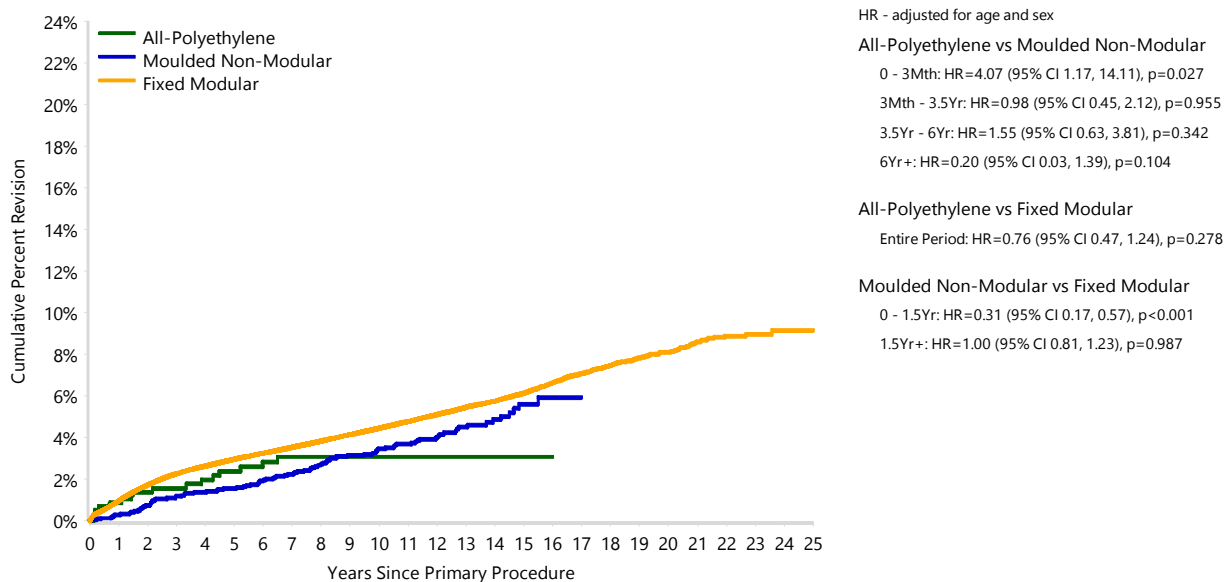
When adjusted for age, sex, fixation, and patella component usage, fixed bearing prostheses have a lower rate of revision compared to mobile bearing prostheses for the majority of the early period, but after 7 years, mobile designs have a lower rate of revision (Table KT25 and Figure KT23).

Table KT24 Cumulative Percent Revision of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)

Fixed Bearing Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All-Polyethylene	16	583	0.9 (0.4, 2.1)	1.6 (0.8, 3.0)	2.4 (1.4, 4.1)	3.1 (1.9, 5.0)	3.1 (1.9, 5.0)	
Moulded Non-Modular	100	2425	0.3 (0.1, 0.6)	1.2 (0.8, 1.7)	1.6 (1.1, 2.1)	3.5 (2.8, 4.3)	5.6 (4.5, 7.0)	
Fixed Modular	21822	674464	1.0 (0.9, 1.0)	2.3 (2.2, 2.3)	3.0 (2.9, 3.0)	4.5 (4.4, 4.5)	6.1 (6.0, 6.2)	8.1 (7.9, 8.4)
TOTAL	21938	677472						

Note: Restricted to modern prostheses

Figure KT22 Cumulative Percent Revision of Primary Total Knee Replacement by Fixed Bearing Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All-Polyethylene	583	564	514	455	137	54	11
Moulded Non-Modular	2425	2402	2325	2227	1845	412	0
Fixed Modular	674464	600223	459298	350275	144719	39342	5242

Note: Restricted to modern prostheses



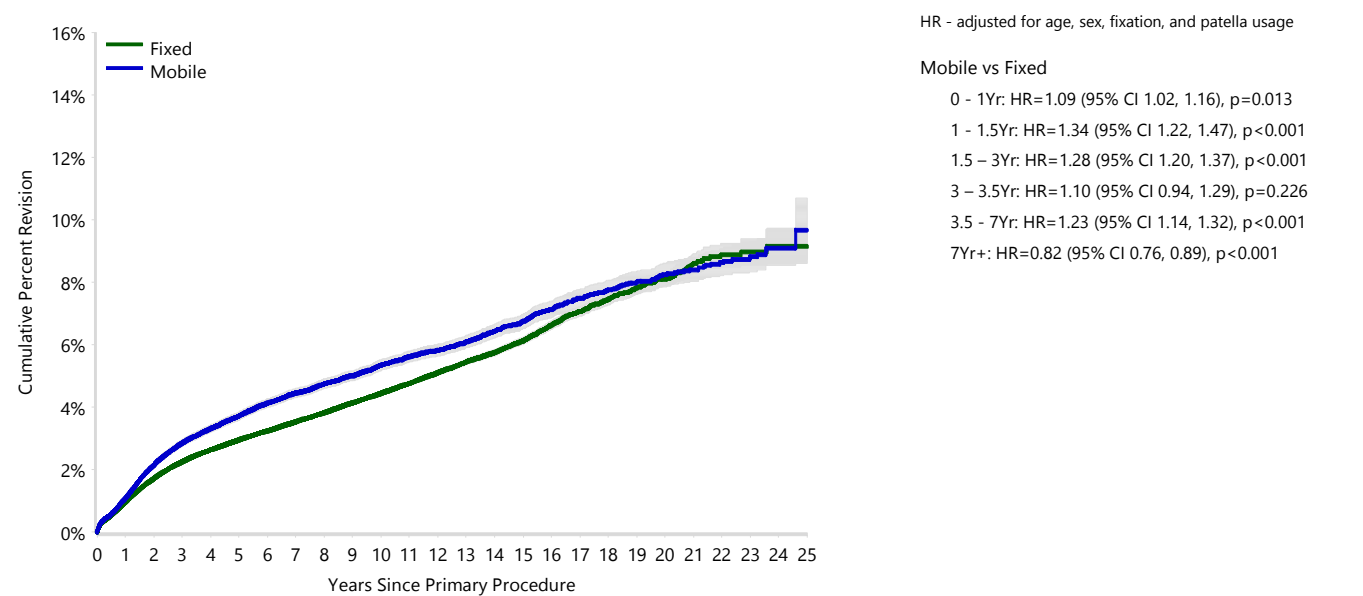
Primary Total Knee Replacement

Table KT25 Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)

Bearing Mobility	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	21938	677472	1.0 (0.9, 1.0)	2.3 (2.2, 2.3)	3.0 (2.9, 3.0)	4.4 (4.4, 4.5)	6.1 (6.0, 6.2)	8.1 (7.9, 8.4)
Mobile	4447	98000	1.1 (1.0, 1.2)	2.9 (2.7, 3.0)	3.7 (3.6, 3.8)	5.3 (5.2, 5.5)	6.7 (6.5, 7.0)	8.2 (7.9, 8.6)
TOTAL	26385	775472						

Note: Restricted to modern prostheses
Excludes 182 procedures with unknown bearing mobility

Figure KT23 Cumulative Percent Revision of Primary Total Knee Replacement by Bearing Mobility (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Fixed	677472	603189	462137	352957	146701	39808	5253
Mobile	98000	91254	77307	62919	31727	11271	3824

Note: Restricted to modern prostheses
Excludes 182 procedures with unknown bearing mobility

Primary Total Knee Replacement

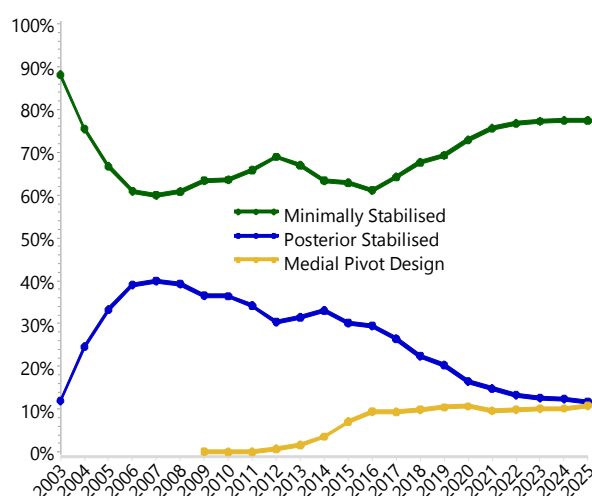
Stability

Stability refers to particular prosthetic features intended to substitute for the intrinsic stability of knee ligaments. In 2018, the classification of stability was expanded to include medial pivot design. The five categories are: minimally stabilised, medial pivot design, posterior stabilised, fully stabilised, and hinged prostheses.

Minimally stabilised prostheses are defined as those that have a flat or dished tibial articulation, regardless of congruency. Medial pivot design prostheses have a ball-and-socket medial portion of the articulation. Posterior stabilised prostheses provide additional posterior stability, most commonly using a peg and box design.

The use of minimally stabilised prostheses has remained relatively constant over the last 10 years. In 2025, these accounted for 77.4% of primary procedures. The use of posterior stabilised prostheses has declined to 11.8% in 2025. The use of medial pivot design prostheses has increased since 2014. In 2025, medial pivot design prostheses accounted for 10.8% of primary procedures (Figure KT24).

Figure KT24 Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Posterior stabilised prostheses have higher rates of revision compared to minimally stabilised prostheses. Medial pivot design prostheses have a lower rate of revision compared to posterior stabilised prostheses. Medial pivot design prostheses overall are similar to minimally stabilised but do have a higher rate of revision in the first 1.5 years, no difference between 1.5 and 3 years, and then a lower rate after 3 years (Table KT26 and Figure KT25).

The cumulative incidence for the different reasons for revision varies depending on stability. Posterior stabilised prostheses have a higher cumulative incidence of revision for infection

and for loosening when compared to minimally stabilised and medial pivot design prostheses.

Medial pivot design prostheses have a higher cumulative incidence of revision for instability compared to minimally stabilised prostheses (Figure KT26).

Prosthesis performance can also be analysed by polyethylene insert shape. Some prostheses offer tibial polyethylene inserts with differing levels of conformity to be used with a cruciate retaining femoral component. Conceptually, these sit between the minimally stabilised and posterior stabilised designs. These are described as 'anterior lipped', 'anterior stabilised', 'asymmetrically stabilised', 'medially stabilised', 'medially congruent', 'deep dish' or 'ultra-congruent' designs, which are intended to provide additional stability.

When prostheses with low polyethylene conformity are compared to those with high polyethylene conformity using XLPE, there is no difference in the rate of revision (Table KT27 and Figure KT27). The most common reasons for revision are shown in Figure KT28. The outcome of total knee replacement with XLPE by prosthesis combination and polyethylene insert shape is presented in Table KT28 and Table KT29. When prosthesis specific analyses are carried out, there is no difference when inserts with low conformity are compared to the ultra-congruent or deep dish designs, but the medially congruent shaped s inserts generally have a higher rate of revision than inserts with low conformity. Table KT28 and Table KT29

Fully Stabilised and Hinged Prostheses

Fully stabilised (large peg and box design) and hinged knees are uncommonly used prostheses that compensate for collateral or posterior cruciate ligament laxity or deficiency. While these knee prostheses are usually considered to be revision components, they can also be used in complex primary clinical situations.

Fully constrained and hinged knee designs are used in 0.8% of primary procedures. Whereas osteoarthritis is the most frequent diagnosis for all primary total knee replacements, fully stabilised prostheses are used in a higher proportion for rheumatoid arthritis. Hinged prostheses are used proportionally more for tumour, fracture, osteonecrosis, and other inflammatory arthritis (Table KT30).

Fully stabilised prostheses have been used in 3,896 primary procedures and hinged prostheses in 3,833 primary procedures. For these two knee designs, the cumulative percent revision for all diagnoses is shown in Table KT31 and Figure KT29.

When the outcome for osteoarthritis is considered, fully stabilised and hinged knee prostheses both have higher rates of revision compared to minimally stabilised prostheses (Table KT26 and Figure KT30). For both of these designs, infection is the most common reason for revision, followed by loosening, fracture and instability (Table KT32 and Figure KT31).

Primary Total Knee Replacement

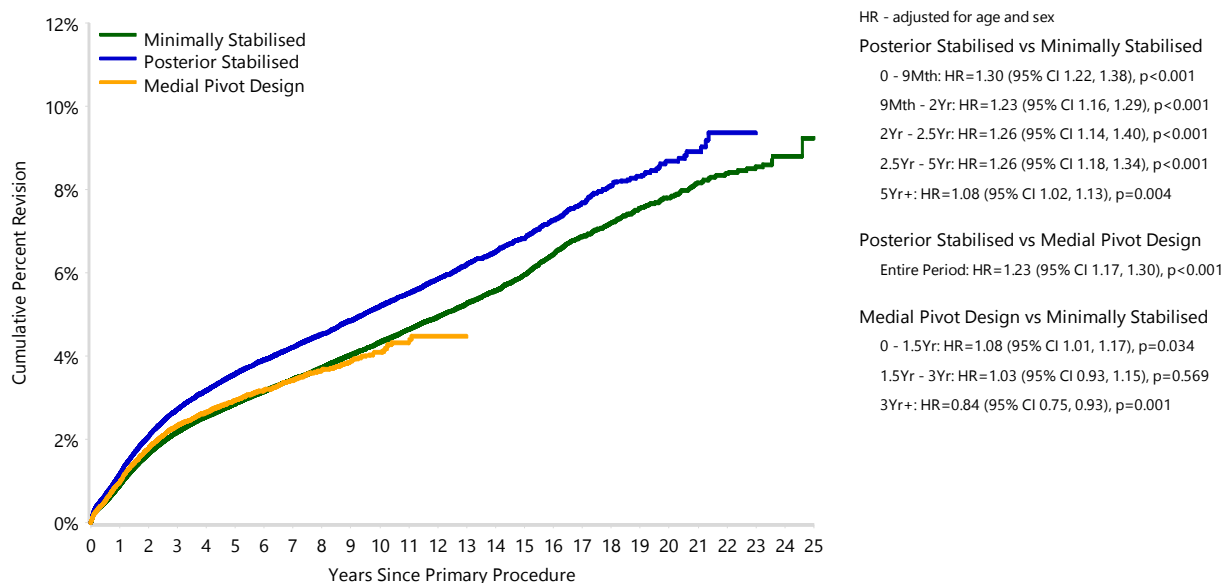
When used for osteoarthritis, fully stabilised and hinged prostheses have a higher revision rate than Minimally Stabilised prostheses.

Table KT26 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

Stability	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	17065	545973	0.9 (0.9, 0.9)	2.2 (2.1, 2.2)	2.9 (2.8, 2.9)	4.3 (4.3, 4.4)	6.0 (5.8, 6.1)	7.8 (7.6, 8.0)
Posterior Stabilised	7452	165304	1.2 (1.1, 1.2)	2.7 (2.6, 2.8)	3.6 (3.5, 3.7)	5.2 (5.1, 5.3)	6.8 (6.6, 7.0)	8.7 (8.3, 9.1)
Medial Pivot Design	1483	58280	1.0 (0.9, 1.1)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.1 (3.8, 4.4)		
Fully Stabilised	199	3576	2.5 (2.0, 3.1)	4.6 (3.9, 5.3)	5.7 (4.9, 6.6)	7.3 (6.3, 8.5)	9.1 (7.5, 10.9)	
Hinged	186	2339	3.4 (2.7, 4.2)	6.7 (5.7, 7.9)	8.3 (7.1, 9.7)	11.9 (10.2, 13.9)	14.7 (11.7, 18.4)	
TOTAL	26385	775472						

Note: Restricted to modern prostheses
Excludes 182 procedures with unknown stability

Figure KT25 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

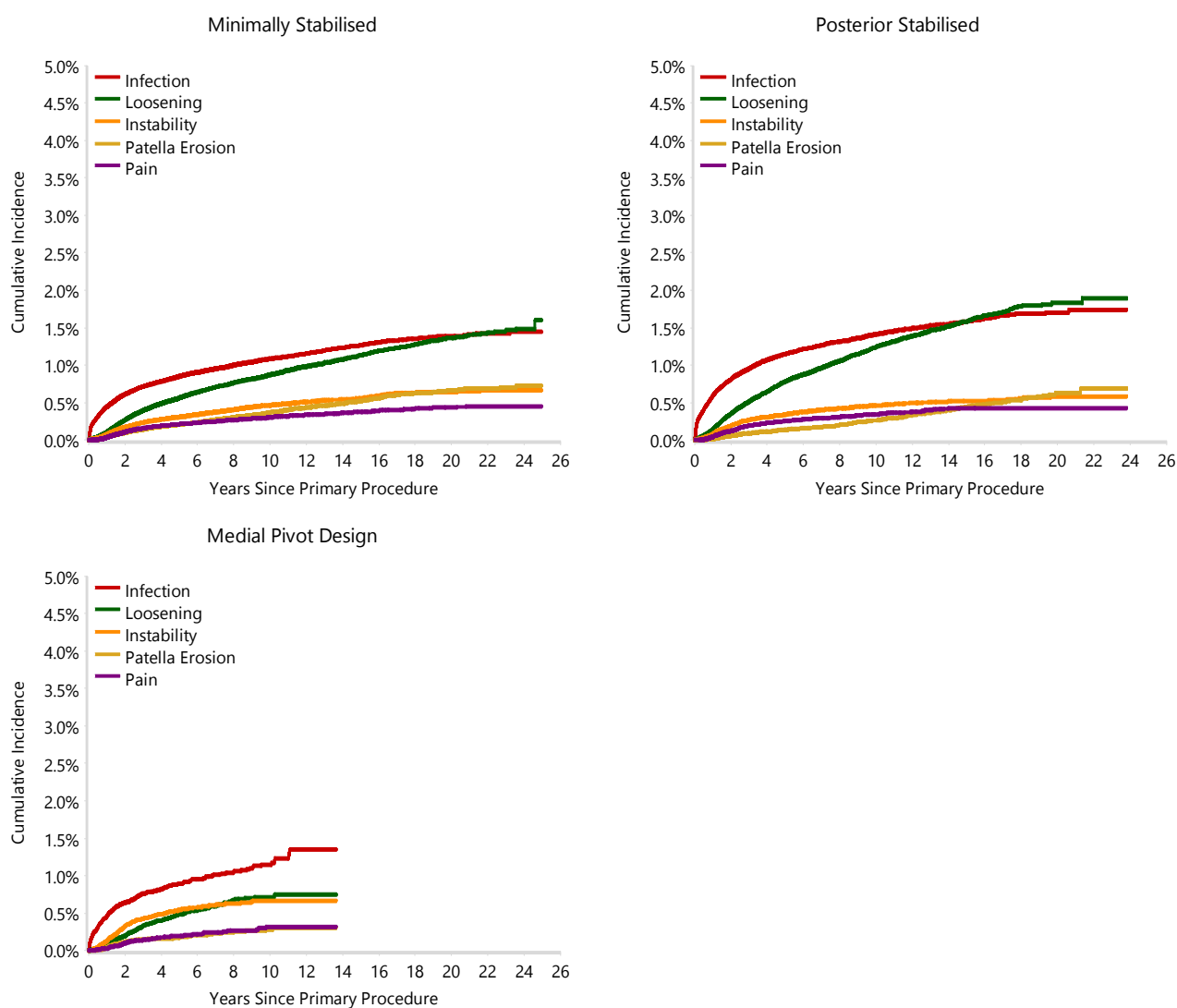


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	545973	484974	368044	276466	117894	34594	7366
Posterior Stabilised	165304	154277	132370	112543	56369	16319	1701
Medial Pivot Design	58280	50023	35234	24140	3365	14	0

Note: Restricted to modern prostheses

Primary Total Knee Replacement

Figure KT26 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses



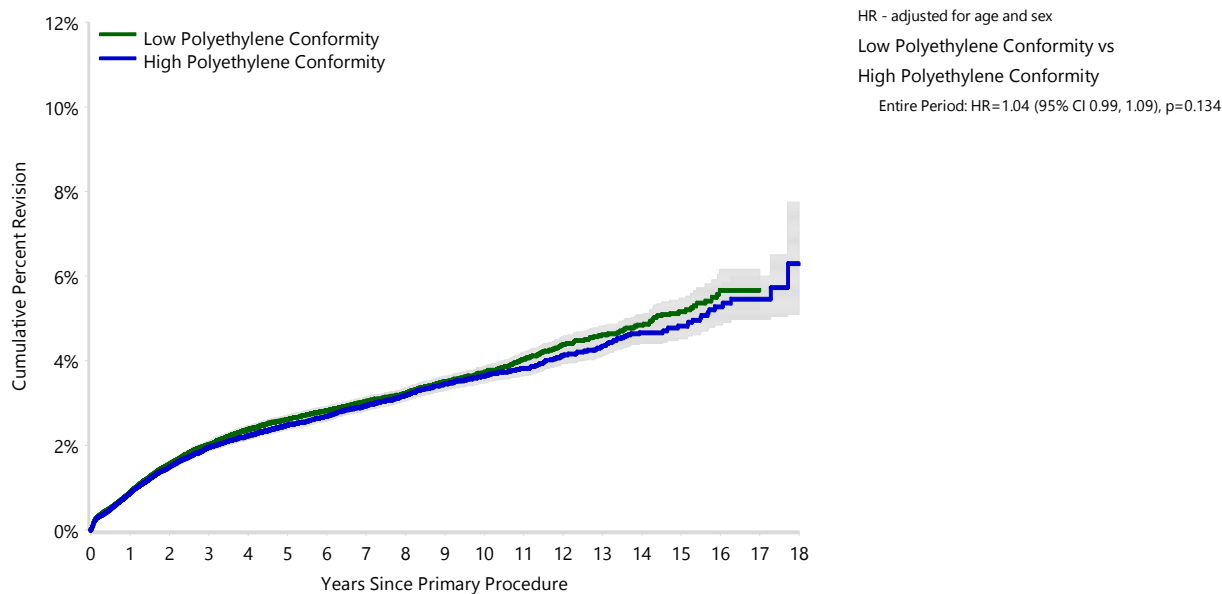
Primary Total Knee Replacement

Table KT27 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement with XLPE by Polyethylene Conformity (Primary Diagnosis OA)

Polyethylene Conformity	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Low Polyethylene Conformity	3393	119923	0.9 (0.8, 0.9)	2.0 (1.9, 2.1)	2.6 (2.5, 2.7)	3.0 (2.9, 3.2)	3.7 (3.6, 3.9)
High Polyethylene Conformity	2828	121178	0.9 (0.8, 0.9)	1.9 (1.9, 2.0)	2.5 (2.4, 2.6)	2.9 (2.8, 3.1)	3.6 (3.5, 3.8)
TOTAL	6221	241101					

Note: Restricted to modern prostheses

Figure KT27 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement with XLPE by Polyethylene Conformity (Primary Diagnosis OA)



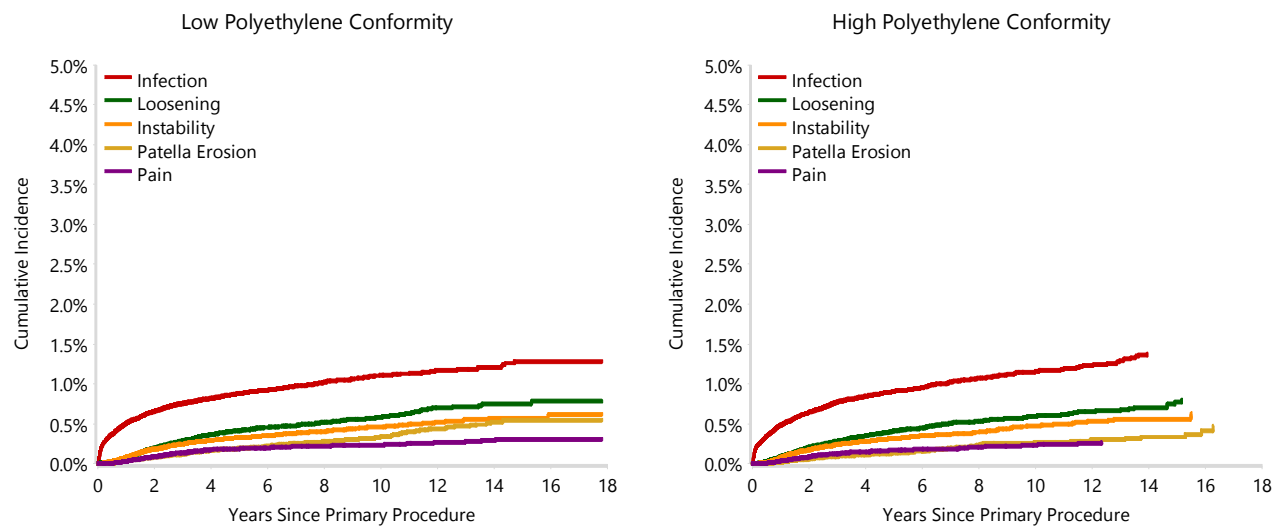
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Low Polyethylene Conformity	119923	111543	90876	72239	49431	21574
High Polyethylene Conformity	121178	104616	75540	53690	33304	15622

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT28 Cumulative Incidence Revision Diagnosis of Minimally Stabilised Primary Total Knee Replacement with XLPE by Polyethylene Conformity (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT28 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement with XLPE by Prosthesis Combination and Polyethylene Insert Shape (Primary Diagnosis OA)

Prosthesis Combination	Polyethylene Shape	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Genesis II/Genesis II	CR High Flex	313	9238	1.1 (0.9, 1.3)	2.4 (2.1, 2.7)	3.0 (2.7, 3.4)	3.6 (3.2, 4.0)	4.8 (4.2, 5.4)	
	Deep Dish	25	1497	0.7 (0.4, 1.3)	1.8 (1.2, 2.8)	2.9 (1.8, 4.6)			
Legion Oxinium/Genesis II	Cruciate Retaining	299	10446	0.9 (0.7, 1.1)	2.3 (2.0, 2.7)	3.1 (2.8, 3.6)	3.7 (3.3, 4.2)	4.5 (3.9, 5.2)	
	Ultra-Congruent	29	1332	1.0 (0.6, 1.7)	2.6 (1.8, 3.8)	2.6 (1.8, 3.8)			
Legion/Genesis II	Cruciate Retaining	227	7159	1.1 (0.9, 1.4)	2.6 (2.2, 3.0)	3.5 (3.0, 4.0)	3.9 (3.4, 4.4)	4.3 (3.7, 5.1)	
	Ultra-Congruent	45	1417	1.3 (0.8, 2.1)	3.3 (2.4, 4.6)	4.3 (3.2, 5.8)			
Persona	Cruciate Retaining	527	27607	1.0 (0.9, 1.1)	1.9 (1.8, 2.1)	2.4 (2.2, 2.6)	2.6 (2.4, 2.9)	3.0 (2.4, 3.8)	
	Medial-Congruent	888	59598	0.8 (0.7, 0.9)	1.9 (1.7, 2.0)	2.4 (2.3, 2.6)	2.7 (2.4, 3.1)		
	Ultra-Congruent	146	6869	1.1 (0.9, 1.4)	2.2 (1.8, 2.6)	2.5 (2.1, 2.9)	2.8 (2.4, 3.4)		
Triathlon/Triathlon	Cruciate Retaining	1769	69839	0.7 (0.7, 0.8)	1.7 (1.6, 1.8)	2.2 (2.1, 2.3)	2.6 (2.5, 2.8)	3.3 (3.1, 3.5)	4.7 (4.4, 5.1)
	Condylar Stabilising	1980	78765	0.8 (0.7, 0.9)	1.8 (1.7, 1.9)	2.4 (2.3, 2.5)	2.8 (2.7, 3.0)	3.6 (3.4, 3.7)	4.7 (4.4, 5.1)
TOTAL		6248	273767						

Note: Restricted to modern prostheses. Only prosthesis that have >500 procedures in each conformity category with a follow-up of >3 years are shown

Table KT29 Comparisons of Revision Rates for Minimally Stabilised Primary Total Knee Replacement with XLPE by Prosthesis Combination and Polyethylene Insert Shape (Primary Diagnosis OA)

Prosthesis Combination	Comparison	Hazard Ratio – adjusted for age and sex
Genesis II/Genesis II	CR High Flex vs Deep Dish	Entire Period: HR=1.18 (95% CI 0.78, 1.78), p=0.439
Legion Oxinium/Genesis II	Cruciate Retaining vs Ultra-Congruent	Entire Period: HR=1.01 (95% CI 0.69, 1.49), p=0.951
Legion/Genesis II	Cruciate Retaining vs Ultra-Congruent	Entire Period: HR=0.85 (95% CI 0.62, 1.17), p=0.325
Persona	Cruciate Retaining vs Ultra-Congruent	Entire Period: HR=0.92 (95% CI 0.76, 1.10), p=0.363
	Cruciate Retaining vs Medial-Congruent	0 - 2.5Yr: HR=1.12 (95% CI 1.00, 1.26), p=0.056
		2.5Yr+: HR=0.69 (95% CI 0.54, 0.89), p=0.004
Triathlon/Triathlon	Cruciate Retaining vs Condylar Stabilising	Entire Period: HR=0.93 (95% CI 0.88, 1.00), p=0.045

Note: Restricted to modern prostheses

Primary Total Knee Replacement

Table KT30 Primary Total Knee Replacement by Primary Diagnosis and Stability

Primary Diagnosis	Fully Stabilised		Hinged		TOTAL	
	N	%	N	%	N	%
Osteoarthritis	3576	91.8	2339	61.0	5915	76.5
Tumour	9	0.2	803	20.9	812	10.5
Fracture	58	1.5	390	10.2	448	5.8
Rheumatoid Arthritis	152	3.9	103	2.7	255	3.3
Other Inflammatory Arthritis	49	1.3	57	1.5	106	1.4
Osteonecrosis	32	0.8	57	1.5	89	1.2
Other	20	0.5	84	2.2	104	1.3
TOTAL	3896	100.0	3833	100.0	7729	100.0

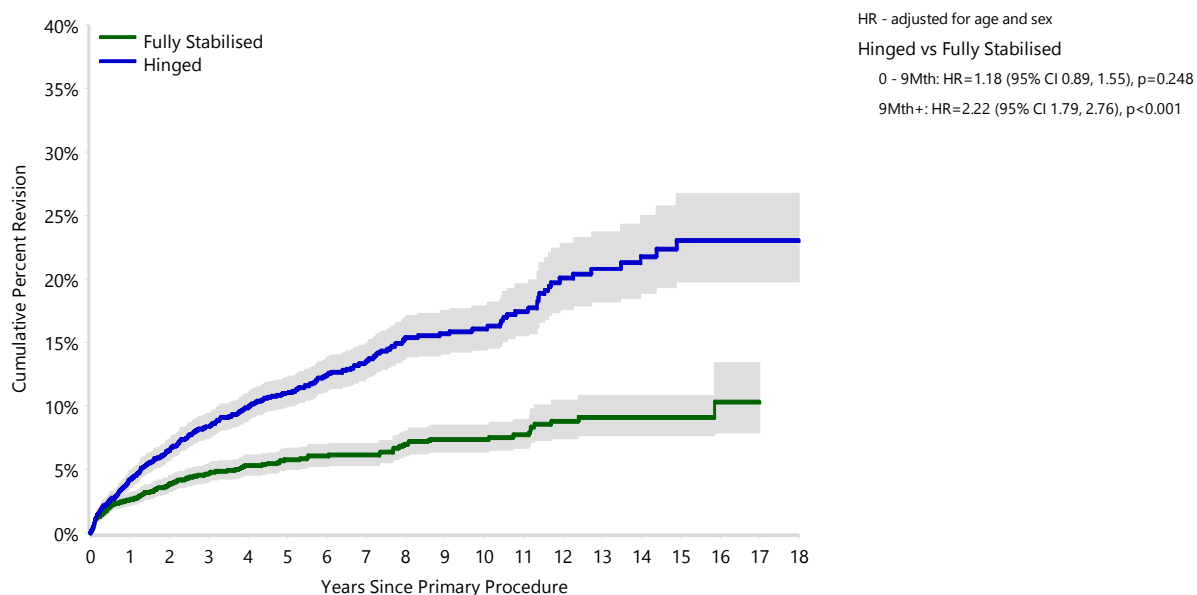
Note: Restricted to modern prostheses

Table KT31 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (All Diagnoses)

Stability	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fully Stabilised	221	3896	2.6 (2.2, 3.2)	4.7 (4.0, 5.4)	5.8 (5.0, 6.7)	6.1 (5.3, 7.0)	7.4 (6.4, 8.5)	9.1 (7.7, 10.9)
Hinged	403	3833	4.2 (3.6, 4.9)	8.4 (7.5, 9.4)	11.0 (9.9, 12.3)	13.5 (12.2, 15.0)	16.1 (14.4, 17.9)	23.0 (19.8, 26.7)
TOTAL	624	7729						

Note: Restricted to modern prostheses

Figure KT29 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (All Diagnoses)



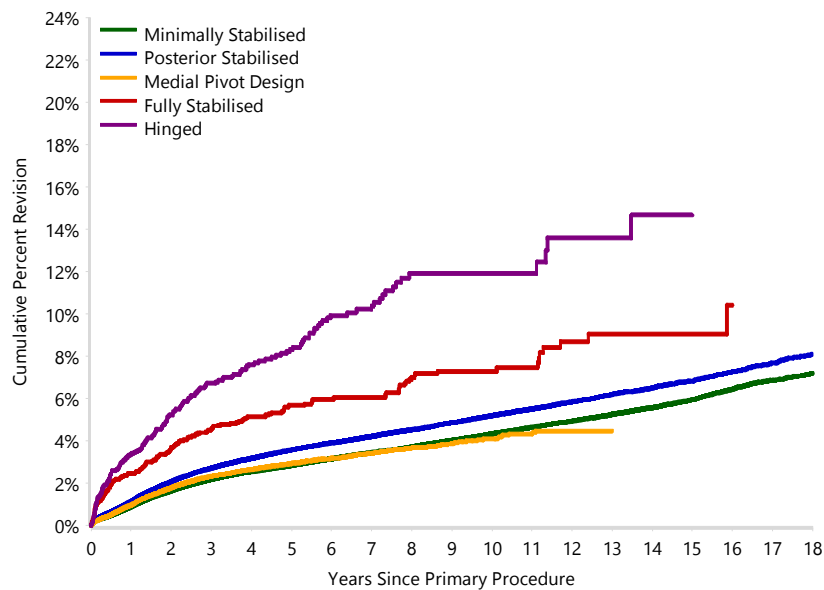
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fully Stabilised	3896	3416	2614	1952	1340	633	121
Hinged	3833	3174	2186	1461	888	412	113

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT30 Cumulative Percent Revision of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	545973	484974	368044	276466	117894	34594	7366
Posterior Stabilised	165304	154277	132370	112543	56369	16319	1701
Medial Pivot Design	58280	50023	35234	24140	3365	14	0
Fully Stabilised	3576	3148	2396	1803	576	106	8
Hinged	2339	2021	1400	924	224	46	2

Note: Restricted to modern prostheses

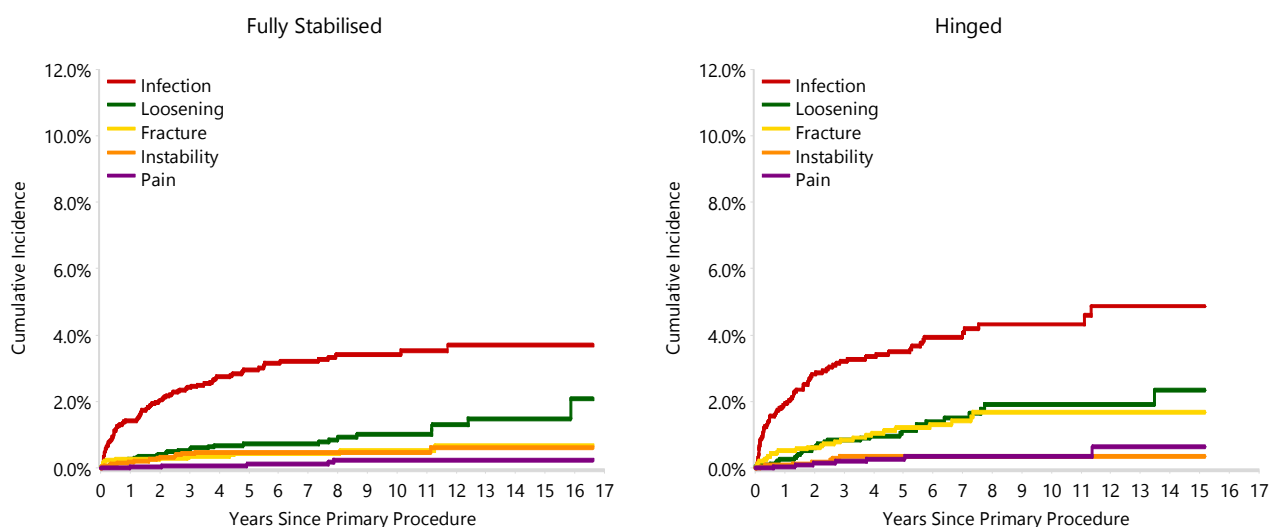
Primary Total Knee Replacement

Table KT32 Revision Diagnosis of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)

Revision Diagnosis	Fully Stabilised			Hinged		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	103	2.9	51.8	83	3.5	44.6
Loosening	30	0.8	15.1	29	1.2	15.6
Fracture	16	0.4	8.0	27	1.2	14.5
Instability	16	0.4	8.0	7	0.3	3.8
Bearing Dislocation	7	0.2	3.5	4	0.2	2.2
Patella Erosion	6	0.2	3.0	5	0.2	2.7
Other	21	0.6	10.6	31	1.3	16.7
N Revision	199	5.6	100.0	186	8.0	100.0
N Primary	3576			2339		

Note: Restricted to modern prostheses

Figure KT31 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Stability (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Knee Replacement

Patellar Resurfacing

Primary total knee replacement procedures with patellar resurfacing have a lower rate of revision compared to procedures without patellar resurfacing from 6 months onwards (Table KT33 and Figure KT32).

When the type of patella replacement is assessed, metal backed patella components have a higher rate of revision compared to all polyethylene patella components (Table KT34 and Figure KT33).

Procedures with patellar resurfacing have a lower rate of revision for each of the three common stability types (for minimally stabilised components, this is only after 3 months) (Table KT35, Figure KT34, Figure KT35 and Figure KT36).

There are seven prosthesis combinations that are used with and without patella resurfacing with >10,000 procedures in each patella usage group. There is prosthesis specific variation with patella use. These are shown in Table KT36 and Table KT37.

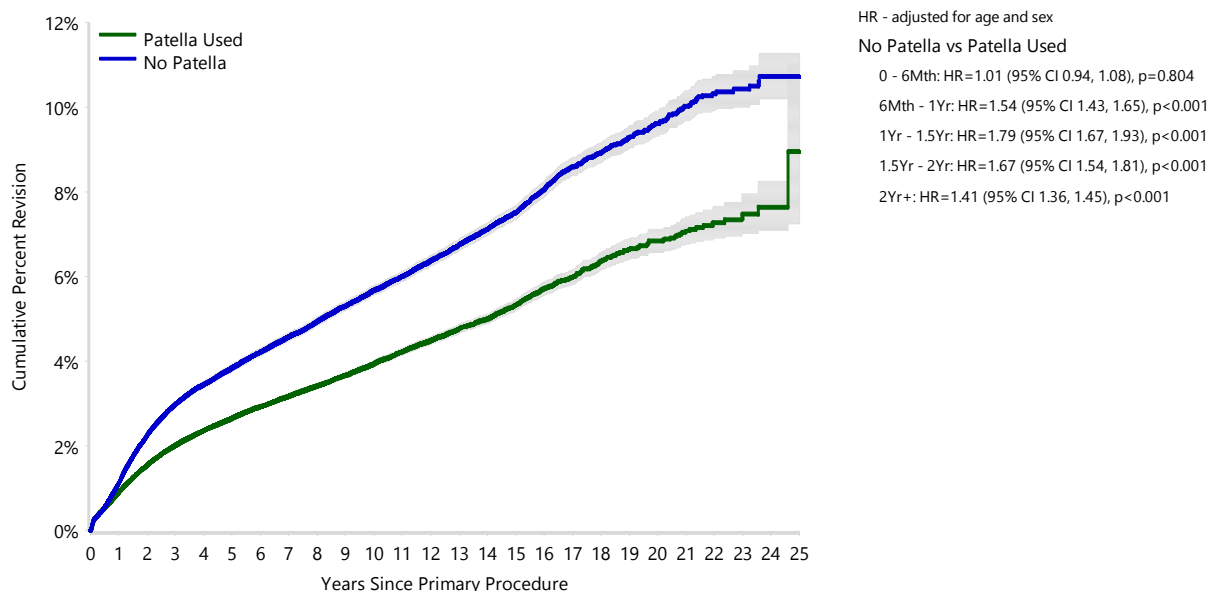
Metal-backed patella components have a higher rate of revision than all-polyethylene designs.

Table KT33 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Component Usage (Primary Diagnosis OA)

Patella Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	14563	535857	0.9 (0.9, 0.9)	2.0 (2.0, 2.1)	2.7 (2.6, 2.7)	3.9 (3.9, 4.0)	5.3 (5.2, 5.5)	6.8 (6.6, 7.1)
No Patella	11829	239797	1.1 (1.1, 1.2)	3.0 (2.9, 3.1)	3.8 (3.8, 3.9)	5.7 (5.6, 5.8)	7.5 (7.4, 7.7)	9.6 (9.3, 9.9)
TOTAL	26392	775654						

Note: Restricted to modern prostheses

Figure KT32 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Component Usage (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	535857	471520	351485	258858	95404	23633	4063
No Patella	239797	223092	188075	157104	83079	27468	5021

Note: Restricted to modern prostheses

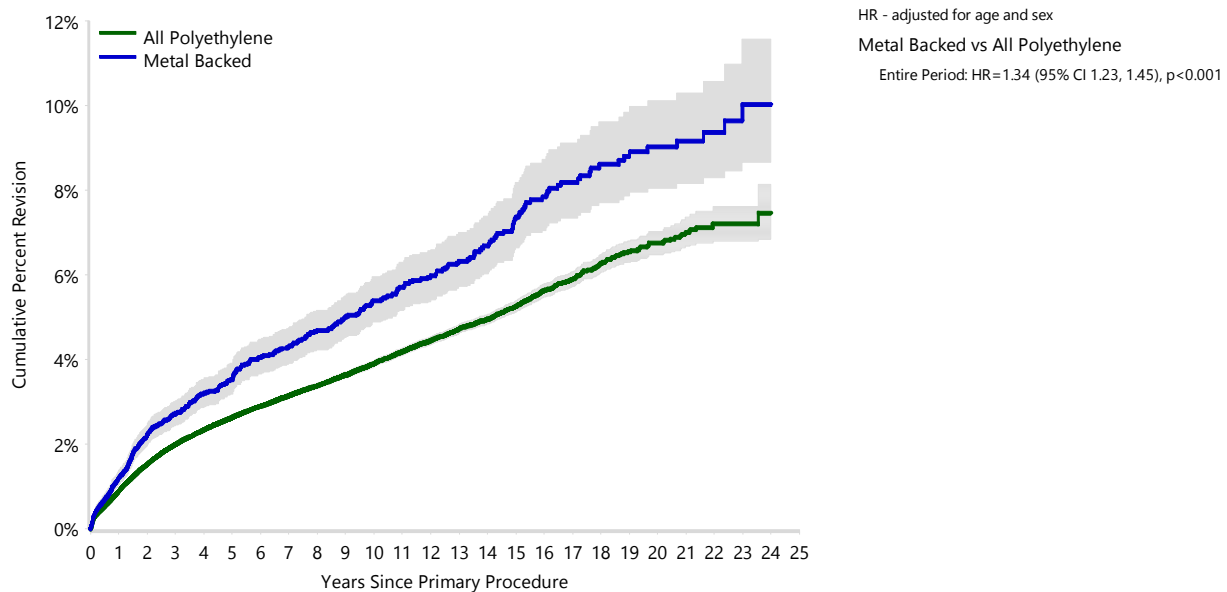
Primary Total Knee Replacement

Table KT34 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Type (Primary Diagnosis OA)

Patella Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All Polyethylene	13989	516916	0.9 (0.9, 0.9)	2.0 (2.0, 2.0)	2.6 (2.6, 2.7)	3.9 (3.8, 4.0)	5.3 (5.1, 5.4)	6.7 (6.5, 7.0)
Metal Backed	574	18916	1.2 (1.0, 1.4)	2.7 (2.5, 3.0)	3.5 (3.2, 3.9)	5.4 (4.9, 6.0)	7.4 (6.6, 8.2)	9.0 (8.0, 10.1)
TOTAL	14563	535832						

Note: Restricted to modern prostheses
Excludes 25 procedures with unknown patella type

Figure KT33 Cumulative Percent Revision of Primary Total Knee Replacement by Patella Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
All Polyethylene	516916	457828	344491	253201	92196	21981	3318
Metal Backed	18916	13671	6983	5652	3208	1652	745

Note: Restricted to modern prostheses
Excludes 25 procedures with unknown patella type

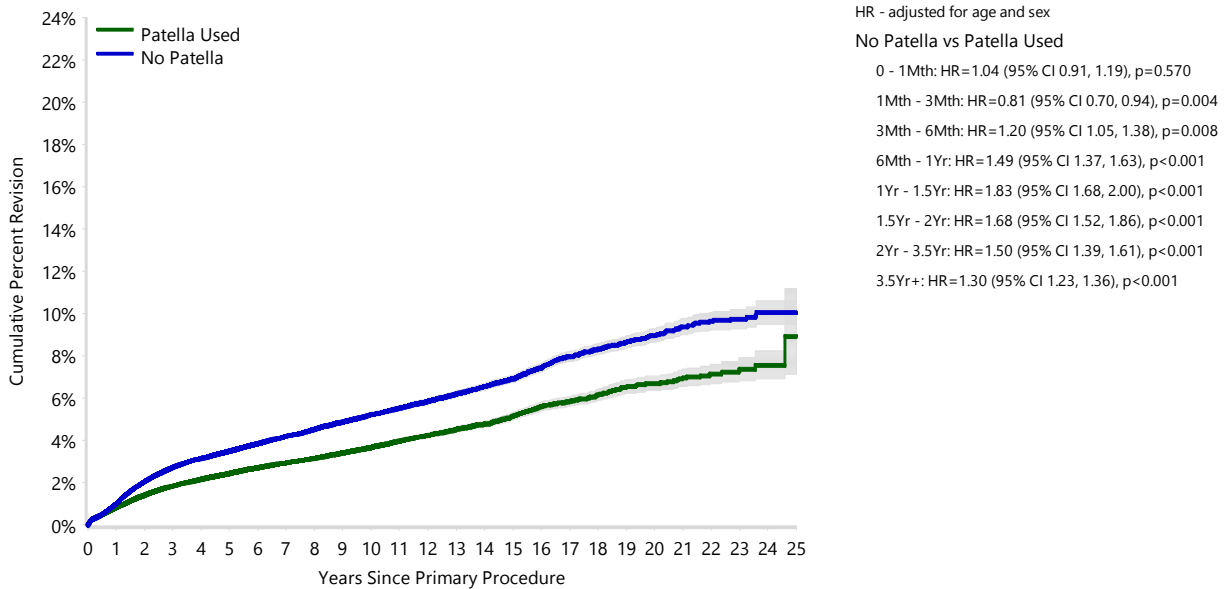
Primary Total Knee Replacement

Table KT35 Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Patella Component Usage (Primary Diagnosis OA)

Stability	Patella Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised	Patella Used	8431	354074	0.8 (0.8, 0.9)	1.8 (1.8, 1.9)	2.4 (2.4, 2.5)	3.7 (3.6, 3.8)	5.2 (5.0, 5.3)	6.7 (6.4, 7.0)
	No Patella	8634	191899	1.0 (1.0, 1.1)	2.7 (2.6, 2.8)	3.5 (3.4, 3.6)	5.2 (5.1, 5.3)	6.9 (6.7, 7.1)	9.0 (8.6, 9.3)
Posterior Stabilised	Patella Used	5048	136280	1.1 (1.0, 1.1)	2.4 (2.3, 2.4)	3.1 (3.0, 3.2)	4.5 (4.4, 4.6)	5.8 (5.6, 6.0)	7.2 (6.8, 7.7)
	No Patella	2404	29024	1.7 (1.5, 1.8)	4.3 (4.1, 4.6)	5.6 (5.4, 5.9)	8.0 (7.6, 8.3)	10.3 (9.9, 10.7)	12.7 (11.9, 13.5)
Medial Pivot Design	Patella Used	821	40804	0.9 (0.8, 0.9)	1.9 (1.8, 2.1)	2.4 (2.3, 2.6)	3.2 (3.0, 3.5)		
	No Patella	662	17476	1.2 (1.1, 1.4)	3.2 (3.0, 3.5)	4.0 (3.7, 4.4)	5.6 (5.2, 6.2)		
TOTAL		26000	769557						

Note: Restricted to modern prostheses

Figure KT34 Cumulative Percent Revision of Primary Total Knee Replacement by Minimally Stabilised Prostheses and Patella Component Usage (Primary Diagnosis OA)

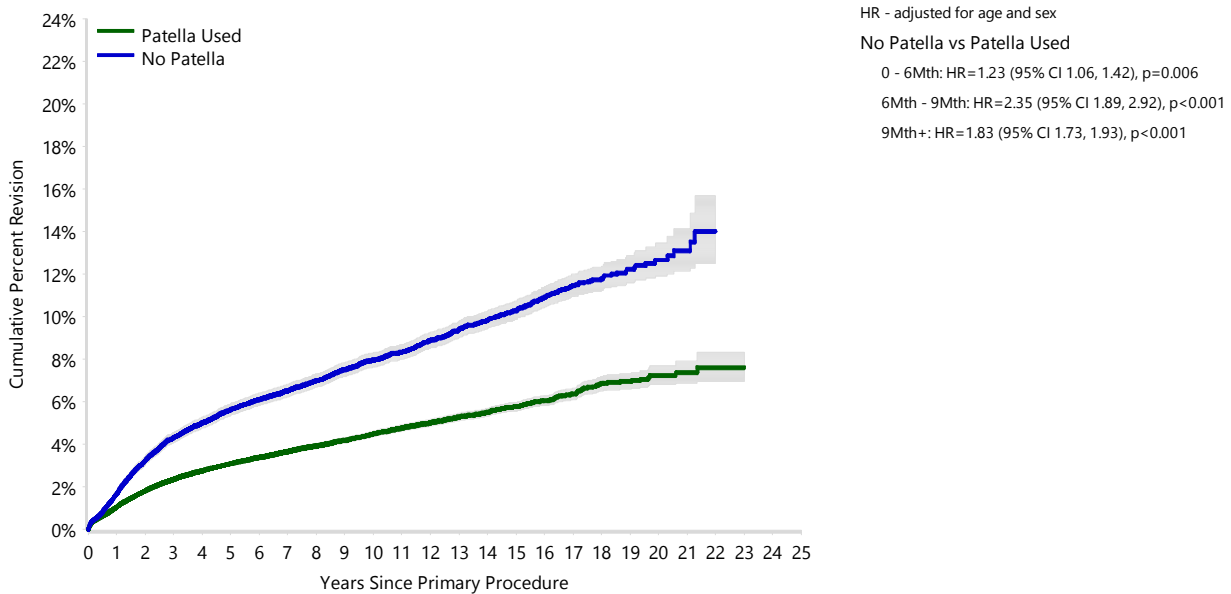


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	354074	306230	217963	151966	52177	13426	2899
No Patella	191899	178744	150081	124500	65717	21168	4467

Note: Restricted to modern prostheses

Primary Total Knee Replacement

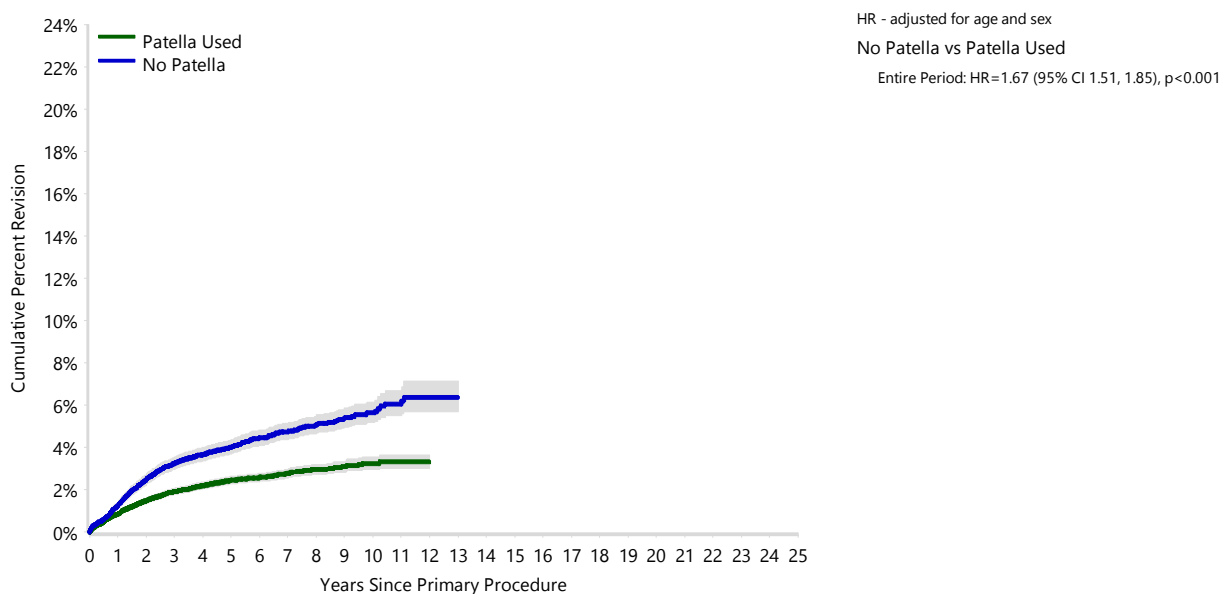
Figure KT35 Cumulative Percent Revision of Primary Total Knee Replacement by Posterior Stabilised Prostheses and Patella Component Usage (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	136280	126385	106740	89144	40955	10119	1155
No Patella	29024	27892	25630	23399	15414	6200	546

Note: Restricted to modern prostheses

Figure KT36 Cumulative Percent Revision of Primary Total Knee Replacement by Medial Pivot Design Prostheses and Patella Component Usage (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Patella Used	40804	34834	23864	15713	1736	3	0
No Patella	17476	15189	11370	8427	1629	11	0

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT36 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Type and Patella Component Usage (Primary Diagnosis OA)

Prosthesis Combination	Patella Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Attune CR/Attune	Patella Used	596	32504	0.8 (0.7, 0.9)	1.7 (1.5, 1.8)	2.2 (2.0, 2.4)	3.0 (2.8, 3.4)		
	No Patella	362	10044	1.1 (0.9, 1.3)	2.9 (2.6, 3.3)	3.7 (3.3, 4.2)	5.3 (4.7, 6.0)		
Genesis II CR/Genesis II	Patella Used	490	12000	0.9 (0.8, 1.1)	2.1 (1.9, 2.4)	2.8 (2.5, 3.1)	4.1 (3.7, 4.5)	5.0 (4.6, 5.5)	6.3 (5.6, 7.1)
	No Patella	876	14966	0.9 (0.8, 1.1)	3.0 (2.8, 3.3)	4.0 (3.6, 4.3)	5.7 (5.3, 6.1)	6.9 (6.4, 7.4)	8.3 (7.6, 9.0)
LCS CR/MBT	Patella Used	625	10532	1.1 (0.9, 1.3)	3.1 (2.8, 3.5)	4.1 (3.7, 4.5)	5.8 (5.3, 6.3)	7.3 (6.7, 8.0)	9.1 (8.1, 10.1)
	No Patella	1067	22471	0.8 (0.7, 0.9)	2.5 (2.3, 2.7)	3.2 (3.0, 3.4)	4.5 (4.2, 4.8)	5.6 (5.2, 6.0)	7.5 (6.8, 8.2)
Persona CR/Persona	Patella Used	1116	70551	0.9 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.1, 2.4)	2.7 (2.4, 2.9)		
	No Patella	445	23550	0.9 (0.8, 1.1)	2.2 (2.0, 2.5)	2.7 (2.4, 2.9)	4.3 (2.3, 8.0)		
Triathlon CR/Triathlon	Patella Used	2013	102792	0.7 (0.6, 0.7)	1.4 (1.4, 1.5)	1.9 (1.8, 2.0)	2.8 (2.6, 2.9)	4.0 (3.7, 4.2)	
	No Patella	2190	57860	0.9 (0.8, 1.0)	2.3 (2.2, 2.4)	2.9 (2.8, 3.1)	4.3 (4.1, 4.5)	5.6 (5.3, 5.9)	8.7 (7.3, 10.3)
Triathlon CR/ Triathlon Tritanium	Patella Used	480	40320	0.8 (0.7, 0.9)	1.4 (1.3, 1.6)	1.8 (1.6, 1.9)			
	No Patella	332	10284	1.8 (1.5, 2.0)	3.6 (3.2, 4.0)	4.4 (3.9, 4.9)			
Vanguard CR/Vanguard	Patella Used	543	13792	0.8 (0.6, 0.9)	2.0 (1.7, 2.2)	2.5 (2.3, 2.8)	3.9 (3.5, 4.2)	5.8 (5.2, 6.5)	
	No Patella	770	13389	0.8 (0.7, 1.0)	2.6 (2.4, 2.9)	3.3 (3.0, 3.6)	5.3 (4.9, 5.7)	8.1 (7.4, 8.7)	
TOTAL		11905	435055						

Note: Restricted to modern prostheses

Only prosthesis combinations with >10,000 procedures in both patella usage groups are listed

Table KT37 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Patella Usage (Primary Diagnosis OA)

Comparison	HR -adjusted for age and sex
Attune CR/Attune Patella Used vs Attune CR/Attune No Patella	0 - 1Mth: HR=1.02 (95% CI 0.66, 1.57), p=0.922
	1Mth - 3Mth: HR=1.42 (95% CI 0.72, 2.82), p=0.315
	3Mth - 1.5Yr: HR=0.43 (95% CI 0.34, 0.54), p<0.001
	1.5Yr+: HR=0.58 (95% CI 0.48, 0.69), p<0.001
Genesis II CR/Genesis II Patella Used vs Genesis II CR/Genesis II No Patella	Entire Period: HR=0.75 (95% CI 0.67, 0.84), p<0.001
LCS CR/MBT Patella Used vs LCS CR/MBT No Patella	Entire Period: HR=1.31 (95% CI 1.18, 1.44), p<0.001
Persona CR/Persona Patella Used vs Persona CR/Persona No Patella	Entire Period: HR=0.85 (95% CI 0.76, 0.95), p=0.005
Triathlon CR/Triathlon Tritanium Patella Used vs Triathlon CR/Triathlon Tritanium No Patella	0 - 3Mth: HR=0.89 (95% CI 0.63, 1.26), p=0.525
	3Mth+: HR=0.34 (95% CI 0.29, 0.40), p<0.001
Triathlon CR/Triathlon Patella Used vs Triathlon CR/Triathlon No Patella	Entire Period: HR=0.67 (95% CI 0.63, 0.71), p<0.001
Vanguard CR/Vanguard Patella Used vs Vanguard CR/Vanguard No Patella	0 - 1Mth: HR=1.21 (95% CI 0.65, 2.24), p=0.547
	1Mth+: HR=0.71 (95% CI 0.63, 0.79), p<0.001

Note: Restricted to modern prostheses

Only prosthesis combinations with >10,000 procedures in both patella usage groups are listed

Primary Total Knee Replacement

Fixation

When fixation types for all modern total knee replacements are compared, procedures using hybrid fixation have a lower rate of revision compared to cemented fixation, except for the 6 months to 1.5 years period where there is no difference. Procedures using hybrid fixation have a lower rate of revision compared to those using cementless fixation except for between 1.5 and 3 years where there is no difference. Procedures using cementless fixation have a higher rate of revision compared to procedures using cemented fixation (Table KT38 and Figure KT37).

However, the effect of fixation varies depending on prosthesis stability. For minimally stabilised prostheses, hybrid fixation has a lower rate of revision for the first 6 months compared to cemented fixation, with no difference after this time point. Cementless fixation has a higher rate of revision compared to both cemented fixation and hybrid fixation (Table KT39 and Figure KT38). The common reasons for revision for each fixation method are shown in Figure KT39.

When minimally stabilised prostheses are further analysed by tibial fixation and age, patients aged <65 years with cementless tibial fixation have the highest rates of revision. Patients in both age categories (aged <65 years and those ≥65 years) have a higher rate of revision with cementless tibial fixation (Table KT40 and Figure KT40).

Patients with minimally stabilised knees using cementless tibial fixation have a higher rate of revision regardless of sex. (Table KT41 and Figure KT41).

When a posterior stabilised knee is used, cemented fixation has a lower rate of revision compared to cementless fixation for the first 1.5 years. After this time, cementless fixation has a lower rate of revision than cemented fixation. Cemented fixation has a lower rate of revision compared to hybrid fixation in the first year. There is no difference from 1 to 6 years, after which time the rate of revision reverses, and

cemented fixation has a higher rate of revision compared to hybrid fixation. There is no difference in the rate of revision when cementless fixation and hybrid fixation are compared (Table KT42 and Figure KT42).

Posterior stabilised prostheses were further analysed by tibial fixation and age. For patients aged <65 years, procedures using cementless fixation have a higher rate of revision compared to cemented fixation for the first 1.5 years. After this time, the rate of revision reverses and cementless fixation has a lower rate of revision. For patients aged ≥65 years, cementless fixation has a higher rate of revision in the first 2.5 years with no difference after this time (Table KT43 and Figure KT43).

Posterior stabilised prostheses were also analysed by tibial fixation and sex. Males with cementless fixation have a higher rate of revision than cemented fixation until 1.5 years, then those with cementless fixation have a lower revision rate. Females with cementless fixation have a higher rate of revision for the first 3.5 years, with no difference after this time (Table KT44 and Figure KT44).

Cementing the tibial component gives the best outcome for minimally stabilised knee replacement.

When a medial pivot design prosthesis is used, there is no difference in rate of revision between cemented and hybrid fixation. There are too few revisions of cementless fixation for an analysis to be undertaken (Table KT45 and Figure KT45).



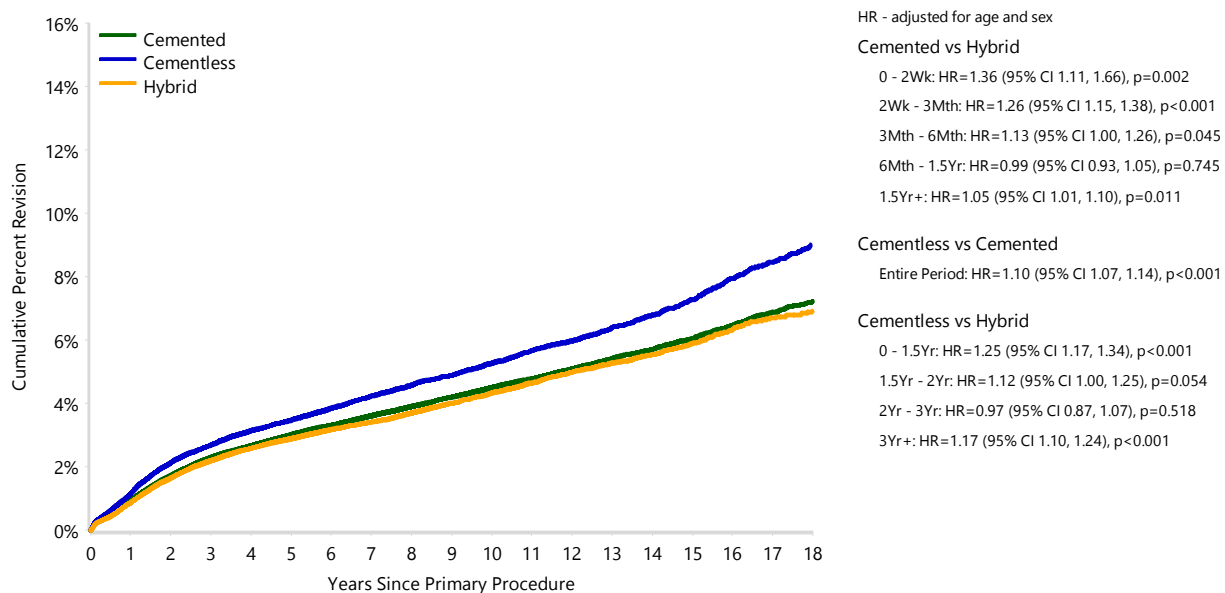
Primary Total Knee Replacement

Table KT38 Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	17039	501324	1.0 (0.9, 1.0)	2.3 (2.2, 2.3)	3.0 (3.0, 3.1)	4.5 (4.4, 4.6)	6.0 (5.9, 6.2)	7.8 (7.6, 8.1)
Cementless	4452	123092	1.2 (1.1, 1.2)	2.7 (2.6, 2.8)	3.5 (3.4, 3.6)	5.3 (5.1, 5.4)	7.3 (7.0, 7.6)	9.6 (9.1, 10.1)
Hybrid	4901	151238	0.9 (0.8, 0.9)	2.2 (2.1, 2.3)	2.9 (2.8, 3.0)	4.3 (4.2, 4.5)	5.9 (5.7, 6.1)	7.4 (7.0, 7.9)
TOTAL	26392	775654						

Note: Restricted to modern prostheses

Figure KT37 Cumulative Percent Revision of Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	501324	455194	361179	282708	114354	32127	5085
Cementless	123092	104819	72392	50082	26955	9006	2096
Hybrid	151238	134599	105989	83172	37174	9968	1903

Note: Restricted to modern prostheses

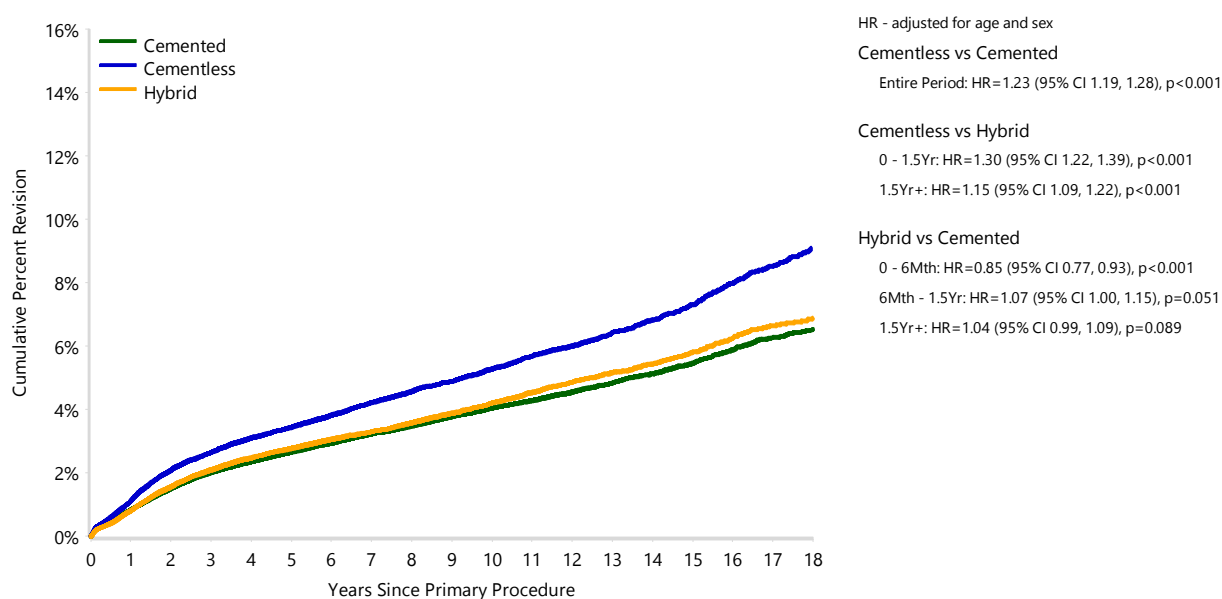
Primary Total Knee Replacement

Table KT39 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	8329	286119	0.8 (0.8, 0.9)	2.0 (2.0, 2.1)	2.7 (2.6, 2.7)	4.0 (3.9, 4.1)	5.5 (5.3, 5.6)	7.2 (6.9, 7.5)
Cementless	4226	118603	1.1 (1.1, 1.2)	2.6 (2.5, 2.8)	3.4 (3.3, 3.6)	5.3 (5.1, 5.5)	7.3 (7.0, 7.6)	9.6 (9.1, 10.2)
Hybrid	4463	141145	0.8 (0.8, 0.9)	2.1 (2.0, 2.2)	2.8 (2.7, 2.9)	4.2 (4.1, 4.3)	5.8 (5.6, 6.0)	7.4 (7.0, 7.8)
TOTAL	17018	545867						

Note: Excludes cementless Genesis II Oxinium femoral prostheses. Restricted to modern prostheses

Figure KT38 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



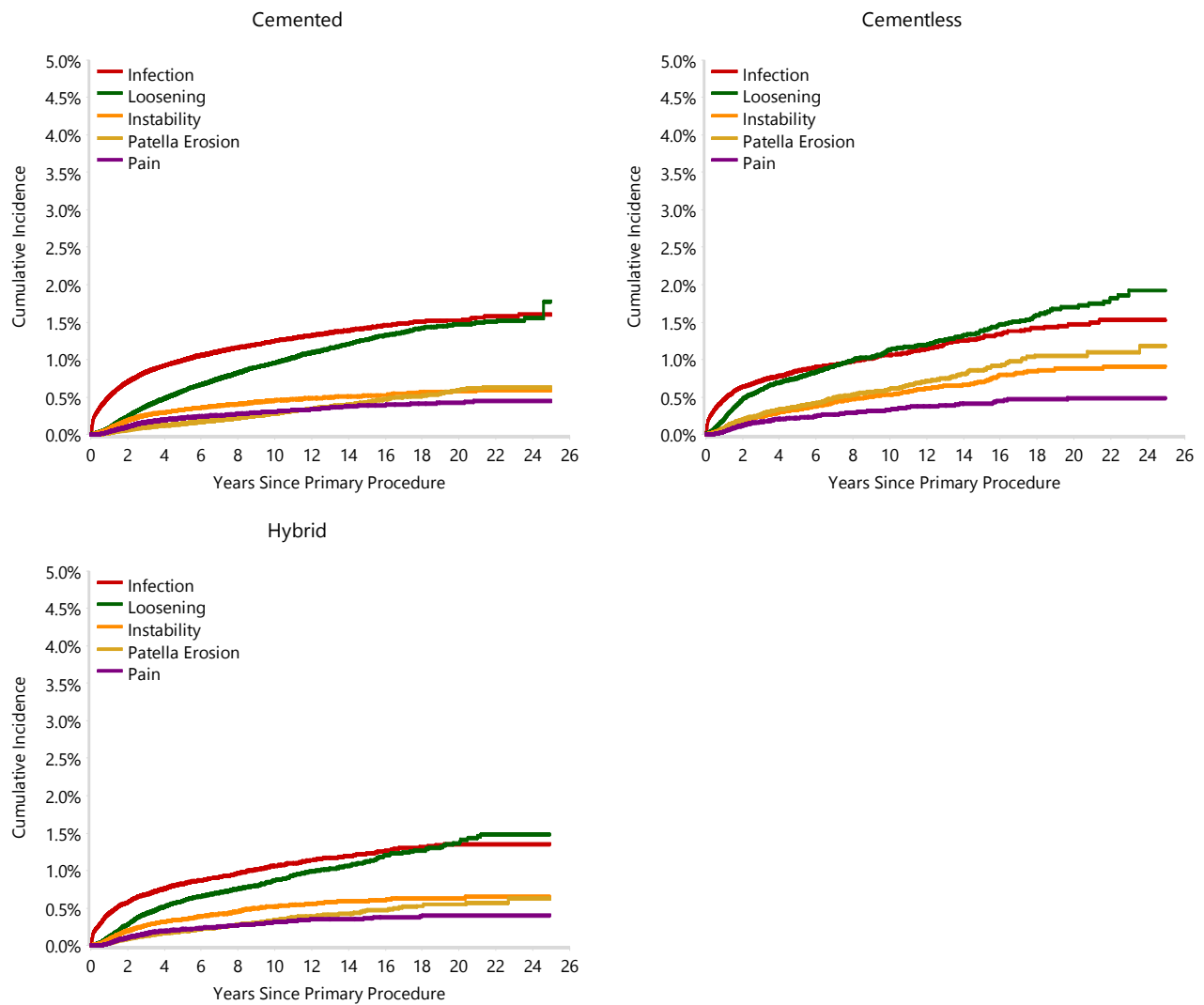
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	286119	256863	198950	150703	57981	16985	3474
Cementless	118603	100885	68998	47166	25296	8383	2085
Hybrid	141145	127134	100035	78537	34570	9192	1786

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT39 Cumulative Incidence Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



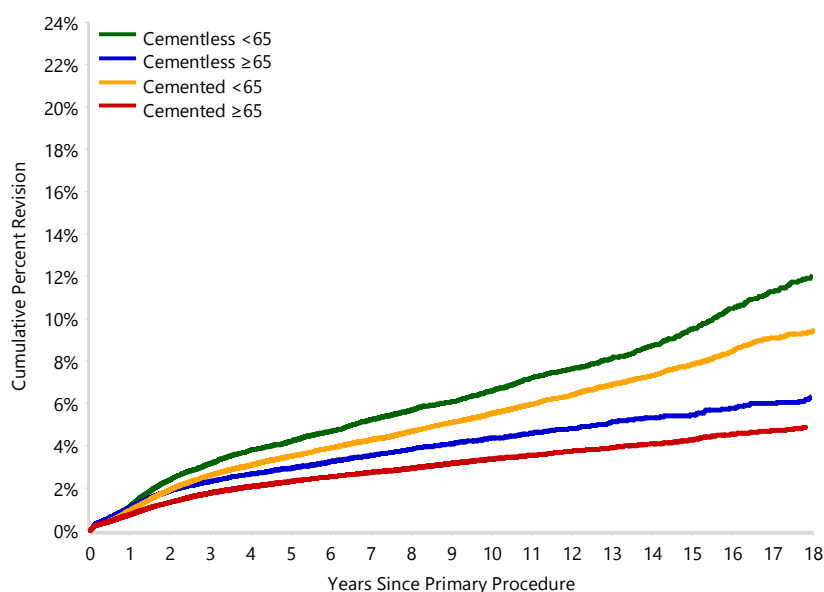
Primary Total Knee Replacement

Table KT40 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)

Tibial Fixation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	2212	45858	1.2 (1.1, 1.3)	3.2 (3.0, 3.3)	4.2 (4.0, 4.4)	6.6 (6.3, 6.9)	9.5 (9.1, 10.0)	12.8 (12.0, 13.6)
	≥65	2091	74684	1.1 (1.0, 1.2)	2.3 (2.2, 2.4)	2.9 (2.8, 3.1)	4.4 (4.2, 4.6)	5.5 (5.2, 5.8)	6.4 (5.9, 6.9)
Cemented	<65	5701	131753	1.0 (0.9, 1.0)	2.6 (2.5, 2.7)	3.5 (3.4, 3.6)	5.5 (5.4, 5.7)	7.9 (7.6, 8.1)	10.4 (10.0, 10.9)
	≥65	7061	293678	0.8 (0.7, 0.8)	1.8 (1.7, 1.8)	2.3 (2.3, 2.4)	3.4 (3.3, 3.5)	4.3 (4.2, 4.4)	5.1 (4.9, 5.4)
TOTAL		17065	545973						

Note: Restricted to modern prostheses

Figure KT40 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)



HR - adjusted for sex

Cementless <65 vs Cementless ≥65

0 - 6Mth: HR=0.90 (95% CI 0.78, 1.03), p=0.136
 6Mth - 1Yr: HR=1.48 (95% CI 1.29, 1.70), p<0.001
 1Yr - 1.5Yr: HR=1.67 (95% CI 1.46, 1.91), p<0.001
 1.5Yr - 2Yr: HR=1.54 (95% CI 1.32, 1.81), p<0.001
 2Yr - 4Yr: HR=1.54 (95% CI 1.38, 1.73), p<0.001
 4Yr - 5.5Yr: HR=1.48 (95% CI 1.24, 1.78), p<0.001
 5.5Yr - 6Yr: HR=1.46 (95% CI 1.02, 2.09), p=0.039
 6Yr - 14.5Yr: HR=1.99 (95% CI 1.79, 2.22), p<0.001
 14.5Yr - 15Yr: HR=3.61 (95% CI 2.23, 5.83), p<0.001
 15Yr - 15.5Yr: HR=2.52 (95% CI 1.53, 4.15), p<0.001
 15.5Yr+: HR=3.65 (95% CI 2.69, 4.95), p<0.001

Cementless <65 vs Cemented <65

Entire Period: HR=1.21 (95% CI 1.15, 1.27), p<0.001

Cementless ≥65 vs Cemented ≥65

Entire Period: HR=1.29 (95% CI 1.23, 1.36), p<0.001

Cemented <65 vs Cemented ≥65

0 - 6Mth: HR=1.01 (95% CI 0.93, 1.10), p=0.820
 6Mth - 1.5Yr: HR=1.66 (95% CI 1.55, 1.77), p<0.001
 1.5Yr - 2Yr: HR=1.76 (95% CI 1.59, 1.96), p<0.001
 2Yr - 2.5Yr: HR=1.41 (95% CI 1.26, 1.58), p<0.001
 2.5Yr - 4Yr: HR=1.63 (95% CI 1.50, 1.78), p<0.001
 4Yr - 4.5Yr: HR=1.81 (95% CI 1.50, 2.17), p<0.001
 4.5Yr - 5.5Yr: HR=1.55 (95% CI 1.35, 1.78), p<0.001
 5.5Yr - 7Yr: HR=1.94 (95% CI 1.70, 2.20), p<0.001
 7Yr - 9Yr: HR=1.92 (95% CI 1.69, 2.19), p<0.001
 9Yr+: HR=2.55 (95% CI 2.30, 2.82), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	45858	39710	27960	19599	11587	4609	1359
	≥65	74684	62850	42201	28174	13990	3928	759
Cemented	<65	131753	119750	96016	76153	33942	11259	2787
	≥65	293678	262664	201867	152540	58375	14798	2461

Note: Restricted to modern prostheses

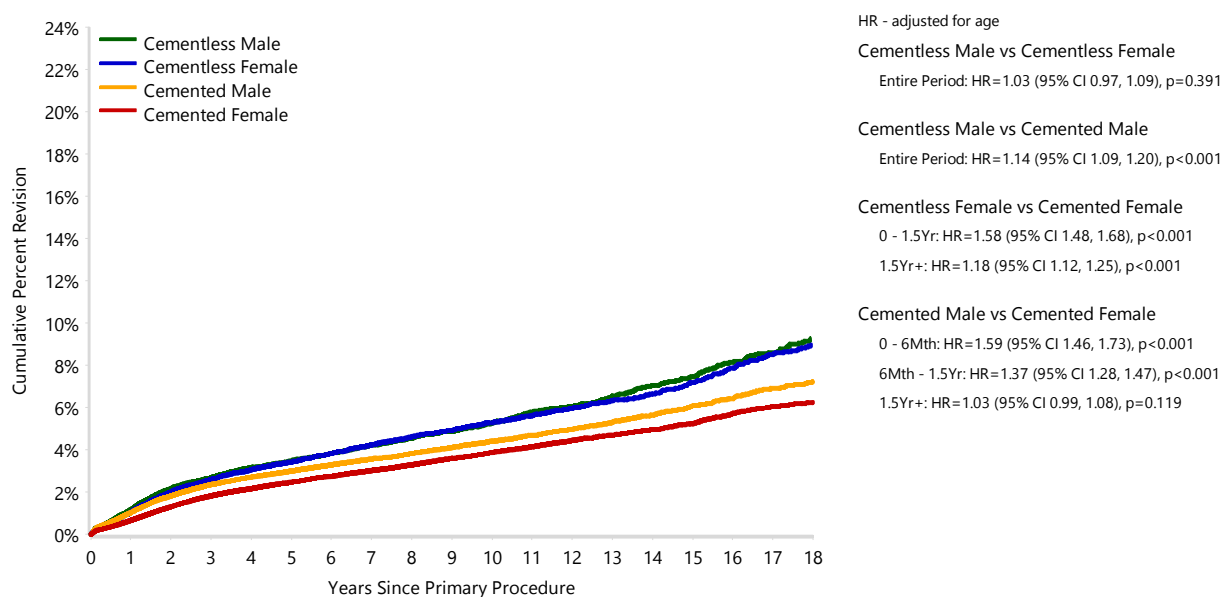
Primary Total Knee Replacement

Table KT41 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Sex (Primary Diagnosis OA)

Tibial Fixation	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	2253	64155	1.2 (1.1, 1.3)	2.7 (2.6, 2.8)	3.5 (3.3, 3.6)	5.3 (5.0, 5.5)	7.4 (7.0, 7.9)	9.7 (9.0, 10.4)
	Female	2050	56387	1.1 (1.0, 1.1)	2.6 (2.5, 2.8)	3.4 (3.2, 3.6)	5.3 (5.0, 5.6)	7.2 (6.8, 7.6)	9.6 (9.0, 10.4)
Cemented	Male	5899	180652	1.0 (1.0, 1.1)	2.4 (2.3, 2.4)	3.0 (2.9, 3.1)	4.4 (4.3, 4.5)	6.1 (5.9, 6.3)	8.0 (7.6, 8.5)
	Female	6863	244779	0.7 (0.6, 0.7)	1.8 (1.8, 1.9)	2.5 (2.4, 2.5)	3.9 (3.8, 4.0)	5.2 (5.1, 5.4)	6.8 (6.5, 7.1)
TOTAL		17065	545973						

Note: Restricted to modern prostheses

Figure KT41 Cumulative Percent Revision of Minimally Stabilised Primary Total Knee Replacement by Tibial Fixation and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	64155	54372	36682	24336	12326	4027	941
	Female	56387	48188	33479	23437	13251	4510	1177
Cemented	Male	180652	162005	126139	96047	36587	9839	1929
	Female	244779	220409	171744	132646	55730	16218	3319

Note: Restricted to modern prostheses

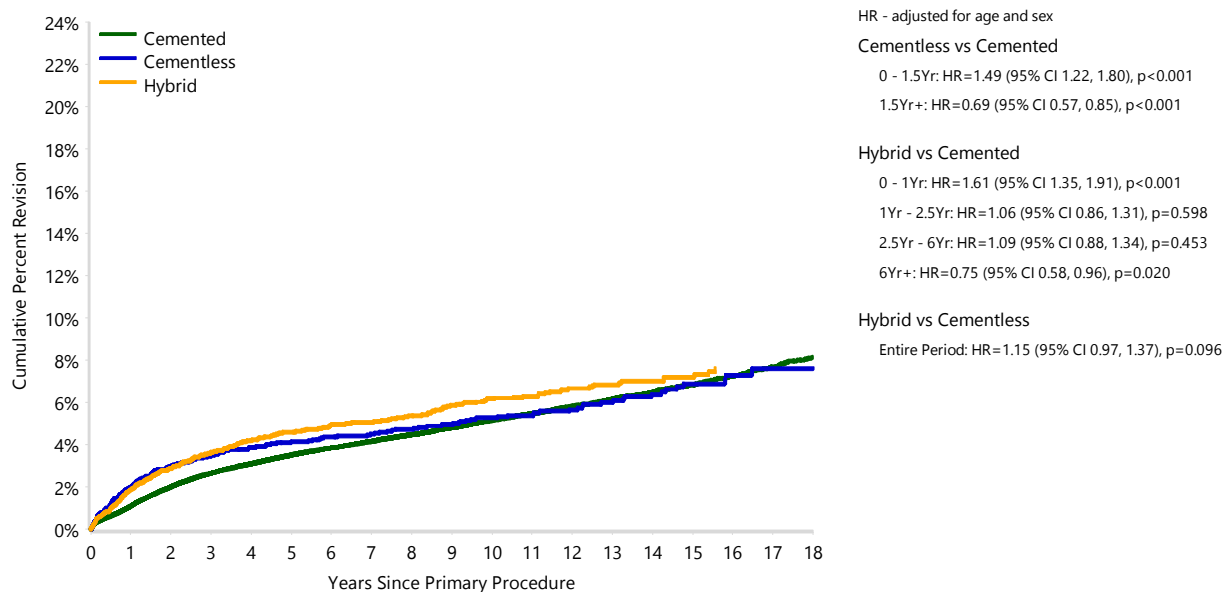
Primary Total Knee Replacement

Table KT42 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	6863	153444	1.1 (1.1, 1.2)	2.7 (2.6, 2.7)	3.5 (3.4, 3.6)	5.2 (5.0, 5.3)	6.8 (6.6, 7.0)	8.7 (8.3, 9.1)
Cementless	209	4406	2.0 (1.6, 2.5)	3.5 (3.0, 4.1)	4.1 (3.6, 4.8)	5.3 (4.6, 6.1)	6.9 (5.9, 8.0)	
Hybrid	380	7454	1.9 (1.6, 2.2)	3.6 (3.2, 4.1)	4.6 (4.1, 5.1)	6.2 (5.6, 6.9)	7.2 (6.4, 8.0)	8.3 (7.1, 9.8)
TOTAL	7452	165304						

Note: Restricted to modern prostheses

Figure KT42 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cemented	153444	143618	123384	105255	52183	14959	1596
Cementless	4406	3864	3369	2897	1645	613	6
Hybrid	7454	6795	5617	4391	2541	747	99

Note: Restricted to modern prostheses

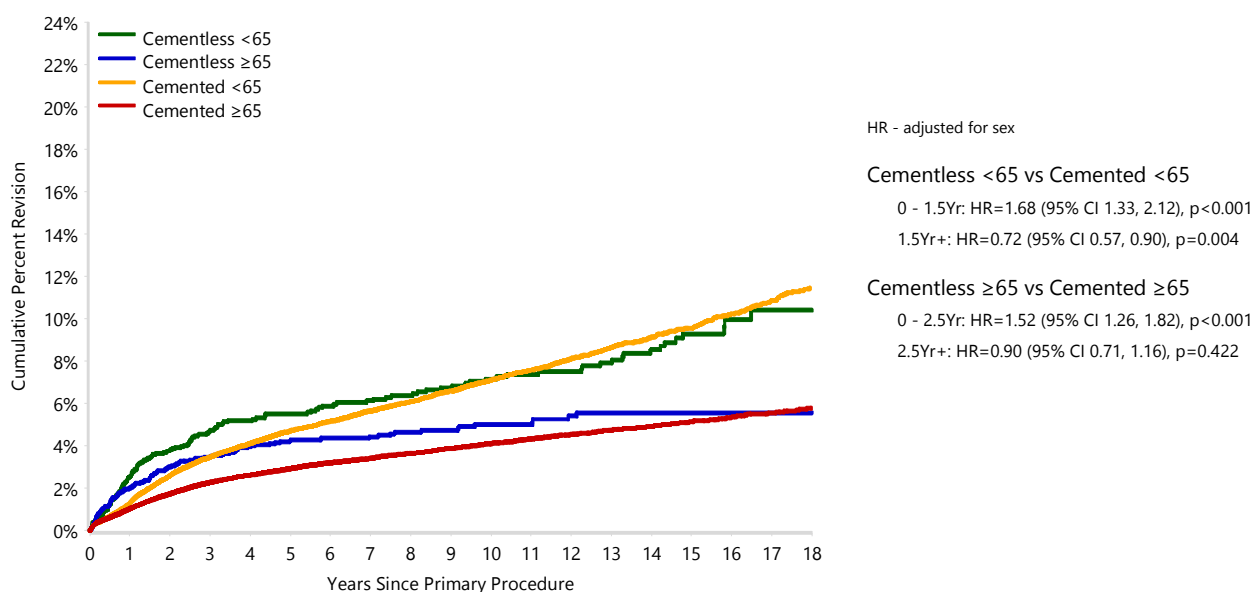
Primary Total Knee Replacement

Table KT43 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)

Tibial Fixation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	150	2321	2.6 (2.0, 3.3)	4.8 (3.9, 5.8)	5.5 (4.6, 6.6)	7.2 (6.0, 8.5)	9.3 (7.8, 11.1)	
	≥65	149	3646	2.0 (1.6, 2.5)	3.5 (2.9, 4.2)	4.3 (3.6, 5.0)	5.0 (4.2, 5.9)	5.6 (4.6, 6.7)	
Cemented	<65	3489	52994	1.3 (1.2, 1.4)	3.5 (3.3, 3.6)	4.7 (4.5, 4.9)	7.1 (6.9, 7.4)	9.6 (9.2, 9.9)	12.4 (11.7, 13.1)
	≥65	3664	106343	1.0 (1.0, 1.1)	2.3 (2.2, 2.4)	2.9 (2.8, 3.0)	4.1 (4.0, 4.3)	5.1 (4.9, 5.3)	5.9 (5.6, 6.3)
TOTAL		7452	165304						

Note: Restricted to modern prostheses

Figure KT43 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	<65	2321	2073	1765	1325	876	392	7
	≥65	3646	3240	2654	1842	914	301	3
Cemented	<65	52994	49861	43387	37955	21153	7222	927
	≥65	106343	99103	84564	71421	33426	8404	764

Note: Restricted to modern prostheses

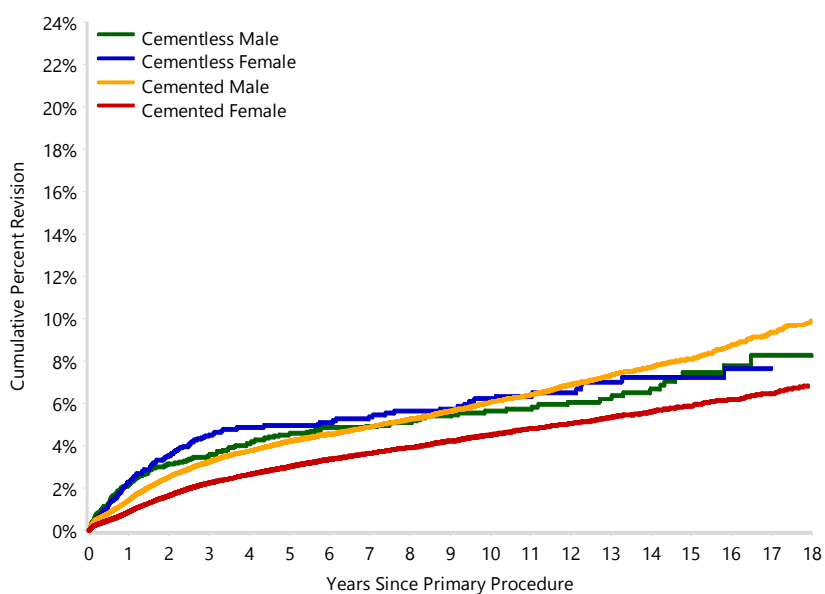
Primary Total Knee Replacement

Table KT44 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Sex (Primary Diagnosis OA)

Tibial Fixation	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	161	3242	2.2 (1.7, 2.7)	3.6 (3.0, 4.3)	4.6 (3.9, 5.4)	5.6 (4.8, 6.7)	7.5 (6.2, 9.0)	
	Female	138	2725	2.3 (1.8, 2.9)	4.5 (3.7, 5.4)	4.9 (4.1, 5.9)	6.2 (5.2, 7.4)	7.2 (6.0, 8.7)	
Cemented	Male	3599	68721	1.4 (1.3, 1.5)	3.2 (3.1, 3.4)	4.2 (4.1, 4.4)	6.1 (5.9, 6.3)	8.1 (7.8, 8.4)	10.9 (10.1, 11.8)
	Female	3554	90616	0.9 (0.8, 1.0)	2.2 (2.1, 2.3)	3.0 (2.9, 3.1)	4.5 (4.4, 4.7)	5.9 (5.7, 6.1)	7.2 (6.8, 7.6)
TOTAL		7452	165304						

Note: Restricted to modern prostheses

Figure KT44 Cumulative Percent Revision of Posterior Stabilised Primary Total Knee Replacement by Tibial Fixation and Sex (Primary Diagnosis OA)



HR - adjusted for age

Cementless Male vs Cementless Female

Entire Period: HR=0.90 (95% CI 0.72, 1.13), p=0.356

Cementless Male vs Cemented Male

0 - 1.5Yr: HR=1.33 (95% CI 1.07, 1.65), p=0.009

1.5Yr+: HR=0.67 (95% CI 0.53, 0.85), p<0.001

Cementless Female vs Cemented Female

0 - 1Mth: HR=2.40 (95% CI 1.81, 3.17), p<0.001

1Mth - 9Mth: HR=2.41 (95% CI 1.92, 3.01), p<0.001

9Mth - 1Yr: HR=1.96 (95% CI 1.50, 2.56), p<0.001

1Yr - 1.5Yr: HR=2.07 (95% CI 1.63, 2.62), p<0.001

1.5Yr - 3.5Yr: HR=1.25 (95% CI 0.95, 1.64), p=0.110

3.5Yr+: HR=0.81 (95% CI 0.62, 1.07), p=0.138

Cemented Male vs Cemented Female

0 - 3Mth: HR=1.75 (95% CI 1.51, 2.03), p<0.001

3Mth - 1.5Yr: HR=1.48 (95% CI 1.35, 1.62), p<0.001

1.5Yr - 2Yr: HR=1.34 (95% CI 1.14, 1.58), p<0.001

2Yr - 2.5Yr: HR=1.11 (95% CI 0.94, 1.32), p=0.226

2.5Yr - 3.5Yr: HR=1.33 (95% CI 1.15, 1.54), p<0.001

3.5Yr - 5Yr: HR=1.18 (95% CI 1.02, 1.36), p=0.024

5Yr - 9.5Yr: HR=1.14 (95% CI 1.03, 1.27), p=0.015

9.5Yr+: HR=1.59 (95% CI 1.39, 1.82), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Cementless	Male	3242	2905	2478	1852	1068	387	5
	Female	2725	2408	1941	1315	722	306	5
Cemented	Male	68721	63853	54234	45676	22025	6079	604
	Female	90616	85111	73717	63700	32554	9547	1087

Note: Restricted to modern prostheses



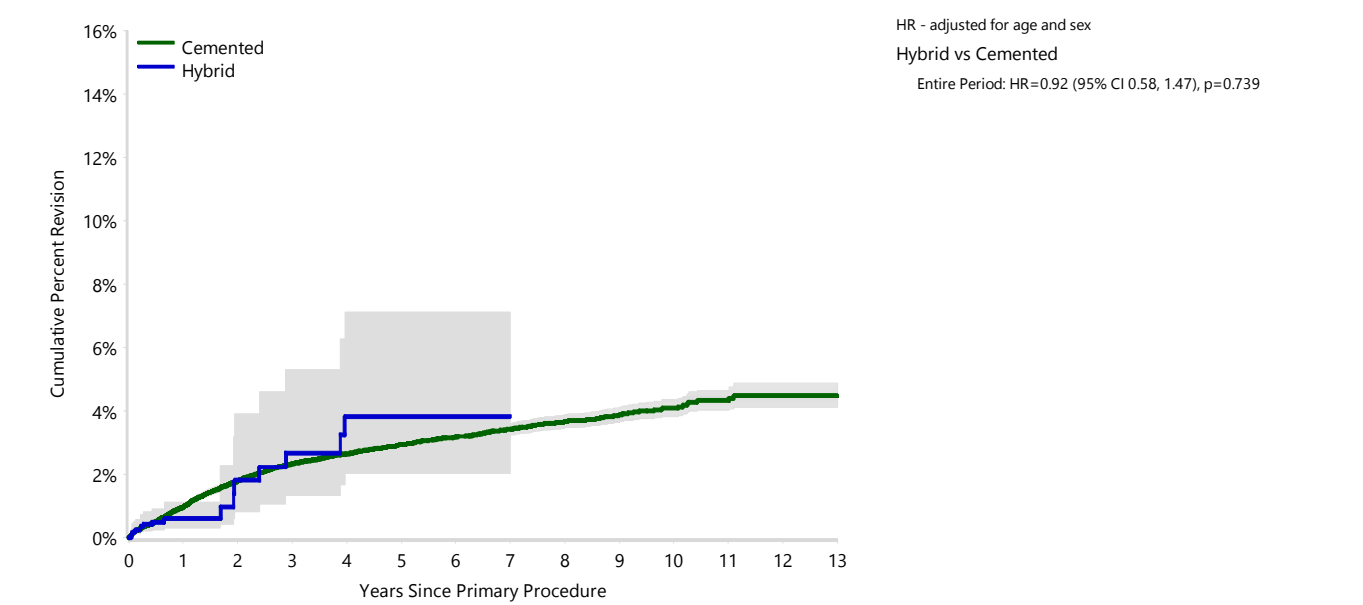
Primary Total Knee Replacement

Table KT45 Cumulative Percent Revision of Medial Pivot Design Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Cemented	1465	55823	1.0 (0.9, 1.1)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.1 (3.8, 4.4)	
Hybrid	18	2428	0.6 (0.3, 1.1)	2.7 (1.3, 5.3)	3.8 (2.0, 7.1)		
TOTAL	1483	58251					

Note: Restricted to modern prostheses
Cementless procedures excluded due to low numbers

Figure KT45 Cumulative Percent Revision of Medial Pivot Design Primary Total Knee Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Cemented	55823	49509	35021	24005	3365	14
Hybrid	2428	495	213	135	0	0

Note: Restricted to modern prostheses
Cementless procedures excluded due to low numbers

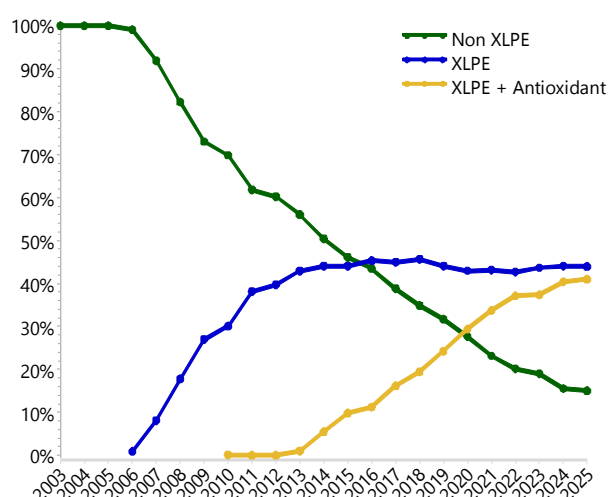
Primary Total Knee Replacement

BEARING SURFACE

Tibial Bearing Surface

There are two main polyethylene types used in primary total knee replacement procedures: cross-linked polyethylene (XLPE) and non cross-linked polyethylene (non XLPE). XLPE has been classified as ultrahigh molecular weight polyethylene that has been irradiated by high dose ($\geq 50\text{kGy}$) gamma or electron beam radiation. XLPE includes a sub-group which has antioxidant added. The use of XLPE with antioxidant has increased with time while use of non XLPE has decreased and in 2025 only 15.0% of procedures use non XLPE (Figure KT46).

Figure KT46 Primary Total Knee Replacement by Polyethylene Type



There are 481,692 primary total knee procedures for osteoarthritis that have used XLPE. When adjusted for age, sex, fixation, bearing mobility, and patella usage, in general XLPE has a lower rate of revision compared to non XLPE except for a brief early period (first 3 months) where the rate of revision is higher (Table KT46 and Figure KT48).

Primary total knee procedures that use non XLPE have a higher rate of revision for loosening than procedures that use XLPE (Figure KT49, Table KT47 and Figure KT50).

Procedures with XLPE have a higher rate of revision for infection in the first 6 months compared to non XLPE. From 6 months onwards, XLPE has a lower rate of revision for infection compared to non XLPE (Table KT48 and Figure KT51).

The difference between XLPE and non XLPE is more evident in younger patients. The 15-year cumulative percent revision rate for patients aged <65 years for XLPE is 7.0% and for non XLPE is 9.9%. For patients aged ≥ 65 years, the 15-year cumulative percent revision for XLPE is 4.1% and for non XLPE is 5.2% (Table KT49 and Figure KT52).

For patients aged <65 years total knee procedures using non XLPE have a higher rate of revision than XLPE. For those aged ≥ 65 years non XLPE has a lower rate of revision for the first 3 months, but after this time, XLPE has a lower revision rate. The common reasons for revision for these groups are shown in Figure KT53.

When XLPE and non XLPE are compared by prosthesis stability, minimally stabilised designs have a lower rate of revision for non XLPE in the first 3 months. From 3 months onwards, this reverses and non XLPE has a higher rate of revision. Posterior stabilised designs also have a higher rate of revision for non XLPE, but only from 3 months onwards. In the medial pivot design group over 98% of replacements use non XLPE. There are insufficient revisions in the medial pivot design group using XLPE for comparative analysis (Table KT50 and Table KT51).

The outcomes of two prosthesis combinations used with both XLPE and non XLPE and with $>10,000$ procedures in each group are shown in Table KT52 and Table KT53.

When considering the XLPE sub-types there is no difference when XLPE is compared to XLPE with antioxidant for the first 2.5 years. After this time, XLPE with antioxidant has a lower rate of revision (Table KT54 and Figure KT54). The most common reasons for revision of XLPE and XLPE with antioxidant are shown in Figure KT55.

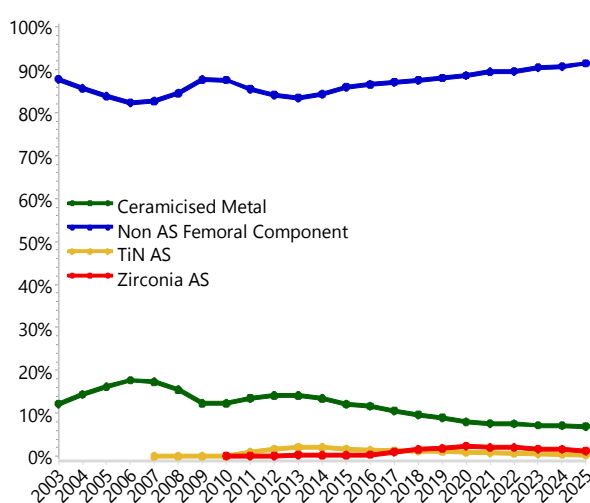
When the subtypes of XLPE are compared by prosthesis stability, there is a higher early rate of revision for XLPE with antioxidant for minimally stabilised designs in the first 3 months and between 1.5 and 2 years only, with no difference outside these times. XLPE has a higher rate of revision than XLPE with antioxidant when posterior stabilised designs are considered (Table KT55 and Table KT56).

Primary Total Knee Replacement

Femoral Bearing Surface

In addition to the regularly used cobalt chrome metal, there are different materials used for the femoral bearing surface. These are often referred to as 'alternate surface' (AS) or 'ceramic surface' components. These can be made of a ceramicised metal or have a zirconia or titanium nitride coating. They are suggested for use in patients who have a metal allergy. The use of primary total knee procedures with an AS femoral component is shown in Figure KT47. AS materials are used for 11.9% of primary femoral components.

Figure KT47 Primary Total Knee Replacement by Alternate Surface Femoral Material



Note: TiN (titanium nitride) surface

There are 92,232 primary procedures with an AS femoral component. When adjusted for age, sex, fixation, stability, bearing mobility, patella usage, and polyethylene type, procedures using an AS femoral component have a higher rate of revision compared to when these are not used (Table KT57 and Figure KT56). There are more revisions for loosening, pain and for patella erosion where an AS femoral component is used (Figure KT57).

When femoral bearing surface is analysed by prosthesis stability, there is a higher rate of revision for minimally stabilised knee replacement with an AS femoral component compared to when a non AS component is used. Posterior stabilised prostheses with an AS femoral component also, for the most part, have a higher rate of revision compared to non AS femoral components, however there is a brief period early (the first 9 months) where the revision rate is lower. There were too few revision procedures involving medial pivot designs with AS femoral components for an analysis to be undertaken (Table KT58 and Table KT59).

There is variation in the revision rate depending on the type of AS material used. In 2025, there were 4 femoral prostheses used with a zirconia-based AS, 10 with a TiN (titanium nitride) surface, and 7 with a ceramicised metal surface.

Compared to non AS femoral components, ceramicised metal prostheses have a higher rate of revision. TiN AS femoral prostheses also have a higher rate of revision compared to non AS femoral components, but only for the first 1.5 years, after which time this reverses and TiN AS has a lower rate of revision. There is no significant difference in the rate of revision when Zirconia AS prostheses are compared to non AS femoral components (Table KT60 and Figure KT58).

The types of revision are shown in Figure KT59. The most common reasons for revision are loosening and infection for all femoral bearing surface materials.

When revision for loosening is assessed, compared to non AS femoral components, ceramicised metal prostheses have a higher rate of revision for the first 5 years with no difference after this time. TiN AS femoral prostheses also have a higher rate of revision compared to non AS femoral components, but only for the first 2 years. There is no statistical difference when Zirconia AS prostheses are compared to non AS femoral components (Table KT61 and Figure KT60).

There are two prosthesis combinations that have >300 procedures in both AS and non AS femoral component groups. The outcomes of these components are shown in Table KT62 and Table KT63.

Primary Total Knee Replacement

Table KT46 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

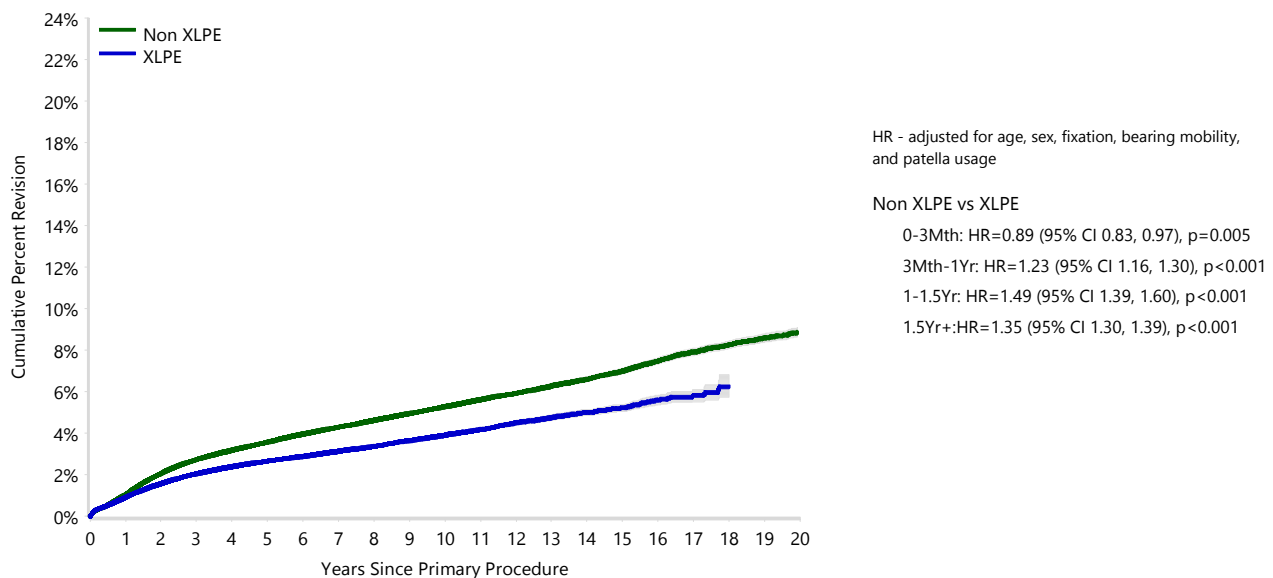
Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	14455	292747	1.1 (1.0, 1.1)	2.7 (2.7, 2.8)	3.6 (3.5, 3.6)	5.3 (5.2, 5.4)	7.0 (6.9, 7.1)	8.9 (8.6, 9.1)
XLPE	11922	481692	0.9 (0.9, 0.9)	2.1 (2.0, 2.1)	2.7 (2.6, 2.7)	3.9 (3.8, 4.0)	5.2 (5.1, 5.4)	
TOTAL	26377	774439						

Note: Restricted to modern prostheses

Includes 172,082 procedures using cross-linked polyethylene with antioxidant

Excludes 1,215 procedures with unknown polyethylene

Figure KT48 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	292747	277530	244285	211725	117652	43488	9077
XLPE	481692	416358	295157	204151	60776	7591	0

Note: Restricted to modern prostheses

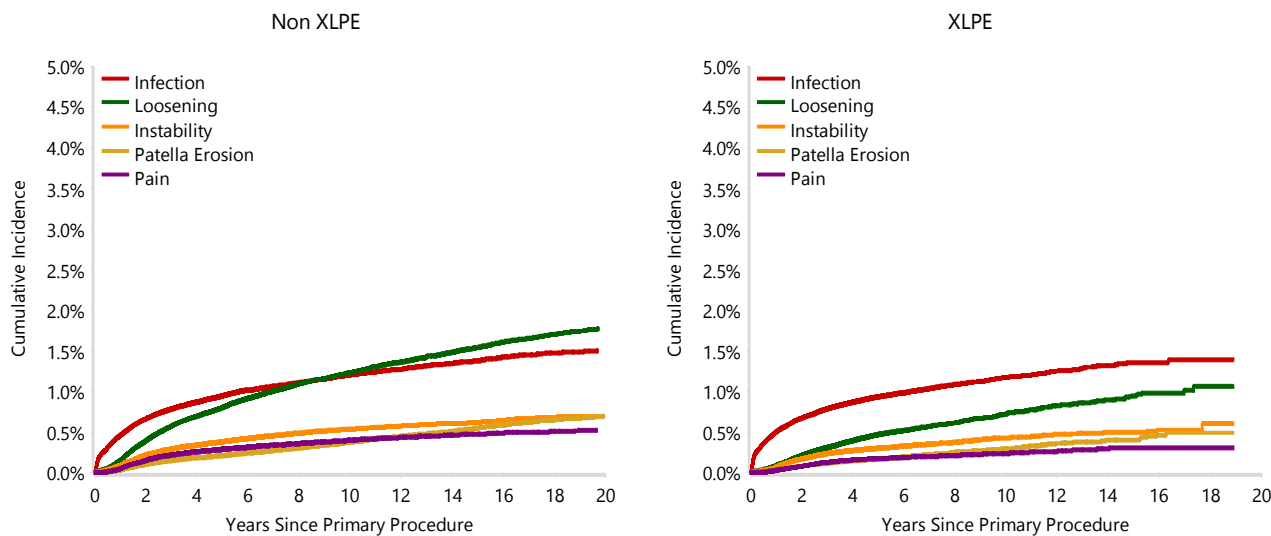
Includes 172,082 procedures using cross-linked polyethylene with antioxidant

Excludes 1,215 procedures with unknown polyethylene



Primary Total Knee Replacement

Figure KT49 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses
Includes 172,082 procedures using cross-linked polyethylene with antioxidant
Excludes 1,215 procedures with unknown polyethylene

Primary Total Knee Replacement

Table KT47 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Loosening)

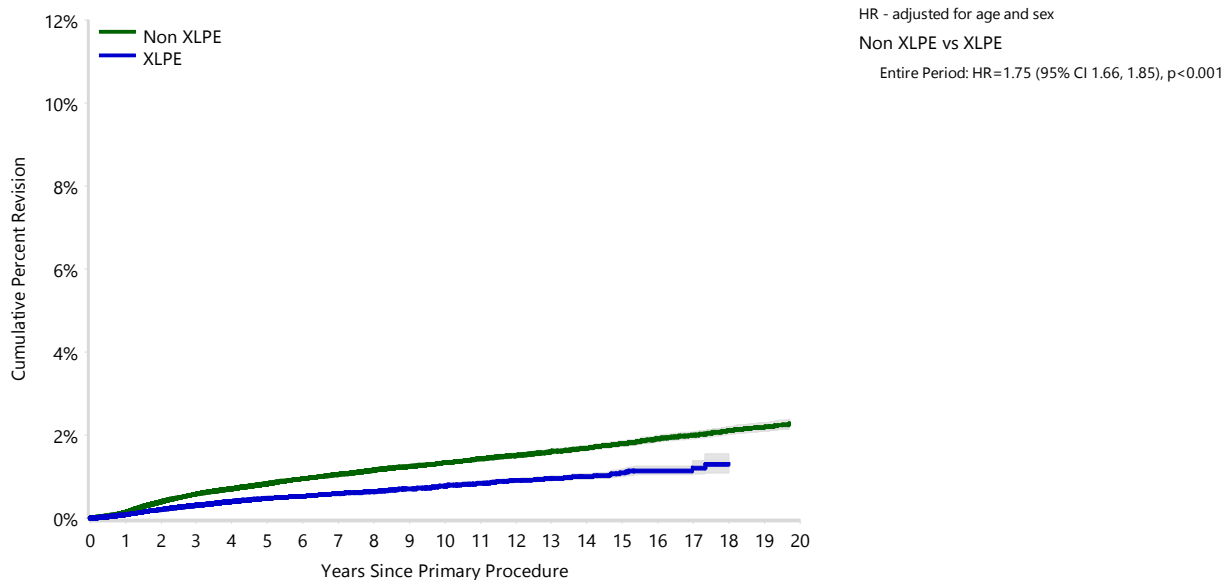
Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	3500	292747	0.2 (0.1, 0.2)	0.6 (0.6, 0.6)	0.8 (0.8, 0.9)	1.3 (1.3, 1.4)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)
XLPE	2083	481692	0.1 (0.1, 0.1)	0.3 (0.3, 0.3)	0.5 (0.5, 0.5)	0.8 (0.7, 0.8)	1.1 (1.0, 1.2)	
TOTAL	5583	774439						

Note: Restricted to modern prostheses

Includes 172,082 procedures using cross-linked polyethylene with antioxidant

Excludes 1,215 procedures with unknown polyethylene

Figure KT50 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	292747	277530	244285	211725	117652	43488	9077
XLPE	481692	416358	295157	204151	60776	7591	0

Note: Restricted to modern prostheses

Includes 172,082 procedures using cross-linked polyethylene with antioxidant

Excludes 1,215 procedures with unknown polyethylene



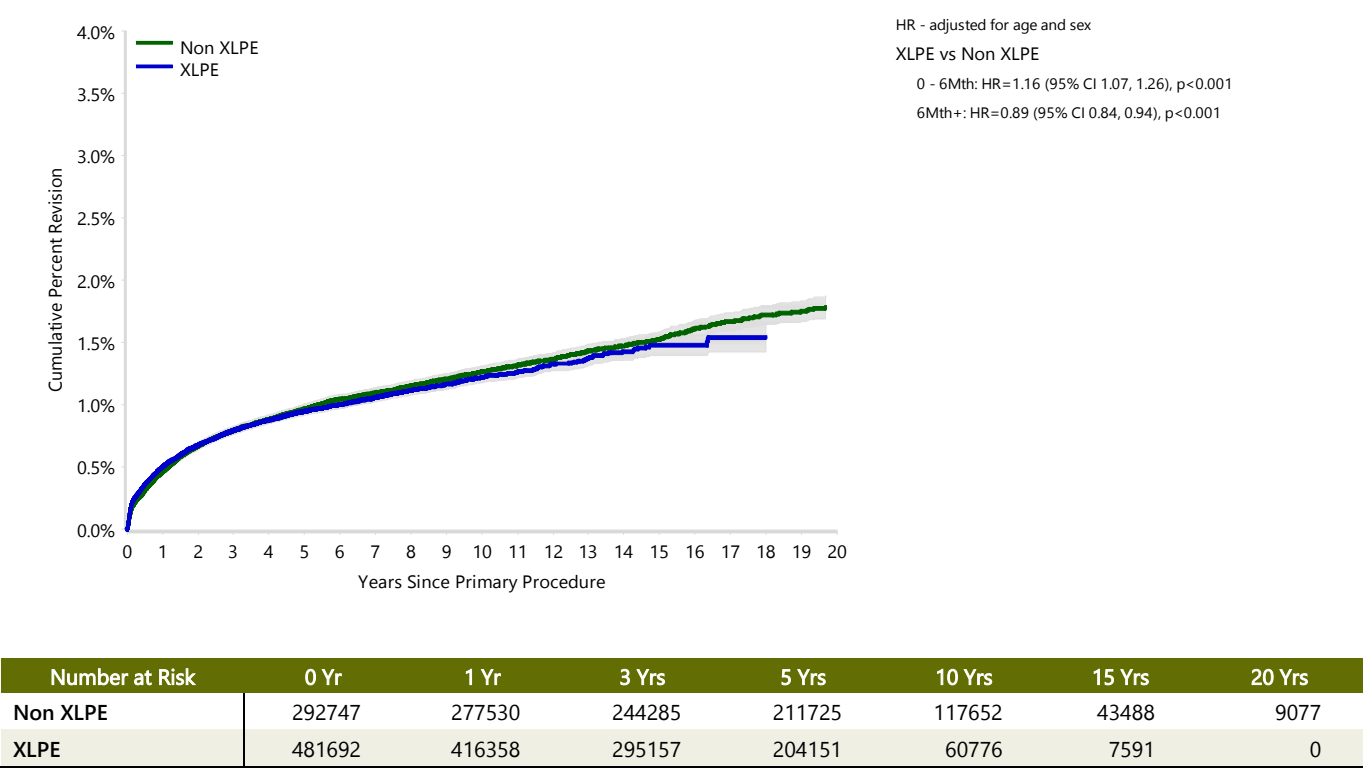
Primary Total Knee Replacement

Table KT48 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Infection)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	3398	292747	0.5 (0.4, 0.5)	0.8 (0.8, 0.8)	1.0 (0.9, 1.0)	1.3 (1.2, 1.3)	1.5 (1.5, 1.6)	1.8 (1.7, 1.9)
XLPE	4183	481692	0.5 (0.5, 0.5)	0.8 (0.8, 0.8)	0.9 (0.9, 1.0)	1.2 (1.2, 1.3)	1.5 (1.4, 1.6)	
TOTAL	7581	774439						

Note: Restricted to modern prostheses
Includes 172,082 procedures using cross-linked polyethylene with antioxidant
Excludes 1,215 procedures with unknown polyethylene

Figure KT51 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA, Revision for Infection)



Note: Restricted to modern prostheses
Includes 172,082 procedures using cross-linked polyethylene with antioxidant
Excludes 1,215 procedures with unknown polyethylene

Primary Total Knee Replacement

Table KT49 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Age (Primary Diagnosis OA)

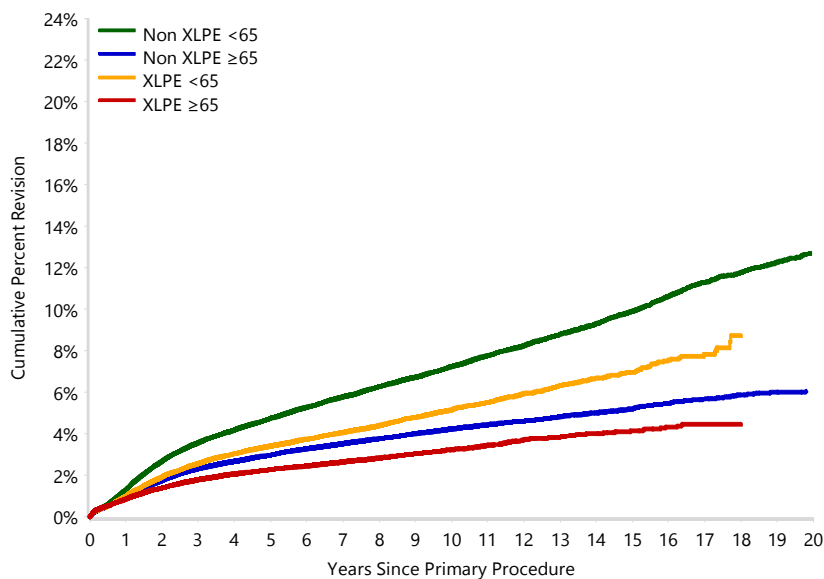
Polyethylene Type	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE		14455	292747	1.1 (1.0, 1.1)	2.7 (2.7, 2.8)	3.6 (3.5, 3.6)	5.3 (5.2, 5.4)	7.0 (6.9, 7.1)	8.9 (8.6, 9.1)
	<65	7161	96510	1.3 (1.2, 1.4)	3.6 (3.4, 3.7)	4.7 (4.6, 4.9)	7.2 (7.1, 7.4)	9.9 (9.7, 10.2)	12.7 (12.3, 13.1)
	≥65	7294	196237	0.9 (0.9, 1.0)	2.3 (2.2, 2.4)	3.0 (2.9, 3.1)	4.2 (4.1, 4.3)	5.2 (5.1, 5.3)	6.0 (5.8, 6.3)
XLPE		11922	481692	0.9 (0.9, 0.9)	2.1 (2.0, 2.1)	2.7 (2.6, 2.7)	3.9 (3.8, 4.0)	5.2 (5.1, 5.4)	
	<65	5225	156565	1.0 (1.0, 1.1)	2.6 (2.5, 2.7)	3.4 (3.3, 3.5)	5.1 (5.0, 5.3)	7.0 (6.7, 7.3)	
	≥65	6697	325127	0.9 (0.8, 0.9)	1.8 (1.7, 1.8)	2.3 (2.2, 2.3)	3.2 (3.1, 3.3)	4.1 (4.0, 4.3)	
TOTAL		26377	774439						

Note: Restricted to modern prostheses

Includes 172,082 procedures using cross-linked polyethylene with antioxidant

Excludes 1,215 procedures with unknown polyethylene

Figure KT52 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Age (Primary Diagnosis OA)



HR - adjusted for sex

Non XLPE <65 vs Non XLPE ≥65

0 - 3Mth: HR=1.10 (95% CI 0.97, 1.24), p=0.131
 3Mth - 6Mth: HR=1.27 (95% CI 1.10, 1.46), p=0.001
 6Mth - 9Mth: HR=1.58 (95% CI 1.39, 1.79), p<0.001
 9Mth - 1.5Yr: HR=1.68 (95% CI 1.56, 1.81), p<0.001
 1.5Yr - 2Yr: HR=1.79 (95% CI 1.62, 1.97), p<0.001
 2Yr - 2.5Yr: HR=1.61 (95% CI 1.44, 1.80), p<0.001
 2.5Yr - 6Yr: HR=1.78 (95% CI 1.68, 1.89), p<0.001
 6Yr - 6.5Yr: HR=2.17 (95% CI 1.81, 2.60), p<0.001
 6.5Yr - 9Yr: HR=1.96 (95% CI 1.78, 2.15), p<0.001
 9Yr - 15.5Yr: HR=2.46 (95% CI 2.26, 2.67), p<0.001
 15.5Yr+: HR=3.49 (95% CI 2.82, 4.30), p<0.001

Non XLPE <65 vs XLPE <65

0 - 6Mth: HR=1.12 (95% CI 1.02, 1.23), p=0.023
 6Mth - 9Mth: HR=1.51 (95% CI 1.32, 1.72), p<0.001
 9Mth - 1Yr: HR=1.51 (95% CI 1.33, 1.72), p<0.001
 1Yr - 2.5Yr: HR=1.50 (95% CI 1.41, 1.60), p<0.001
 2.5Yr+: HR=1.44 (95% CI 1.36, 1.52), p<0.001

Non XLPE ≥65 vs XLPE ≥65

0 - 3Mth: HR=0.88 (95% CI 0.81, 0.95), p=0.002
 3Mth+: HR=1.37 (95% CI 1.33, 1.43), p<0.001

XLPE <65 vs XLPE ≥65

0 - 3Mth: HR=0.92 (95% CI 0.85, 1.00), p=0.052
 3Mth - 6Mth: HR=1.23 (95% CI 1.09, 1.38), p<0.001
 6Mth - 1Yr: HR=1.39 (95% CI 1.28, 1.52), p<0.001
 1Yr - 1.5Yr: HR=1.70 (95% CI 1.56, 1.86), p<0.001
 1.5Yr - 2Yr: HR=1.74 (95% CI 1.57, 1.93), p<0.001
 2Yr - 2.5Yr: HR=1.56 (95% CI 1.39, 1.74), p<0.001
 2.5Yr+: HR=1.80 (95% CI 1.69, 1.91), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Non XLPE	<65	96510	91975	82240	73073	45352	19977	5089
	≥65	196237	185555	162045	138652	72300	23511	3988
XLPE	<65	156565	137128	100026	71285	23801	3590	0
	≥65	325127	279230	195131	132866	36975	4001	0

Note: Restricted to modern prostheses

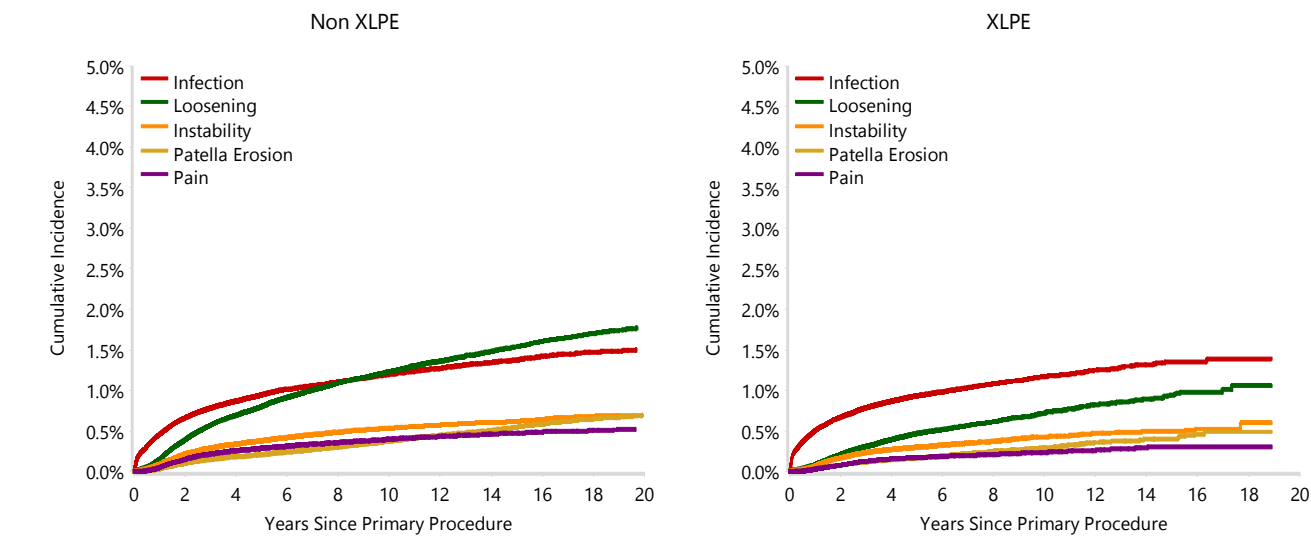
Includes 172,082 procedures using cross-linked polyethylene with antioxidant

Excludes 1,215 procedures with unknown polyethylene



Primary Total Knee Replacement

Figure KT53 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT50 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Stability	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised		17063	545150	0.9 (0.9, 0.9)	2.2 (2.1, 2.2)	2.9 (2.8, 2.9)	4.3 (4.3, 4.4)	6.0 (5.8, 6.1)	7.8 (7.6, 8.0)
	Non XLPE	8943	171169	1.0 (0.9, 1.0)	2.7 (2.6, 2.7)	3.5 (3.4, 3.6)	5.2 (5.1, 5.3)	6.9 (6.7, 7.0)	8.7 (8.5, 9.0)
	XLPE	8120	373981	0.9 (0.8, 0.9)	1.9 (1.9, 2.0)	2.5 (2.4, 2.5)	3.6 (3.5, 3.7)	4.9 (4.7, 5.1)	
Posterior Stabilised		7446	165089	1.2 (1.1, 1.2)	2.7 (2.6, 2.8)	3.6 (3.5, 3.7)	5.2 (5.1, 5.3)	6.8 (6.6, 7.0)	8.7 (8.3, 9.1)
	Non XLPE	3718	59627	1.3 (1.2, 1.4)	3.1 (2.9, 3.2)	4.1 (3.9, 4.3)	5.9 (5.7, 6.1)	7.6 (7.4, 7.9)	9.5 (9.1, 10.0)
	XLPE	3728	105462	1.1 (1.0, 1.2)	2.5 (2.4, 2.6)	3.2 (3.1, 3.4)	4.7 (4.5, 4.8)	6.0 (5.7, 6.3)	
Medial Pivot Design		1483	58280	1.0 (0.9, 1.1)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.1 (3.8, 4.4)		
	Non XLPE	1477	57524	1.0 (0.9, 1.1)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.1 (3.8, 4.4)		
	XLPE	6	756	1.1 (0.4, 2.6)					
TOTAL		25992	768519						

Note: Restricted to modern prostheses

XLPE includes 172,082 procedures using XLPE with Antioxidant.

Excludes 1,215 procedures with unknown polyethylene.

Table KT51 Comparisons of Revision Rates for Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Comparison	HR -adjusted for age and sex
Minimally Stabilised Non XLPE vs Minimally Stabilised XLPE	0 - 3Mth: HR=0.88 (95% CI 0.80, 0.98), p=0.015
	3Mth - 1Yr: HR=1.27 (95% CI 1.18, 1.37), p<0.001
	1Yr - 2.5Yr: HR=1.67 (95% CI 1.57, 1.76), p<0.001
	2.5Yr+: HR=1.49 (95% CI 1.42, 1.57), p<0.001
Posterior Stabilised Non XLPE vs Posterior Stabilised XLPE	0 - 3Mth: HR=0.93 (95% CI 0.80, 1.09), p=0.381
	3Mth - 1.5Yr: HR=1.38 (95% CI 1.26, 1.51), p<0.001
	1.5Yr - 3Yr: HR=1.24 (95% CI 1.12, 1.37), p<0.001
	3Yr+: HR=1.37 (95% CI 1.27, 1.47), p<0.001

Note: Restricted to modern prostheses

XLPE includes 172,082 procedures using XLPE with Antioxidant.

Excludes 1,215 procedures with unknown polyethylene.



Primary Total Knee Replacement

Table KT52 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Combination and Polyethylene Type (Primary Diagnosis OA)

Prosthesis Combination	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Genesis II Oxinium PS/Genesis II	Non XLPE	1068	11643	1.6 (1.4, 1.8)	3.9 (3.6, 4.3)	5.3 (4.9, 5.7)	7.4 (7.0, 7.9)	9.7 (9.1, 10.3)	12.4 (11.5, 13.4)
	XLPE	595	11496	1.3 (1.1, 1.6)	3.3 (2.9, 3.6)	4.4 (4.0, 4.8)	6.5 (6.0, 7.1)		
Triathlon CR/Triathlon	Non XLPE	456	12052	0.7 (0.6, 0.9)	1.8 (1.6, 2.1)	2.3 (2.1, 2.6)	3.4 (3.0, 3.7)	4.4 (4.0, 4.8)	6.8 (5.7, 8.0)
	XLPE	3747	148588	0.8 (0.7, 0.8)	1.8 (1.7, 1.8)	2.3 (2.2, 2.4)	3.4 (3.3, 3.6)	4.7 (4.5, 5.0)	
TOTAL		5866	183779						

Note: Restricted to modern prostheses
Only prosthesis combinations have more than 10,000 procedures in both groups are listed

Table KT53 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Polyethylene Type (Primary Diagnosis OA)

Comparison	HR- adjusted for age and sex
Genesis II Oxinium PS/Genesis II Non XLPE vs Genesis II Oxinium PS/Genesis II XLPE	Entire Period: HR=1.14 (95% CI 1.03, 1.27), p=0.011
Triathlon CR/Triathlon Non XLPE vs Triathlon CR/Triathlon XLPE	Entire Period: HR=0.96 (95% CI 0.87, 1.07), p=0.483

Note: Restricted to modern prostheses
Only prosthesis combinations have more than 10,000 procedures in both groups are listed

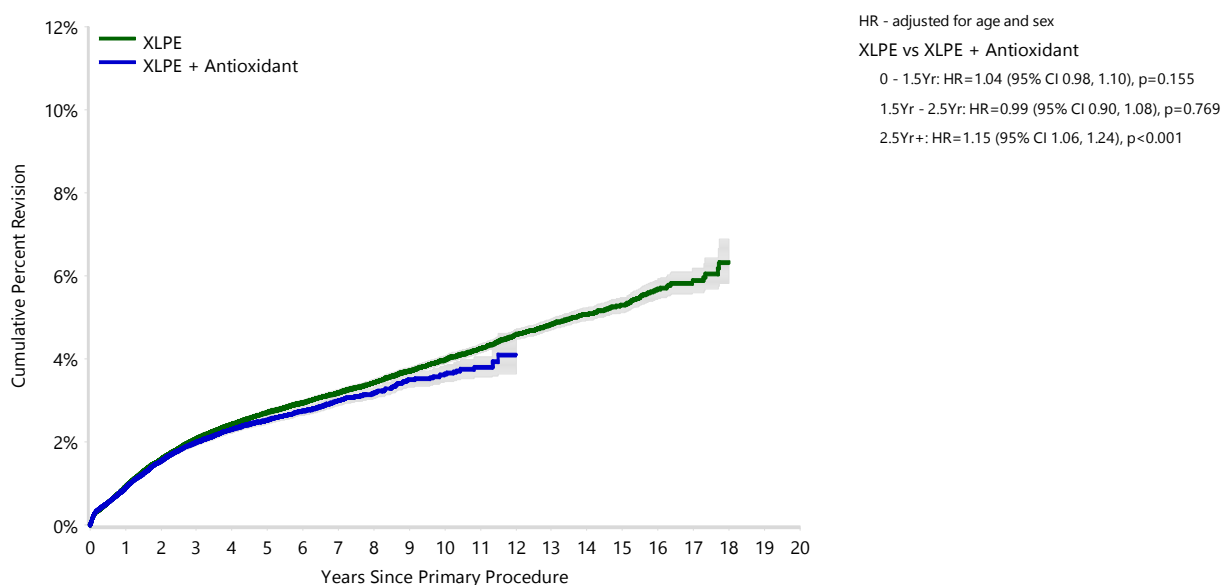
Primary Total Knee Replacement

Table KT54 Cumulative Percent Revision of XLPE Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
XLPE	8574	309610	0.9 (0.9, 1.0)	2.1 (2.0, 2.1)	2.7 (2.7, 2.8)	4.0 (3.9, 4.1)	5.3 (5.1, 5.5)
XLPE + Antioxidant	3348	172082	0.9 (0.8, 0.9)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.6 (3.4, 3.8)	
TOTAL	11922	481692					

Note: Restricted to modern prostheses

Figure KT54 Cumulative Percent Revision of XLPE Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



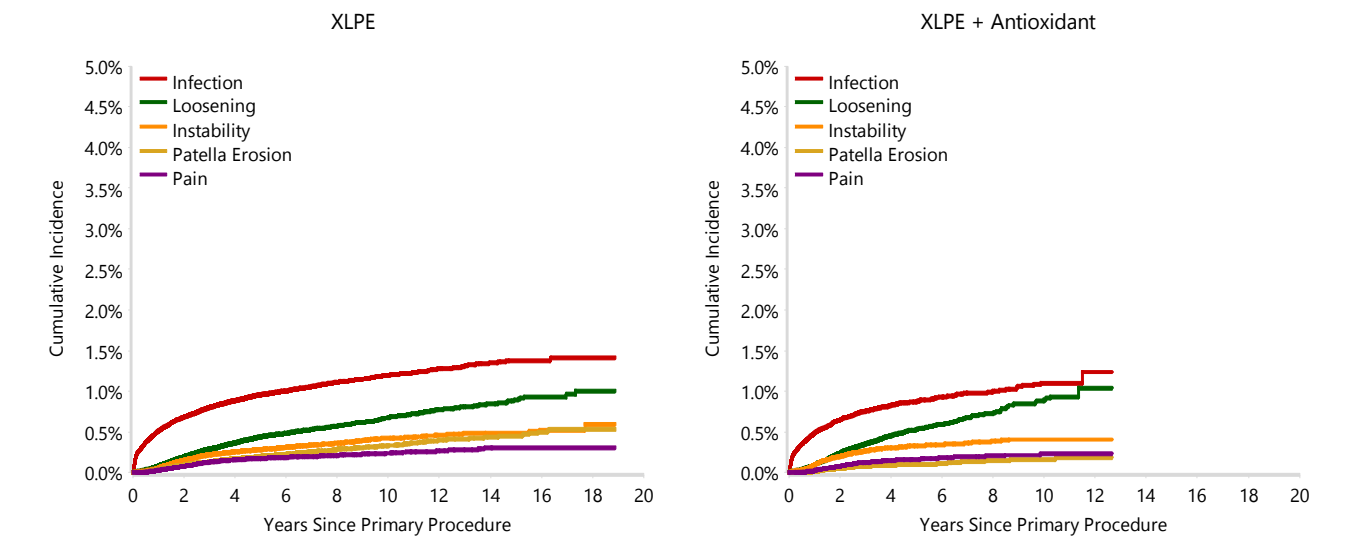
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
XLPE	309610	274836	208822	156976	56425	7577	0
XLPE + Antioxidant	172082	141522	86335	47175	4351	14	0

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT55 Cumulative Incidence Revision Diagnosis of XLPE Primary Total Knee Replacement by Polyethylene Type (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT55 Cumulative Percent Revision of Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Stability	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Minimally Stabilised		8120	373981	0.9 (0.8, 0.9)	1.9 (1.9, 2.0)	2.5 (2.4, 2.5)	3.6 (3.5, 3.7)	4.9 (4.7, 5.1)
	XLPE	5509	231194	0.8 (0.8, 0.9)	1.9 (1.8, 2.0)	2.5 (2.4, 2.5)	3.6 (3.5, 3.7)	4.9 (4.7, 5.2)
	XLPE + Antioxidant	2611	142787	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.6)	3.4 (3.2, 3.6)	
Posterior Stabilised		3728	105462	1.1 (1.0, 1.2)	2.5 (2.4, 2.6)	3.2 (3.1, 3.4)	4.7 (4.5, 4.8)	6.0 (5.7, 6.3)
	XLPE	3023	77384	1.1 (1.1, 1.2)	2.6 (2.5, 2.7)	3.4 (3.2, 3.5)	4.8 (4.6, 5.0)	6.1 (5.8, 6.4)
	XLPE + Antioxidant	705	28078	1.0 (0.9, 1.1)	2.2 (2.1, 2.4)	2.8 (2.6, 3.0)	4.3 (3.9, 4.7)	
Medial Pivot Design		6	756	1.1 (0.4, 2.6)				
	XLPE + Antioxidant	6	756	1.1 (0.4, 2.6)				
TOTAL		11854	480199					

Note: Restricted to modern prostheses
Excludes 1,215 procedures with unknown polyethylene

Table KT56 Comparisons of Revision Rates for Primary Total Knee Replacement by Polyethylene Type and Stability (Primary Diagnosis OA)

Comparison	HR -adjusted for age and sex
Minimally Stabilised XLPE vs Minimally Stabilised XLPE + Antioxidant	0 - 3Mth: HR=0.86 (95% CI 0.77, 0.96), p=0.006
	3Mth - 1.5Yr: HR=1.07 (95% CI 0.99, 1.16), p=0.083
	1.5Yr - 2Yr: HR=0.86 (95% CI 0.75, 1.00), p=0.045
	2Yr+: HR=1.07 (95% CI 0.99, 1.16), p=0.104
Posterior Stabilised XLPE vs Posterior Stabilised XLPE+ Antioxidant	Entire Period: HR=1.12 (95% CI 1.03, 1.22), p=0.007

Note: Restricted to modern prostheses
Excludes 1,215 procedures with unknown polyethylene



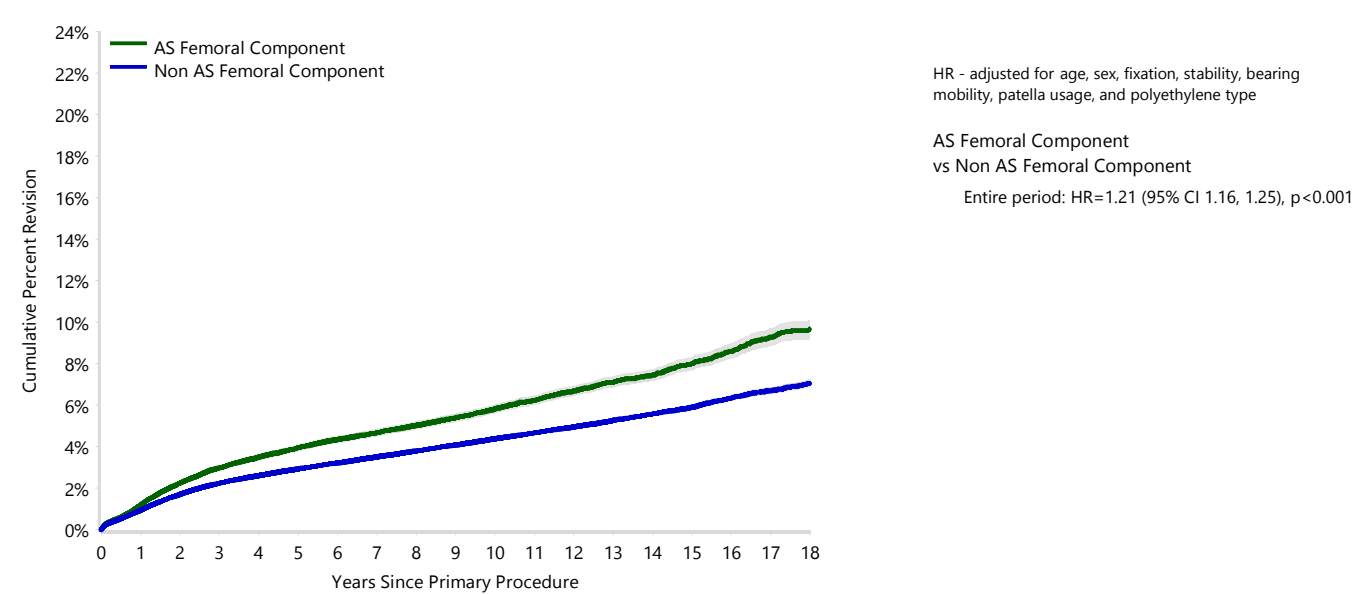
Primary Total Knee Replacement

Table KT57 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Bearing Surface (Primary Diagnosis OA)

Femoral Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
AS Femoral Component	4474	92596	1.2 (1.1, 1.3)	3.0 (2.9, 3.1)	4.0 (3.8, 4.1)	5.8 (5.6, 6.0)	8.0 (7.7, 8.3)	10.6 (10.1, 11.2)
Non AS Femoral Component	21918	683058	0.9 (0.9, 1.0)	2.2 (2.2, 2.3)	2.9 (2.9, 3.0)	4.4 (4.3, 4.4)	5.9 (5.8, 6.0)	7.6 (7.4, 7.8)
TOTAL	26392	775654						

Note: Restricted to modern prostheses

Figure KT56 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Bearing Surface (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
AS Femoral Component	92596	84878	69706	56596	27456	8264	1496
Non AS Femoral Component	683058	609734	469854	359366	151027	42837	7588

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT58 Cumulative Percent Revision of Primary Total Knee Replacement by Stability and Femoral Bearing Surface (Primary Diagnosis OA)

Stability	Femoral Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Minimally Stabilised		17065	545973	0.9 (0.9, 0.9)	2.2 (2.1, 2.2)	2.9 (2.8, 2.9)	4.3 (4.3, 4.4)	6.0 (5.8, 6.1)	7.8 (7.6, 8.0)
	AS Femoral Component	1720	40753	1.1 (1.0, 1.2)	2.7 (2.5, 2.9)	3.5 (3.3, 3.7)	5.4 (5.1, 5.7)	7.5 (7.1, 8.0)	10.0 (9.3, 10.9)
	Non AS Femoral Component	15345	505220	0.9 (0.8, 0.9)	2.1 (2.1, 2.2)	2.8 (2.7, 2.8)	4.2 (4.2, 4.3)	5.8 (5.7, 5.9)	7.6 (7.3, 7.8)
Posterior Stabilised		7452	165304	1.2 (1.1, 1.2)	2.7 (2.6, 2.8)	3.6 (3.5, 3.7)	5.2 (5.1, 5.3)	6.8 (6.6, 7.0)	8.7 (8.3, 9.1)
	AS Femoral Component	2681	50216	1.2 (1.1, 1.3)	3.2 (3.0, 3.3)	4.3 (4.1, 4.4)	6.1 (5.9, 6.4)	8.3 (7.9, 8.7)	11.1 (10.3, 12.0)
	Non AS Femoral Component	4771	115088	1.1 (1.1, 1.2)	2.5 (2.4, 2.6)	3.3 (3.2, 3.4)	4.8 (4.7, 5.0)	6.2 (6.0, 6.4)	7.6 (7.2, 8.0)
Medial Pivot Design		1483	58280	1.0 (0.9, 1.1)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.1 (3.8, 4.4)		
	AS Femoral Component	0	81	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Non AS Femoral Component	1483	58199	1.0 (0.9, 1.1)	2.3 (2.2, 2.5)	2.9 (2.8, 3.1)	4.1 (3.8, 4.4)		
TOTAL		26000	769557						

Note: Restricted to modern prostheses
Excludes 1,215 procedures with unknown polyethylene

Table KT59 Comparisons of Revision Rates for Primary Total Knee Replacement by Stability and Femoral Bearing Surface (Primary Diagnosis OA)

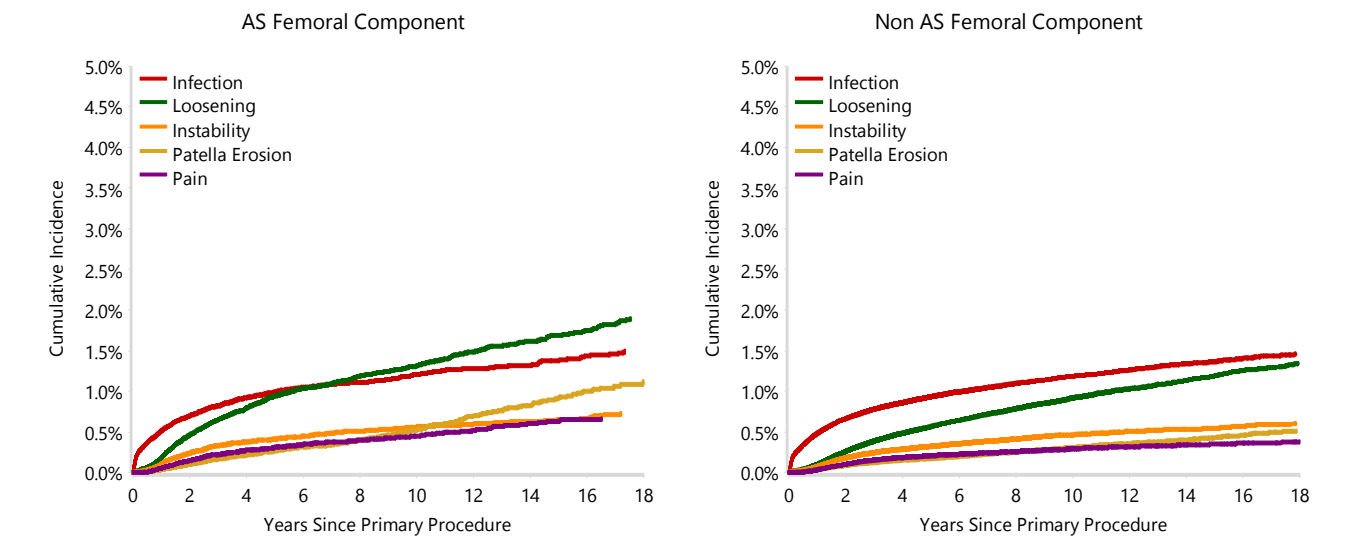
Comparison	HR- adjusted for age and sex
Minimally Stabilised AS Femoral Component vs Minimally Stabilised Non AS Femoral Component	Entire Period: HR=1.20 (95% CI 1.14, 1.26), p<0.001
Posterior Stabilised AS Femoral Component vs Posterior Stabilised Non AS Femoral Component	0 - 9Mth: HR=0.86 (95% CI 0.77, 0.96), p=0.008
	9Mth - 2Yr: HR=1.35 (95% CI 1.23, 1.48), p<0.001
	2Yr+: HR=1.23 (95% CI 1.16, 1.31), p<0.001

Note: Restricted to modern prostheses
Excludes 1,215 procedures with unknown polyethylene



Primary Total Knee Replacement

Figure KT57 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Femoral Bearing Surface (Primary Diagnosis OA)



Note: Restricted to modern prostheses

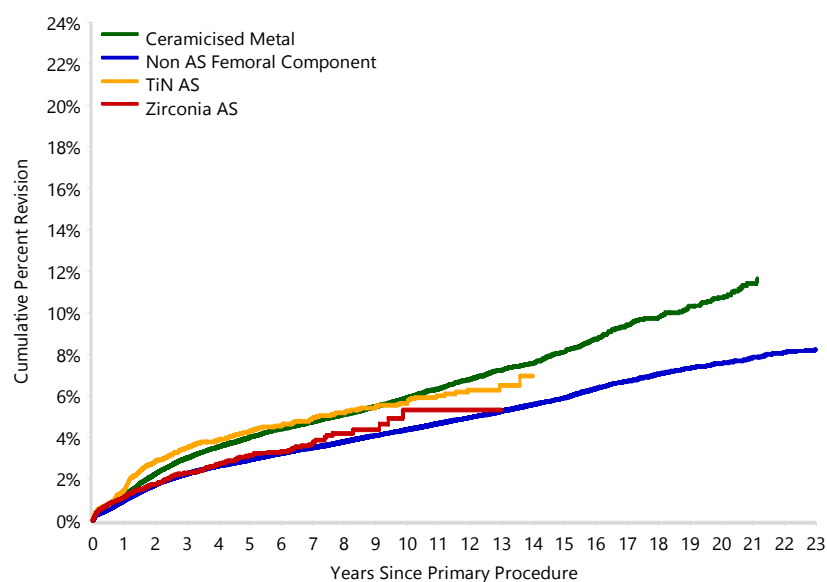
Primary Total Knee Replacement

Table KT60 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA)

Femoral Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	3898	76212	1.2 (1.1, 1.2)	3.0 (2.9, 3.1)	4.0 (3.9, 4.2)	5.9 (5.7, 6.1)	8.1 (7.8, 8.4)	10.7 (10.2, 11.3)
Non AS Femoral Component	21920	683422	0.9 (0.9, 1.0)	2.2 (2.2, 2.3)	2.9 (2.9, 3.0)	4.4 (4.3, 4.4)	5.9 (5.8, 6.0)	7.6 (7.4, 7.8)
TiN AS	329	6880	1.5 (1.2, 1.8)	3.5 (3.1, 4.0)	4.3 (3.8, 4.9)	5.6 (5.0, 6.3)		
Zirconia AS	245	9140	1.1 (0.9, 1.4)	2.3 (2.0, 2.6)	3.1 (2.7, 3.6)	5.3 (4.2, 6.8)		
TOTAL	26392	775654						

Note: Restricted to modern prostheses

Figure KT58 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA)



HR - adjusted for age and sex

Ceramicised Metal vs Non AS Femoral Component
Entire period: HR=1.27 (95%CI 1.22, 1.32), p<0.001

TiN AS vs Non AS Femoral Component
0-1.5Yr: HR=1.59 (95%CI 1.39, 1.85), p <0.001
1.5Yr+: HR=0.89 (95%CI 0.73, 0.95), p= 0.005

Zirconia AS vs Non AS Femoral Component
0-2Yr: HR=1.12 (95%CI 0.97,1.28), p=0.109
2Yr+: HR=0.88 (0.75,1.05), p=0.164

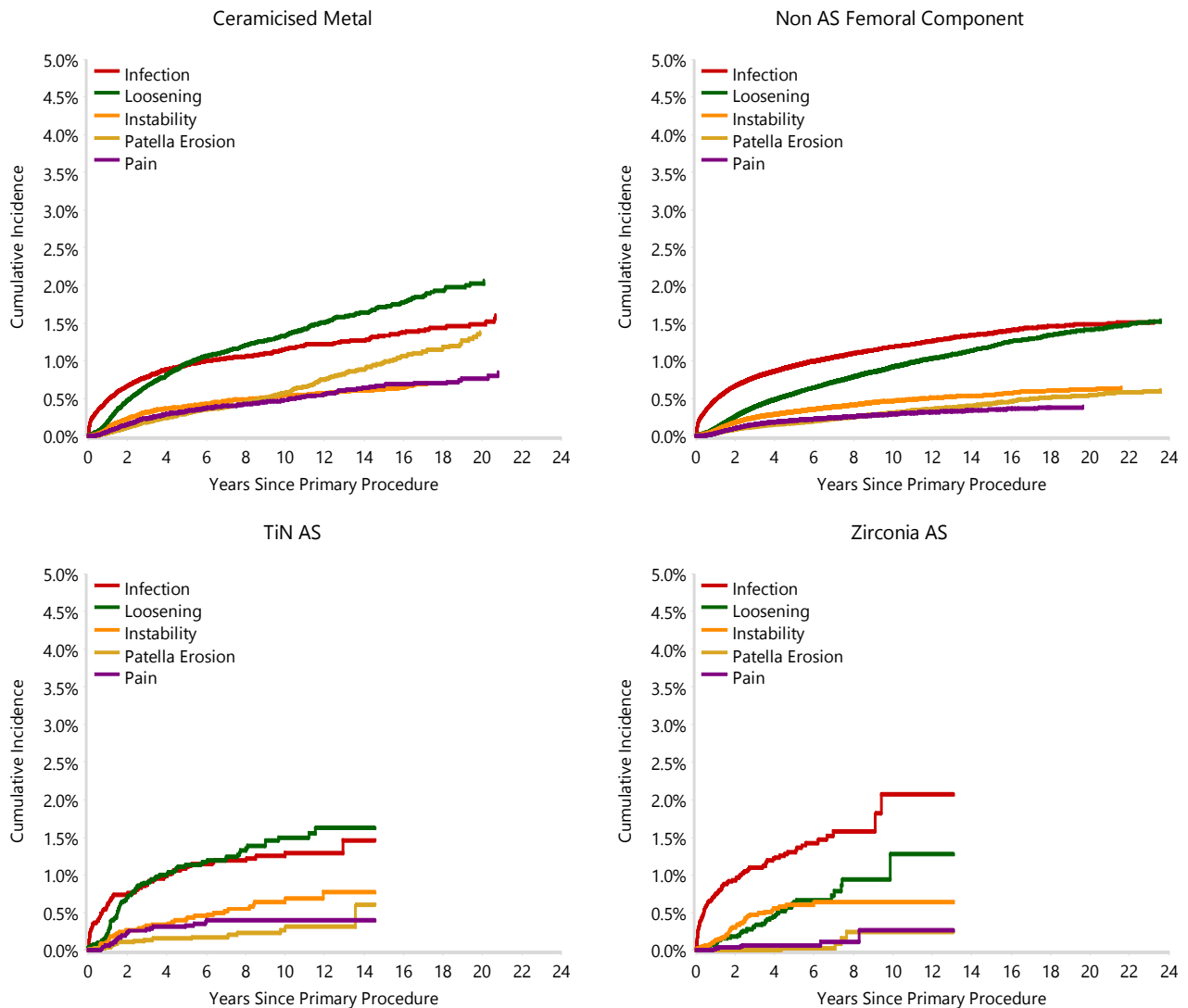
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	76212	70224	58438	48626	25352	8244	1496
Non AS Femoral Component	683422	609734	469854	359366	151027	42837	7588
TiN AS	6880	6512	5554	4565	1870	11	0
Zirconia AS	9140	8142	5714	3405	234	9	0

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Figure KT59 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA)



Note: Restricted to modern prostheses

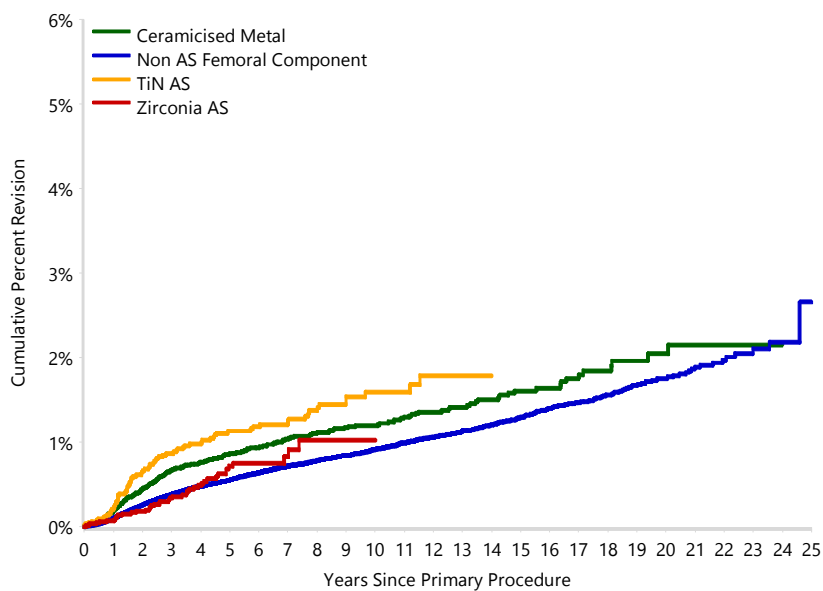
Primary Total Knee Replacement

Table KT61 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA, Revision for Loosening)

AS Femoral Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	895	76212	0.2 (0.2, 0.2)	0.7 (0.6, 0.7)	1.0 (0.9, 1.1)	1.4 (1.3, 1.5)	1.9 (1.8, 2.1)	2.4 (2.2, 2.7)
Non AS Femoral Component	4561	683422	0.1 (0.1, 0.1)	0.4 (0.4, 0.4)	0.6 (0.6, 0.6)	1.0 (1.0, 1.0)	1.4 (1.3, 1.5)	1.9 (1.8, 2.0)
TiN AS	86	6880	0.2 (0.1, 0.4)	0.9 (0.7, 1.2)	1.2 (0.9, 1.5)	1.6 (1.3, 2.0)		
Zirconia AS	45	9140	0.1 (0.0, 0.2)	0.3 (0.2, 0.5)	0.7 (0.5, 0.9)	1.4 (0.8, 2.6)		
TOTAL	5587	775654						

Note: Restricted to modern prostheses

Figure KT60 Cumulative Percent Revision of Primary Total Knee Replacement by Femoral Material (Primary Diagnosis OA, Revision for Loosening)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Ceramicised Metal	76212	70224	58438	48626	25352	8244	1496
Non AS Femoral Component	683422	609734	469854	359366	151027	42837	7588
TiN AS	6880	6512	5554	4565	1870	11	0
Zirconia AS	9140	8142	5714	3405	234	9	0

Note: Restricted to modern prostheses



Primary Total Knee Replacement

Table KT62 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Type and Femoral Bearing Surface (Primary Diagnosis OA)

Prosthesis Combination	Femoral Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs
Columbus/Columbus	AS Femoral Component	205	8199	1.0 (0.8, 1.3)	2.1 (1.8, 2.5)	3.1 (2.6, 3.5)	4.2 (3.5, 5.0)	
	Non AS Femoral Component	112	1008	2.0 (1.3, 3.1)	6.4 (5.1, 8.2)	7.8 (6.3, 9.7)	10.7 (8.8, 12.8)	12.6 (10.5, 15.1)
E.Motion/E.Motion	AS Femoral Component	25	496	1.8 (1.0, 3.5)	3.7 (2.4, 5.8)	3.7 (2.4, 5.8)	6.6 (4.4, 10.1)	
	Non AS Femoral Component	55	545	3.1 (2.0, 5.0)	7.3 (5.4, 9.8)	8.8 (6.7, 11.6)	10.4 (8.0, 13.3)	10.4 (8.0, 13.3)
TOTAL		397	10248					

Note: Restricted to modern prostheses

Table KT63 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Femoral Bearing Surface (Primary Diagnosis OA)

Comparison	HR- adjusted for age and sex
Columbus/Columbus AS Femoral Component vs Columbus/Columbus Non AS Femoral Component	Entire Period: HR=0.37 (95% CI 0.29, 0.48), p<0.001
E.Motion/E.Motion AS Femoral Component vs E.Motion/E.Motion Non AS Femoral Component	Entire Period: HR=0.56 (95% CI 0.35, 0.89), p=0.015

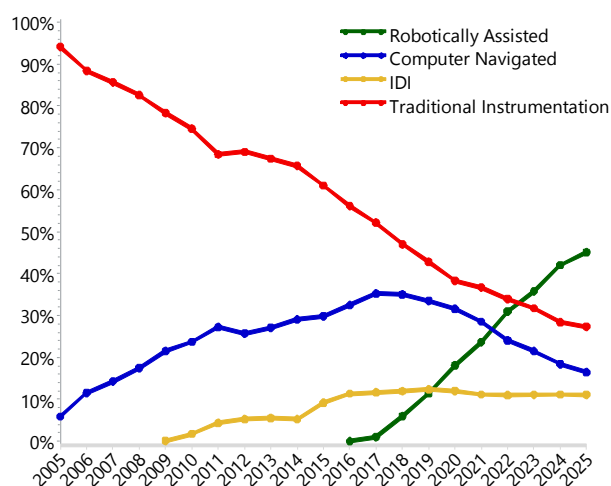
Note: Restricted to modern prostheses

Primary Total Knee Replacement

SURGEON ASSISTIVE TOOLS

Computer navigation, image derived instrumentation (IDI) and robotic assistance, to aid implantation of knee replacements, have been labelled as 'surgeon assistive tools'. Procedures using traditional instrumentation have decreased to 27.3% of primary total knee procedures in 2025. The change in use of each assistive tool is shown in Figure KT61. Results for primary total knee replacement for osteoarthritis with the use of these techniques are presented, followed by a comparison of the assistive tools used with XLPE since 2016 (when robotic assistance was introduced). Revision outcomes are analysed using each of these methods compared to traditional instrumentation.

Figure KT61 Primary Total Knee Replacement by Surgeon Assistive Tool (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Computer Navigation

There have been 195,257 primary total knee replacement procedures using computer navigation. In 2025, computer navigation was used in 16.5% of all primary total knee replacement procedures.

When adjusted for age, sex, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability, there is no difference in the rate of revision when procedures using computer navigation are compared to procedures using traditional instrumentation. Comparisons are made from 2015, when BMI data collection commenced (Table KT64, Figure KT62 and Figure KT63).

Using the same adjustments, there is a lower rate of revision for patients aged <65 years when computer navigation is used compared to traditional instrumentation. There is no difference when these comparisons are repeated for patients aged ≥65 years (Table KT65 and Figure KT64).

The outcomes of five prosthesis combinations used with computer navigation and with traditional instrumentation,

and that have >5,000 procedures in each group, are shown in Table KT66 and Table KT67.

Image Derived Instrumentation (IDI)

IDI is the use of custom-made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient.

There have been 70,652 primary total knee replacement procedures undertaken using IDI since 2009. In 2025, IDI was used in 11.1% of all primary total knee replacement procedures.

When procedures using IDI are compared to procedures using traditional instrumentation with adjustment for age, sex, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability, IDI usage has a higher rate of revision. Comparisons are made from 2015, when BMI data collection commenced (Table KT68 and Figure KT65). There is an increased proportion of revision for instability when IDI is used (Figure KT66).

The effect of IDI on revision varies with age. Using the same adjustments, for patients aged ≥65 years where IDI is used, there is a higher rate of revision compared to traditional instrumentation. There is no difference with IDI use for patients aged <65 years (Table KT69 and Figure KT67).

The outcomes of three prosthesis combinations used with IDI and with traditional instrumentation, and that have >5,000 procedures in each group, are shown in Table KT70 and Table KT71.

Robotic Assistance

Robotic assistance has been recorded for 132,750 total knee replacements since 2016. In 2025, robotic assistance was used in 45.1% of all primary total knee replacement procedures. There are 5 robotic systems that are used with a small number of prostheses, and many of these systems have limited follow-up.

When adjusted for age, sex, ASA, BMI, bearing surface, patella component usage, surgeon volume and stability, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation. Comparisons are made from 2016, when robotic assistance commenced (Table KT72 and Figure KT68). Reasons for revision when robotic assistance is used are shown in Figure KT69.

Using the same adjustments, there is no difference in the rate of revision for patients aged <65 years when robotic assistance is used compared to traditional instrumentation. However, for patients aged ≥65 years there is a higher rate of revision when robotic assistance is used compared to traditional instrumentation (Table KT73 and Figure KT70).

The outcomes of three prosthesis combinations used with robotic assistance and traditional instrumentation with >5,000 procedures in each group are shown in Table KT74 and Table KT75.



Primary Total Knee Replacement

When adjusted for age, sex, ASA, BMI, tibial fixation, bearing surface, patella component usage, surgeon volume and stability, there is no difference in the rate of revision when procedures using robotic assistance are compared to procedures using traditional instrumentation.

Surgeon Assistive Tools Compared

Total knee procedures since 2016 for osteoarthritis using XLPE with the use of assistive tools and adjusted for age, sex, ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability are compared in Table KT76 and Figure KT71.

With these restrictions, there is no difference in the rate of revision when procedures using computer navigation, IDI, robotic assistance and traditional instrumentation are compared.

Prosthesis-Specific Analysis

There are two prosthesis combinations using XLPE that have used at least three assistive methods that have >10,000 procedures in each group. The analyses for these two prostheses have been adjusted for age, sex, ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability.

There is no difference in the rate of revision when the Persona CR/Persona combination is used with robotic assistance compared to when computer navigation is used, and when compared to procedures using traditional instrumentation (Table KT77 and Figure KT72).

The Triathlon CR/Triathlon combination also shows no difference when procedures using any of the types of assistive tools are compared (Table KT78 and Figure KT73).

Primary Total Knee Replacement

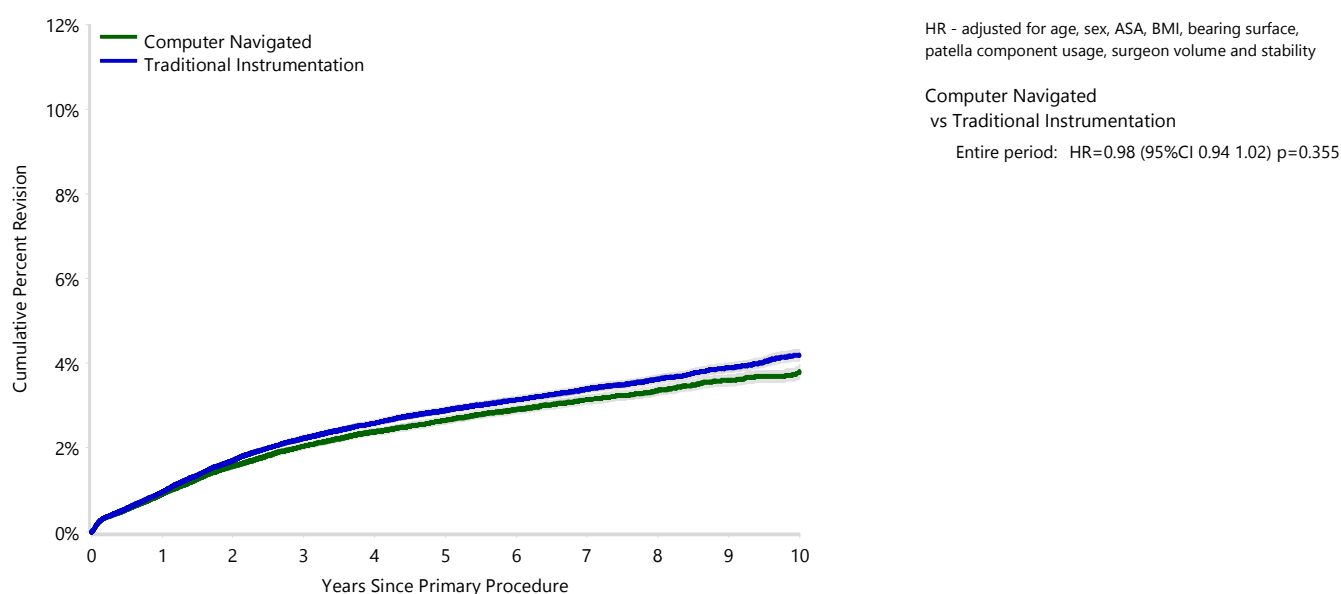
Table KT64 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	4Yrs	7 Yrs	10 Yrs
Computer Navigated	3720	147621	0.9 (0.8, 0.9)	2.4 (2.3, 2.5)	3.1 (3.0, 3.2)	3.8 (3.6, 4.0)
Traditional Instrumentation	5695	209803	1.0 (0.9, 1.0)	2.6 (2.5, 2.7)	3.4 (3.3, 3.5)	4.2 (4.1, 4.3)
TOTAL	9415	357424				

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT62 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	4 Yrs	7 Yrs	10 Yrs
Computer Navigated	147621	134323	90310	43688	7218
Traditional Instrumentation	209803	188206	123588	64441	12906

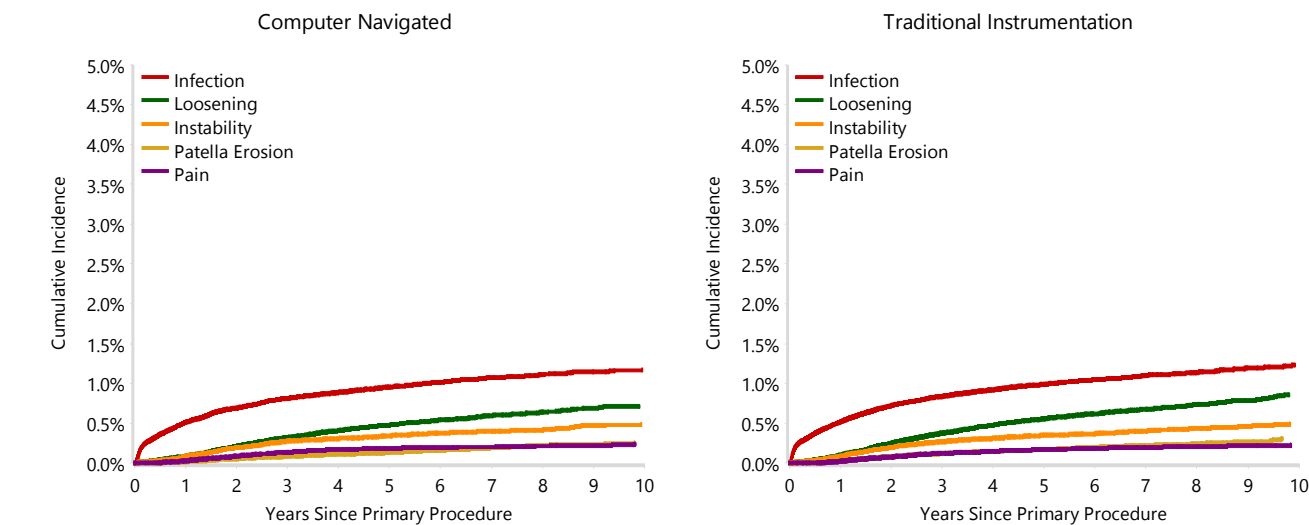
Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.



Primary Total Knee Replacement

Figure KT63 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement Since 2015 by Computer Navigation (Primary Diagnoses OA)



Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Primary Total Knee Replacement

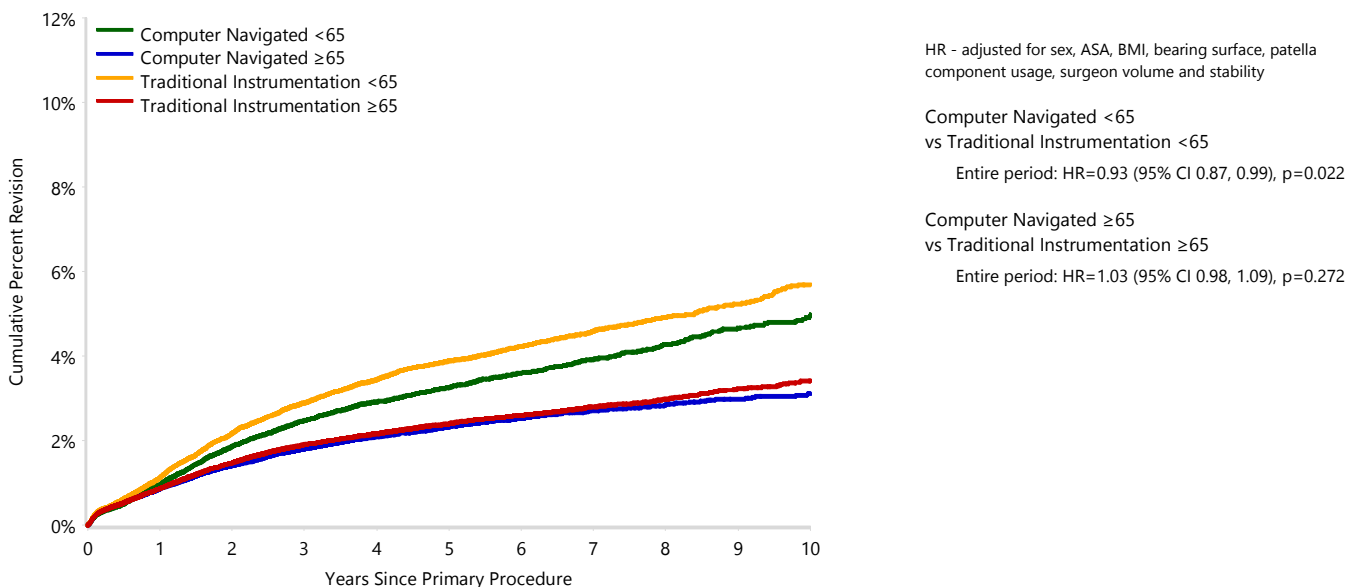
Table KT65 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9Yrs	10 Yrs
Computer Navigated	<65	1603	49114	1.0 (0.9, 1.1)	2.5 (2.3, 2.6)	3.3 (3.1, 3.4)	3.9 (3.7, 4.1)	4.7 (4.4, 4.9)	5.0 (4.7, 5.3)
	≥65	2117	98507	0.9 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)	2.7 (2.6, 2.8)	3.0 (2.8, 3.1)	3.1 (3.0, 3.3)
Traditional Instrumentation	<65	2478	65896	1.1 (1.1, 1.2)	2.9 (2.8, 3.0)	3.9 (3.7, 4.1)	4.6 (4.4, 4.8)	5.2 (5.0, 5.5)	5.7 (5.4, 6.0)
	≥65	3217	143907	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.2 (3.1, 3.4)	3.4 (3.3, 3.6)
TOTAL		9415	357424						

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability.

Figure KT64 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by Computer Navigation and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Computer Navigated	<65	49114	45116	36042	26547	16341	6666	2876
	≥65	98507	89207	68413	47674	27347	10246	4342
Traditional Instrumentation	<65	65896	59694	46680	34299	22423	10486	4837
	≥65	143907	128512	96774	68487	42018	17951	8069

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability



Primary Total Knee Replacement

Table KT66 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Apex Knee CR/Apex Knee	Computer Navigated	113	6266	0.8 (0.6, 1.1)	1.8 (1.5, 2.2)	2.2 (1.8, 2.7)	2.5 (2.0, 3.0)	2.6 (2.1, 3.2)	2.6 (2.1, 3.2)
	Traditional Instrumentation	146	7750	0.7 (0.5, 0.9)	1.4 (1.2, 1.7)	1.9 (1.6, 2.3)	2.4 (2.0, 2.8)	2.8 (2.3, 3.4)	3.0 (2.4, 3.7)
Attune CR/Attune	Computer Navigated	238	11121	0.8 (0.6, 1.0)	1.7 (1.5, 2.0)	2.2 (2.0, 2.6)	2.6 (2.3, 3.0)	3.1 (2.7, 3.7)	3.1 (2.7, 3.7)
	Traditional Instrumentation	587	21790	0.9 (0.8, 1.0)	2.2 (2.0, 2.4)	2.8 (2.6, 3.1)	3.4 (3.1, 3.7)	3.9 (3.6, 4.3)	4.1 (3.7, 4.5)
Attune PS/Attune	Computer Navigated	185	6957	0.9 (0.7, 1.2)	2.3 (1.9, 2.7)	2.8 (2.4, 3.2)	3.3 (2.8, 3.9)	3.9 (3.2, 4.7)	3.9 (3.2, 4.7)
	Traditional Instrumentation	248	8987	0.9 (0.7, 1.1)	2.1 (1.8, 2.5)	2.7 (2.4, 3.1)	3.6 (3.2, 4.2)	4.3 (3.7, 5.0)	4.3 (3.7, 5.0)
Persona CR/Persona	Computer Navigated	388	20719	0.9 (0.7, 1.0)	1.8 (1.6, 2.0)	2.3 (2.1, 2.6)	2.7 (2.4, 3.1)	2.8 (2.5, 3.2)	2.8 (2.5, 3.2)
	Traditional Instrumentation	499	30581	0.9 (0.8, 1.0)	1.9 (1.7, 2.1)	2.3 (2.1, 2.6)	2.6 (2.3, 2.9)	2.6 (2.3, 2.9)	3.4 (2.1, 5.6)
Triathlon CR/Triathlon	Computer Navigated	1156	51101	0.8 (0.7, 0.9)	1.7 (1.6, 1.8)	2.2 (2.1, 2.4)	2.6 (2.5, 2.8)	3.1 (2.9, 3.3)	3.2 (3.0, 3.4)
	Traditional Instrumentation	764	31245	0.8 (0.7, 0.9)	1.8 (1.7, 2.0)	2.4 (2.2, 2.6)	2.8 (2.6, 3.0)	3.2 (3.0, 3.5)	3.4 (3.1, 3.7)
TOTAL		4324	196517						

Note: Restricted to modern prostheses
Only prosthesis combinations with >5,000 procedures in both groups have been listed
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability



Primary Total Knee Replacement

Table KT67 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and Computer Navigation (Primary Diagnosis OA)

Comparison	HR – adjusted for age, sex, ASA, BMI, patella component usage and surgeon volume
Apex Knee CR/Apex Knee Computer Navigated vs Apex Knee CR/Apex Knee Traditional Instrumentation	Entire Period: HR=1.00 (95% CI 0.77, 1.31), p=0.977
Attune CR/Attune Computer Navigated vs Attune CR/Attune Traditional Instrumentation	Entire Period: HR=0.80 (95% CI 0.69, 0.94), p=0.007
Attune PS/Attune Computer Navigated vs Attune PS/Attune Traditional Instrumentation	Entire Period: HR=1.02 (95% CI 0.84, 1.26), p=0.799
Persona CR/Persona Computer Navigated vs Persona CR/Persona Traditional Instrumentation	Entire Period: HR=1.06 (95% CI 0.93, 1.22), p=0.387
Triathlon CR/Triathlon Computer Navigated vs Triathlon CR/Triathlon Traditional Instrumentation	Entire Period: HR=0.90 (95% CI 0.82, 1.00), p=0.042

Note: Restricted to modern prostheses

Only prosthesis combinations with >5,000 procedures in both groups have been listed

Apex Knee CR/Apex Knee and Triathlon CR/Triathlon have been adjusted for bearing surface



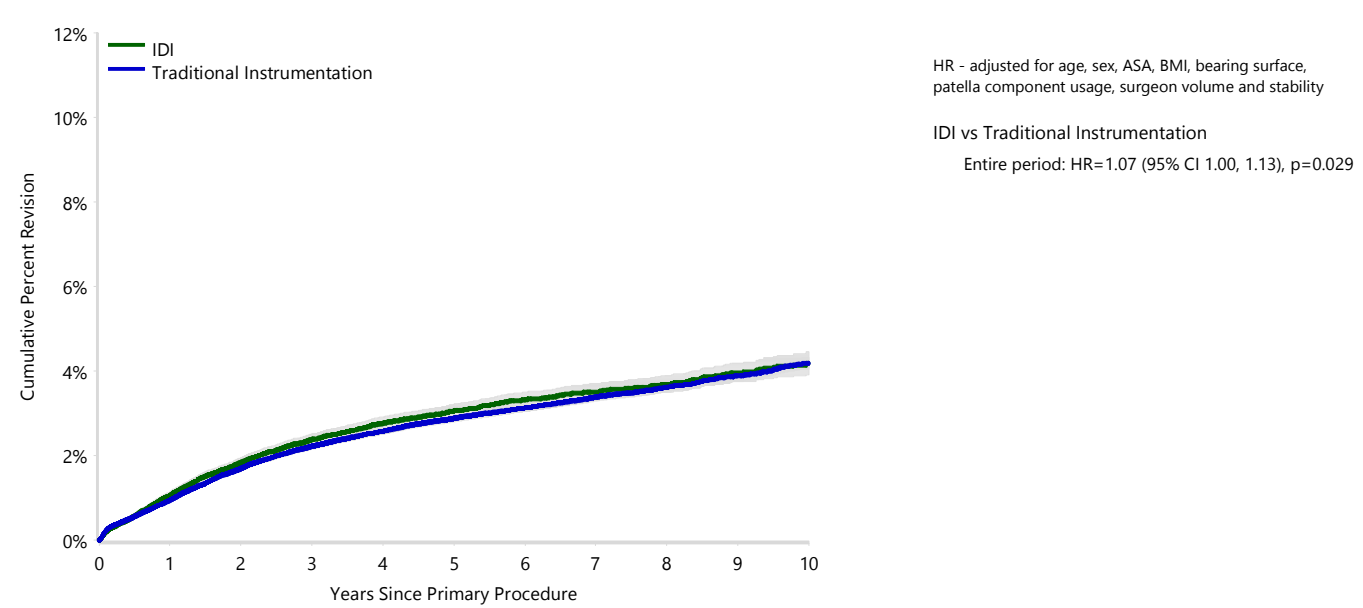
Primary Total Knee Replacement

Table KT68 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	4 Yrs	7 Yrs	10 Yrs
IDI	1648	62319	1.1 (1.0, 1.1)	2.8 (2.6, 2.9)	3.5 (3.3, 3.7)	4.2 (3.9, 4.5)
Traditional Instrumentation	5695	209803	1.0 (0.9, 1.0)	2.6 (2.5, 2.7)	3.4 (3.3, 3.5)	4.2 (4.1, 4.3)
TOTAL	7343	272122				

Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Figure KT65 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)

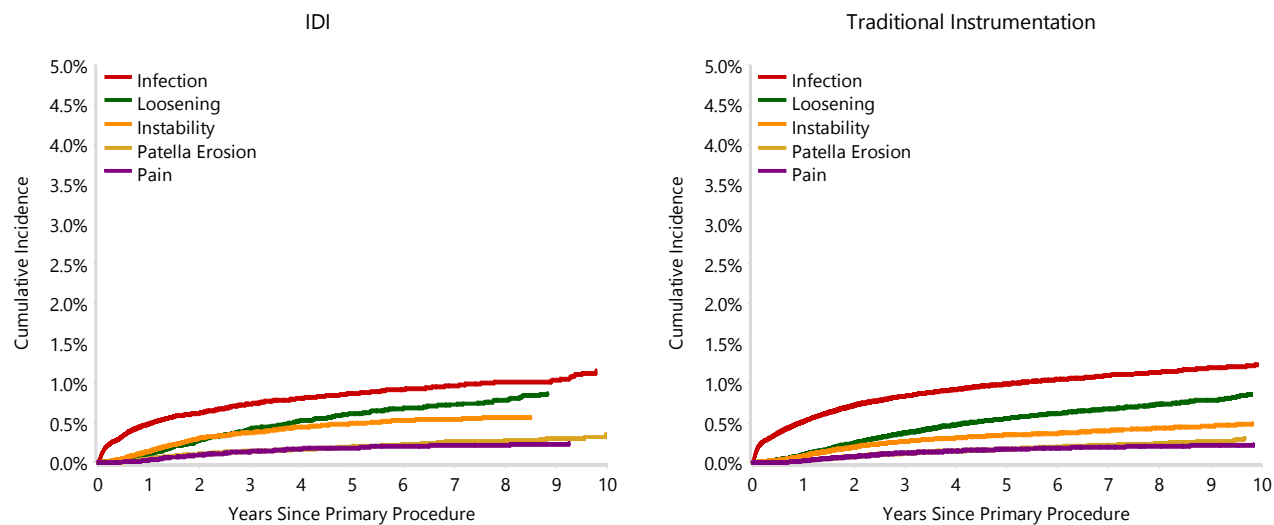


Number at Risk	0 Yr	1 Yr	4Yrs	7 Yrs	10 Yrs
IDI	62319	54247	32582	14985	2341
Traditional Instrumentation	209803	188206	123588	64441	12906

Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Primary Total Knee Replacement

Figure KT66 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement Since 2015 by IDI Usage (Primary Diagnosis OA)



Note: Restricted to modern prostheses
 Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability



Primary Total Knee Replacement

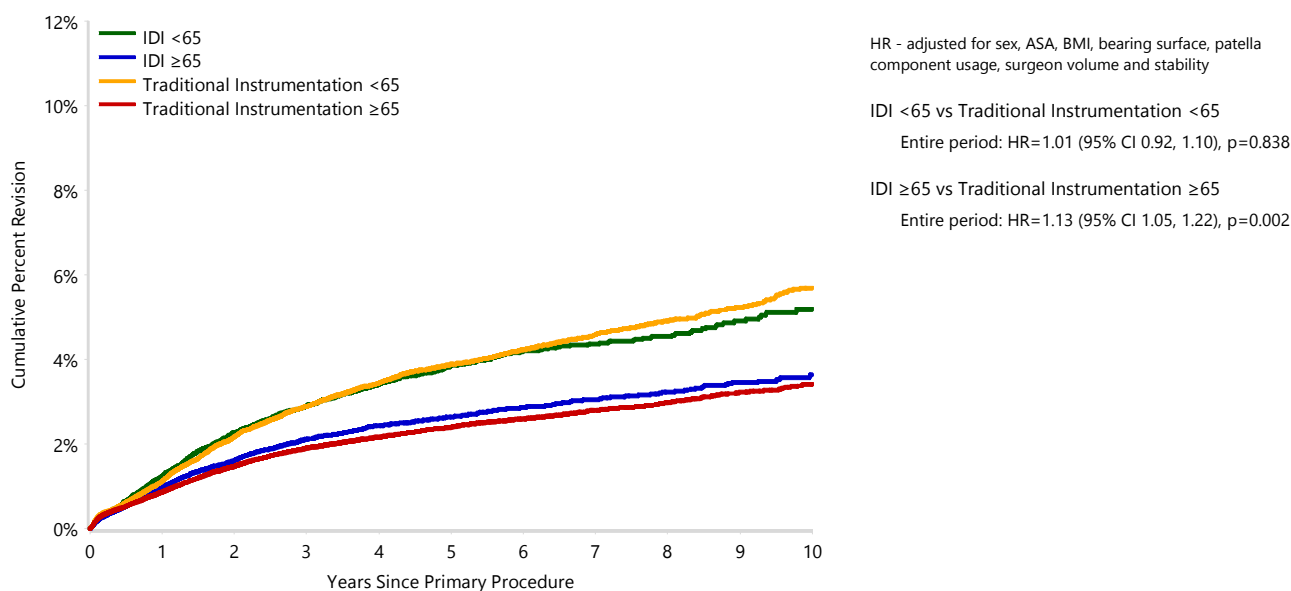
Table KT69 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
IDI	<65	700	20609	1.2 (1.1, 1.4)	2.9 (2.7, 3.2)	3.9 (3.6, 4.2)	4.4 (4.0, 4.7)	4.9 (4.5, 5.3)	5.2 (4.7, 5.7)
	≥65	948	41710	1.0 (0.9, 1.1)	2.1 (2.0, 2.3)	2.6 (2.5, 2.8)	3.1 (2.9, 3.3)	3.5 (3.2, 3.7)	3.6 (3.3, 4.0)
Traditional Instrumentation	<65	2478	65896	1.1 (1.1, 1.2)	2.9 (2.8, 3.0)	3.9 (3.7, 4.1)	4.6 (4.4, 4.8)	5.2 (5.0, 5.5)	5.7 (5.4, 6.0)
	≥65	3217	143907	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.2 (3.1, 3.4)	3.4 (3.3, 3.6)
TOTAL		7343	272122						

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Figure KT67 Cumulative Percent Revision of Primary Total Knee Replacement Since 2015 by IDI Usage and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
IDI	<65	20609	18212	13403	9493	5576	2244	943
	≥65	41710	36035	25361	16834	9409	3535	1398
Traditional Instrumentation	<65	65896	59694	46680	34299	22423	10486	4837
	≥65	143907	128512	96774	68487	42018	17951	8069

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability



Primary Total Knee Replacement

Table KT70 Cumulative Percent Revision of Primary Total Knee Replacement by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Evolution/Evolution	IDI	173	5229	1.0 (0.8, 1.4)	2.5 (2.1, 3.0)	3.2 (2.7, 3.7)	3.7 (3.2, 4.3)	3.8 (3.3, 4.4)	3.9 (3.4, 4.6)
	Traditional Instrumentation	110	5491	0.7 (0.5, 0.9)	1.8 (1.4, 2.2)	2.2 (1.8, 2.6)	2.4 (2.0, 2.9)	2.7 (2.2, 3.3)	2.7 (2.2, 3.3)
GMK Sphere Primary/GMK Primary	IDI	516	21681	1.2 (1.1, 1.4)	2.5 (2.3, 2.7)	3.1 (2.8, 3.4)	3.5 (3.2, 3.9)	3.9 (3.5, 4.4)	4.1 (3.6, 4.6)
	Traditional Instrumentation	224	8214	1.1 (0.9, 1.3)	2.8 (2.4, 3.2)	3.4 (2.9, 3.9)	4.0 (3.5, 4.6)	4.5 (3.9, 5.3)	4.8 (4.0, 5.7)
Persona CR/Persona	IDI	175	9982	0.9 (0.7, 1.1)	1.9 (1.6, 2.2)	2.3 (2.0, 2.7)	2.4 (2.1, 2.9)		
	Traditional Instrumentation	499	30581	0.9 (0.8, 1.0)	1.9 (1.7, 2.1)	2.3 (2.1, 2.6)	2.6 (2.3, 2.9)	2.6 (2.3, 2.9)	3.4 (2.1, 5.6)
TOTAL		1697	81178						

Note: Restricted to modern prostheses

Only prosthesis combinations with >5,000 procedures in both groups are listed

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage and surgeon volume

Table KT71 Comparisons of Revision Rates for Primary Total Knee Replacement by Prosthesis Combination and IDI Usage (Primary Diagnosis OA)

Comparison	HR -adjusted for age, sex, ASA, BMI, bearing surface, patella component usage and surgeon volume
Evolution/Evolution IDI vs Evolution/Evolution Traditional Instrumentation	Entire Period: HR=1.48 (95% CI 1.12, 1.94), p=0.005
GMK Sphere Primary/GMK Primary IDI vs GMK Sphere Primary/GMK Primary Traditional Instrumentation	0-9Mth: HR=1.42 (95% CI 1.05, 1.92), p=0.021
	9Mth+: HR=0.74 (95% CI 0.62, 0.90), p=0.002
Persona CR/Persona IDI vs Persona CR/Persona Traditional Instrumentation	Entire Period: HR=0.98 (95% CI 0.82, 1.17), p=0.801

Note: Restricted to modern prostheses

Only prosthesis combinations with >5,000 procedures in both groups are listed

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage and surgeon volume



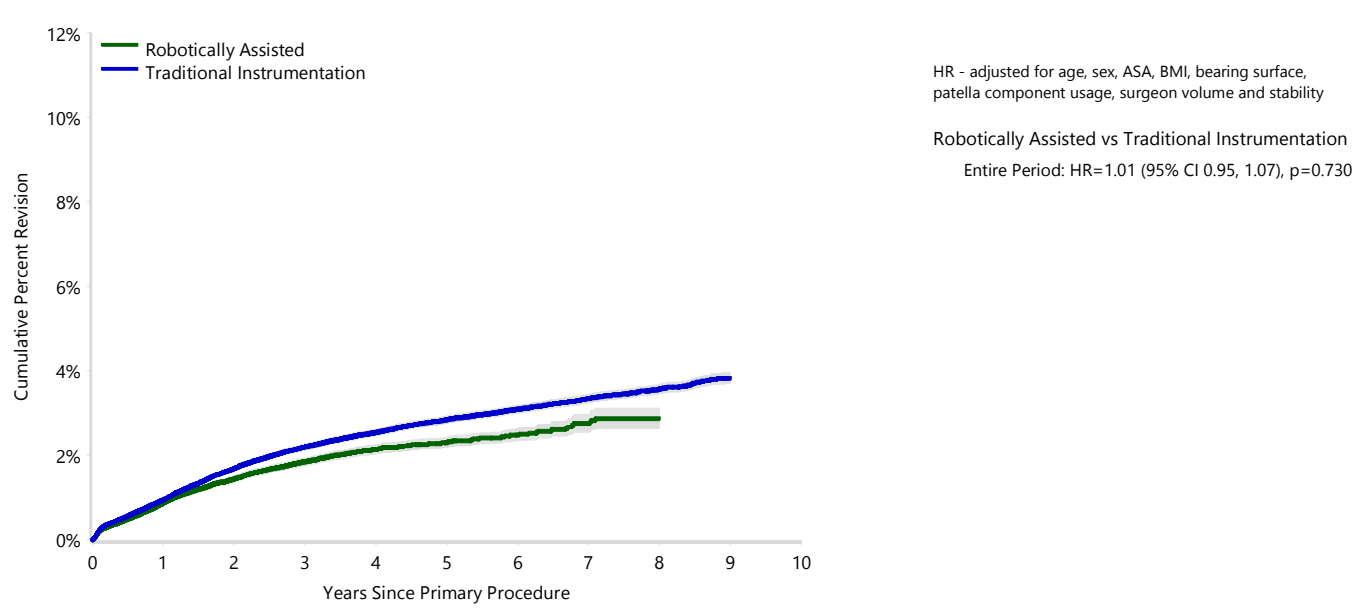
Primary Total Knee Replacement

Table KT72 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)

Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Robotically Assisted	1950	131808	0.9 (0.8, 0.9)	1.9 (1.8, 1.9)	2.3 (2.2, 2.4)	2.8 (2.6, 3.0)		
Traditional Instrumentation	4960	193182	1.0 (0.9, 1.0)	2.2 (2.1, 2.3)	2.8 (2.8, 2.9)	3.3 (3.2, 3.4)	3.8 (3.7, 4.0)	
TOTAL	6910	324990						

Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Figure KT68 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance (Primary Diagnosis OA)

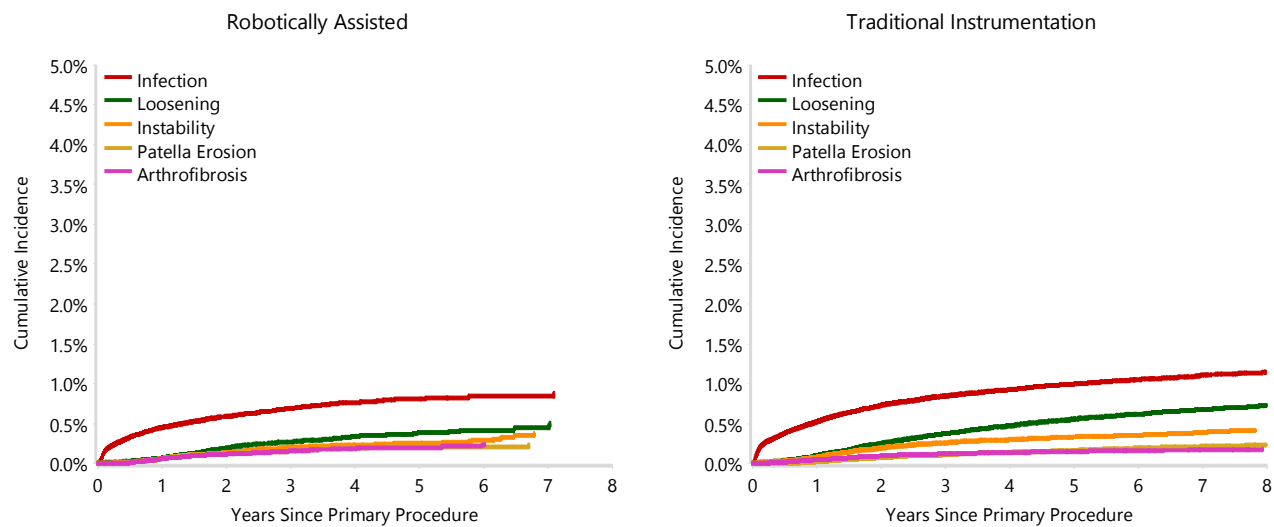


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Robotically Assisted	131808	99133	45464	16057	2740	8	0
Traditional Instrumentation	193182	171833	127656	87622	50100	15021	0

Note: Restricted to modern prostheses
Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability

Primary Total Knee Replacement

Figure KT69 Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement Since 2016 by Robotic Assistance (Primary Diagnoses OA)



Note: Restricted to modern prostheses
 Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability



Primary Total Knee Replacement

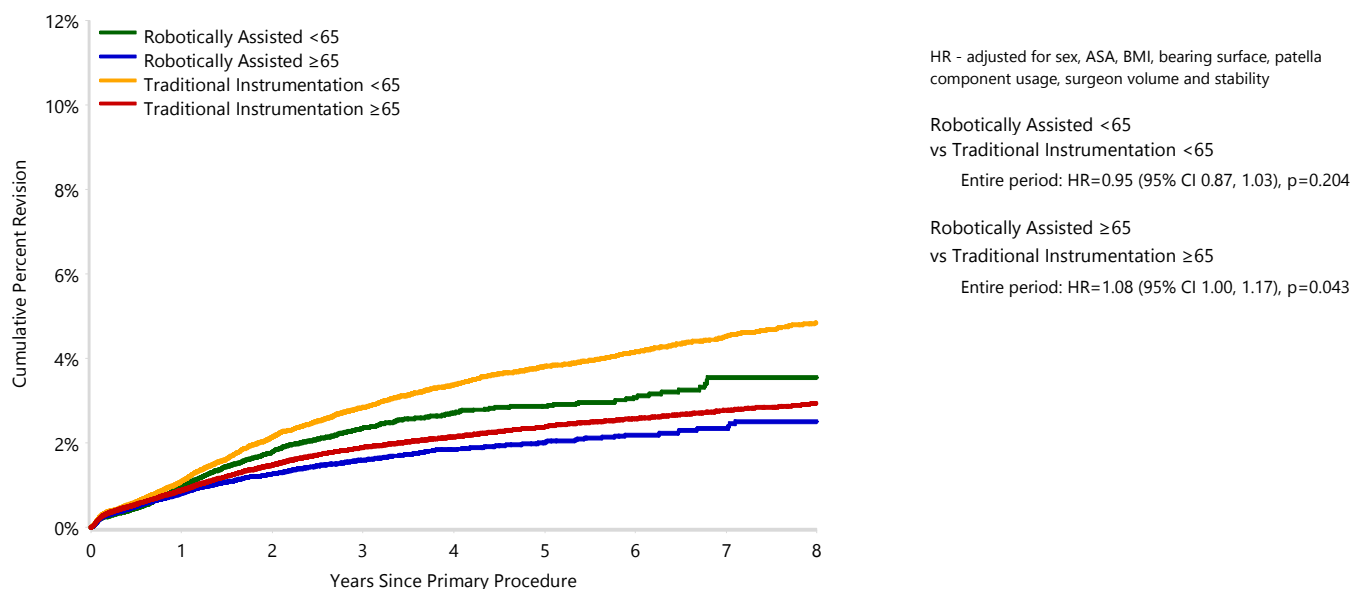
Table KT73 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)

Surgeon Assistive Tool	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Robotically Assisted	<65	800	42887	1.0 (0.9, 1.1)	2.4 (2.2, 2.5)	2.9 (2.7, 3.1)	3.5 (3.1, 4.0)		
	≥65	1150	88921	0.8 (0.8, 0.9)	1.6 (1.5, 1.7)	2.0 (1.9, 2.2)	2.3 (2.1, 2.6)		
Traditional Instrumentation	<65	2134	60419	1.1 (1.0, 1.2)	2.8 (2.7, 3.0)	3.8 (3.6, 4.0)	4.5 (4.3, 4.7)	5.2 (5.0, 5.5)	
	≥65	2826	132763	0.9 (0.8, 0.9)	1.9 (1.8, 2.0)	2.4 (2.3, 2.5)	2.8 (2.7, 2.9)	3.1 (3.0, 3.3)	
TOTAL		6910	324990						

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella usage and mobility

Figure KT70 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Robotic Assistance and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	<65	42887	32944	15864	5817	1027	5
	≥65	88921	66189	29600	10240	1713	3
Traditional Instrumentation	<65	60419	54302	41435	29175	17399	5584
	≥65	132763	117531	86221	58447	32701	9437

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage, surgeon volume and stability



Primary Total Knee Replacement

Table KT74 Cumulative Percent Revision of Primary Total Knee Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Prosthesis Combination	Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Attune CR/Attune	Robotically Assisted	54	7306	0.6 (0.5, 0.9)	1.3 (0.9, 1.8)				
	Traditional Instrumentation	587	21790	0.9 (0.8, 1.0)	2.2 (2.0, 2.4)	2.8 (2.6, 3.1)	3.4 (3.1, 3.7)	3.9 (3.6, 4.3)	4.1 (3.7, 4.5)
Persona CR/Persona	Robotically Assisted	497	32694	0.9 (0.8, 1.0)	2.0 (1.9, 2.2)	2.5 (2.2, 2.8)			
	Traditional Instrumentation	499	30581	0.9 (0.8, 1.0)	1.9 (1.7, 2.1)	2.3 (2.1, 2.6)	2.6 (2.3, 2.9)	2.6 (2.3, 2.9)	3.4 (2.1, 5.6)
Triathlon CR/Triathlon	Robotically Assisted	448	36293	0.6 (0.5, 0.7)	1.4 (1.3, 1.6)	1.9 (1.7, 2.1)	2.1 (1.9, 2.3)		
	Traditional Instrumentation	764	31245	0.8 (0.7, 0.9)	1.8 (1.7, 2.0)	2.4 (2.2, 2.6)	2.8 (2.6, 3.0)	3.2 (3.0, 3.5)	3.4 (3.1, 3.7)
TOTAL		2849	159909						

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage and surgeon volume

Only prosthesis combinations with >5,000 procedures in both groups have been listed

Table KT75 Comparisons of Revision Rates for Primary Total Knee Replacement Since 2016 by Prosthesis Combination and Robotic Assistance (Primary Diagnosis OA)

Comparison	HR -adjusted for age, sex, ASA, BMI, bearing surface, patella component usage and surgeon volume
Attune CR/Attune Robotically Assisted vs Attune CR/Attune Traditional Instrumentation	Entire Period: HR=0.72 (95%CI 0.54, 0.96), p=0.025
Persona CR/Persona Robotically Assisted vs Persona CR/Persona Traditional Instrumentation	Entire Period: HR=1.07 (95% CI 0.93, 1.22), p=0.363
Triathlon CR/Triathlon Robotically Assisted vs Triathlon CR/Triathlon Traditional Instrumentation	0 - 1.5Yr: HR=0.86 (95% CI 0.73, 1.01), p=0.072
	1.5Yr+: HR=0.81 (95% CI 0.67, 0.97), p=0.026

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, bearing surface, patella component usage and surgeon volume

Only prosthesis combinations with >5,000 procedures in both groups have been listed

Primary Total Knee Replacement

Table KT76 Cumulative Percent Revision of Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

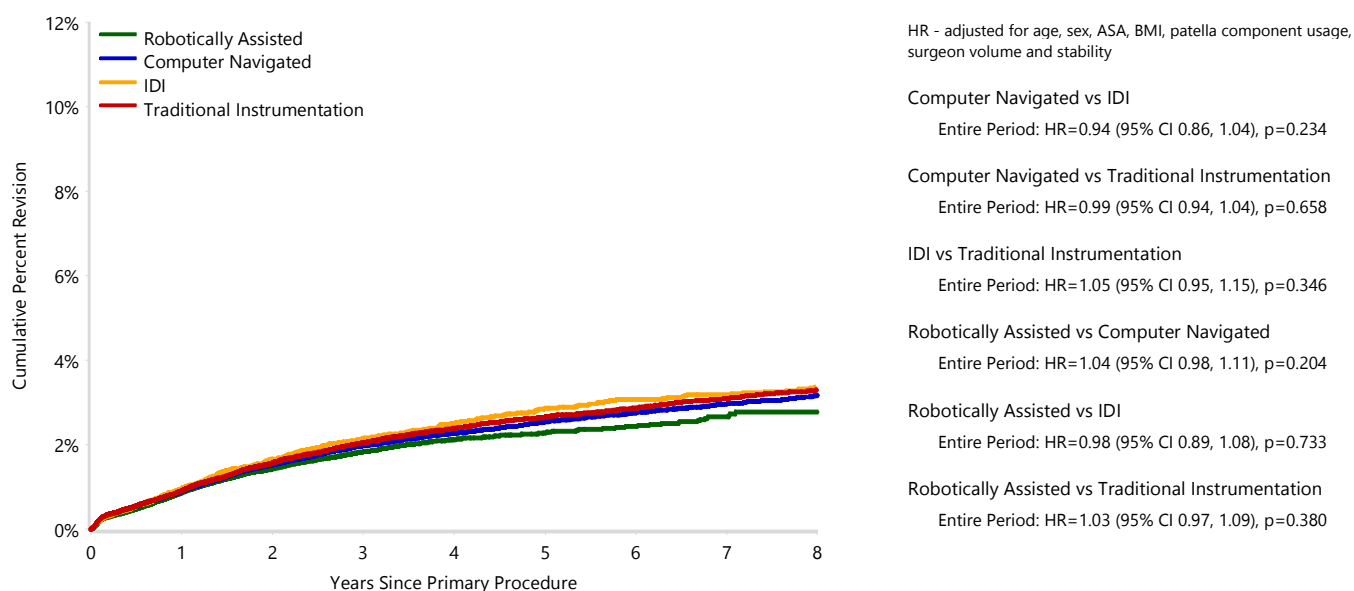
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7Yrs	9 Yrs
Robotically Assisted	1915	131009	0.9 (0.8, 0.9)	1.8 (1.7, 1.9)	2.3 (2.2, 2.4)	2.7 (2.5, 2.9)	
Computer Navigated	2637	115422	0.9 (0.8, 1.0)	2.0 (1.9, 2.1)	2.5 (2.4, 2.6)	3.0 (2.8, 3.1)	3.4 (3.2, 3.5)
IDI	532	22060	1.0 (0.8, 1.1)	2.1 (2.0, 2.4)	2.9 (2.6, 3.1)	3.2 (2.9, 3.5)	3.7 (3.3, 4.1)
Traditional Instrumentation	2794	122801	0.9 (0.9, 1.0)	2.0 (2.0, 2.1)	2.7 (2.6, 2.8)	3.1 (3.0, 3.2)	3.6 (3.4, 3.7)
TOTAL	7878	391292					

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, patella component usage, surgeon volume and stability

Excludes 789 medial pivot design and hinged prostheses due to small number of revisions

Figure KT71 Cumulative Percent Revision of Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	131009	98484	44992	15706	2662	8
Computer Navigated	115422	103483	77640	52145	27535	6927
IDI	22060	19321	13990	9416	4985	1305
Traditional Instrumentation	122801	107318	75629	48460	26062	7203

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, patella component usage, surgeon volume and stability

Excludes 789 medial pivot design and hinged prostheses due to small number of revisions

Primary Total Knee Replacement

Table KT77 Cumulative Percent Revision of Persona CR/Persona Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

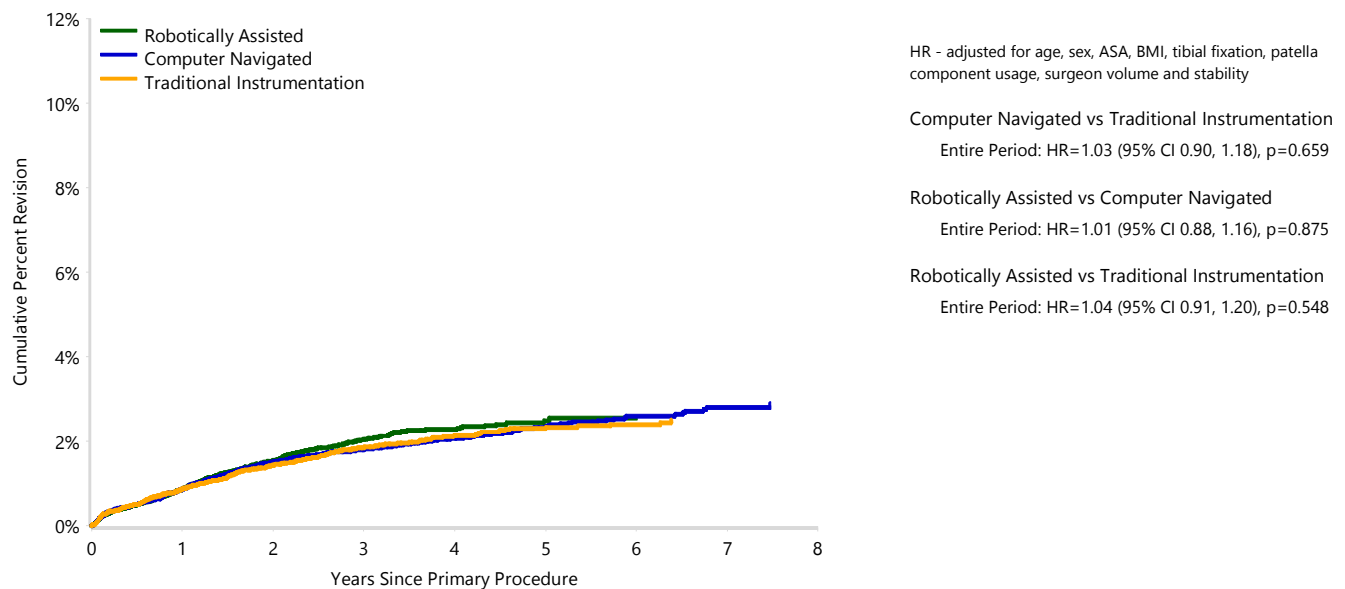
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	495	32436	0.9 (0.8, 1.0)	2.0 (1.9, 2.3)	2.5 (2.2, 2.8)		
Computer Navigated	383	20198	0.9 (0.7, 1.0)	1.8 (1.6, 2.0)	2.3 (2.1, 2.6)	2.8 (2.5, 3.1)	2.9 (2.5, 3.3)
Traditional Instrumentation	473	29608	0.9 (0.8, 1.0)	1.9 (1.7, 2.0)	2.3 (2.1, 2.5)	2.5 (2.2, 2.8)	2.5 (2.2, 2.8)
TOTAL	1351	82242					

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability

Excludes 9,838 procedures using IDI and 2 posterior stabilised procedures

Figure KT72 Cumulative Percent Revision of Persona CR/Persona Primary Total Knee Replacement Using XLPE Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	32436	24267	10218	1730	1	0
Computer Navigated	20198	17362	11582	7037	1911	57
Traditional Instrumentation	29608	23788	12858	4678	1009	87

Note: Restricted to modern prostheses

Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability

Excludes 9,838 procedures using IDI and 2 posterior stabilised procedures

Primary Total Knee Replacement

Table KT78 Cumulative Percent Revision of Triathlon CR/Triathlon XLPE Primary Total Knee Replacement Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)

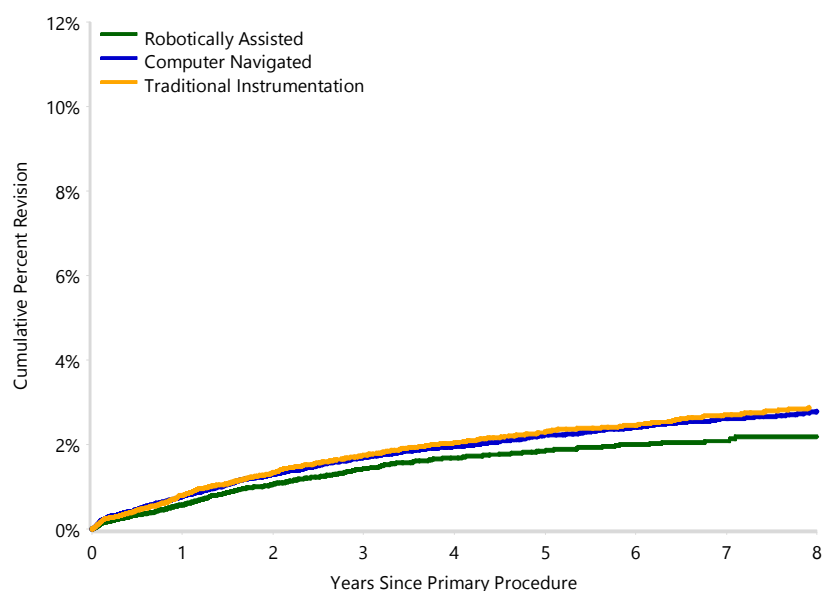
Surgeon Assistive Tool	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	441	35881	0.6 (0.5, 0.7)	1.4 (1.3, 1.6)	1.9 (1.7, 2.1)	2.1 (1.9, 2.3)	
Computer Navigated	918	43150	0.8 (0.7, 0.9)	1.7 (1.6, 1.8)	2.2 (2.1, 2.4)	2.6 (2.4, 2.8)	3.0 (2.8, 3.2)
Traditional Instrumentation	550	24917	0.8 (0.7, 0.9)	1.7 (1.6, 1.9)	2.3 (2.1, 2.5)	2.7 (2.5, 2.9)	3.2 (2.9, 3.5)
TOTAL	1909	103948					

Note: Restricted to modern prostheses

Excludes 48 procedures using IDI and 10 posterior stabilised procedures

Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability

Figure KT73 Cumulative Percent Revision of Triathlon CR/Triathlon XLPE Primary Total Knee Replacement Since 2016 by Surgeon Assistive Tool (Primary Diagnosis OA)



HR - adjusted for age, sex, ASA, BMI, tibial fixation, patella component usage and surgeon volume

Computer Navigated vs Traditional Instrumentation

Entire Period: HR=0.93 (95% CI 0.84, 1.04), p=0.191

Robotically Assisted vs Computer Navigated

Entire Period: HR=0.97 (95% CI 0.87, 1.10), p=0.654

Robotically Assisted vs Traditional Instrumentation

Entire Period: HR=0.91 (95% CI 0.80, 1.03), p=0.138

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Robotically Assisted	35881	28278	15040	6817	2024	7
Computer Navigated	43150	39646	31151	22838	14203	4018
Traditional Instrumentation	24917	22783	17762	13455	8434	2590

Note: Restricted to modern prostheses

Excludes 48 procedures using IDI and 10 posterior stabilised procedures

Restricted to procedures with known ASA, BMI, tibial fixation, patella component usage, surgeon volume and stability

Bibliography (2021-2026)

DATA LINKAGE

1. Lim YZ, Wang Y, Cicuttini FM, Giles GG, Graves S, Wluka AE, Hussain SM. Obesity defined by body mass index and waist circumference and risk of total knee arthroplasty for osteoarthritis: A prospective cohort study. *PLoS One*. 2021;16(1):e0245002. <https://doi.org/10.1371/journal.pone.0245002>.
2. Harris IA, Kirwan DP, Peng Y, Lewis PL, de Steiger RN, Graves SE. Increased early mortality after total knee arthroplasty using conventional instrumentation compared with technology-assisted surgery: an analysis of linked national registry data. *BMJ Open*. 2022;12(5):e055859. <https://doi.org/10.1136/bmjopen-2021-055859>.
3. Jin X, Gallego Luxan B, Hanly M, Pratt NL, Harris I, de Steiger R, Graves SE, Jorm L. Estimating incidence rates of periprosthetic joint infection after hip and knee arthroplasty for osteoarthritis using linked registry and administrative health data. *Bone Joint J*. 2022;104-B(9):1060-6. <https://doi.org/10.1302/0301-620X.104B9.BJJ-2022-0116.R1>.
4. Munugoda IP, Brennan-Olsen SL, Wills K, Cai G, Graves SE, Lorimer M, Cicuttini FM, Callisaya ML, Aitken D, Jones G. Association between socioeconomic status and joint replacement of the hip and knee: a population-based cohort study of older adults in Tasmania. *Intern Med J*. 2022;52(2):265-71. <https://doi.org/10.1111/imj.15066>.
5. Harris I, Duszynski K, Lorimer M, Alexander T, Ackerman I, Naylor J, Capell J. Practice Variation and Determinants of Post-Operative Inpatient Rehabilitation for Patients Following Joint Replacement Surgery: A Registry Linkage Cohort Study. *OSF*. 2024. <https://doi.org/10.17605/OSF.IO/8HE9G>.

EPIDEMIOLOGY/SURGEON FACTORS

6. Lim YZ, Wang Y, Cicuttini FM, Giles GG, Graves S, Wluka AE, Hussain SM. Obesity defined by body mass index and waist circumference and risk of total knee arthroplasty for osteoarthritis: A prospective cohort study. *PLoS One*. 2021;16(1):e0245002. <https://doi.org/10.1371/journal.pone.0245002>.
7. Ackerman IN, Busija L, Lorimer M, de Steiger R, Graves SE. Monitoring the lifetime risk of revision knee arthroplasty over a decade : a population-level analysis of Australian national registry data. *Bone Joint J*. 2022;104-B(5):613-9. <https://doi.org/10.1302/0301-620X.104B5.BJJ-2021-1219.R1>.
8. Ackerman IN, Soh SE, de Steiger R. Actual versus Forecast Burden of Primary Hip and Knee Replacement Surgery in Australia: Analysis of Data from the Australian Orthopaedic Association National Joint Replacement Registry. *J Clin Med*. 2022;11(7):1883. <https://doi.org/10.3390/jcm11071883>.
9. Chen L, Zheng M, Chen Z, Peng Y, Jones C, Graves S, Chen P, Ruan R, Papadimitriou J, Carey-Smith R, Leys T, Mitchell C, Huang YG, Wood D, Bulsara M, Zheng MH. The burden

of end-stage osteoarthritis in Australia: a population-based study on the incidence of total knee replacement attributable to overweight/obesity. *Osteoarthritis Cartilage*. 2022;30(9):1254-62.

<https://doi.org/10.1016/j.joca.2021.10.017>.

10. Hoskins W, Rainbird S, Lorimer M, Graves SE, Bingham R. What Can We Learn from Surgeons Who Perform THA and TKA and Have the Lowest Revision Rates? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res*. 2022;480(3):464-81. <https://doi.org/10.1097/CORR.0000000000002007>.
11. Klasan A, Parker DA, Lewis PL, Young SW. Low percentage of surgeons meet the minimum recommended unicompartmental knee arthroplasty usage thresholds: Analysis of 3037 Surgeons from Three National Joint Registries. *Knee Surg Sports Traumatol Arthrosc*. 2022;30(3):958-64. <https://doi.org/10.1007/s00167-021-06437-7>.
12. Wall CJ, de Steiger RN, Vertullo CJ, Stoney JD, Graves SE, Lorimer MF, Kondalsamy-Chennakesavan S. Obesity is associated with an increased risk of undergoing knee replacement in Australia. *ANZ J Surg*. 2022;92(7-8):1814-9. <https://doi.org/10.1111/ans.17689>.
13. Wall CJ, Vertullo CJ, Kondalsamy-Chennakesavan S, Lorimer MF, de Steiger RN. A Prospective, Longitudinal Study of the Influence of Obesity on Total Knee Arthroplasty Revision Rate: Results from the Australian Orthopaedic Association National Joint Replacement Registry. *J Bone Joint Surg Am*. 2022;104(15):1386-92. <https://doi.org/10.2106/JBJS.21.01491>.
14. Vaotuuva D, O'Connor P, Belford M, Lewis P, Hatton A, Holder C, McAuliffe M. The Effect of Surgeon Volume on Revision for Periprosthetic Joint Infection: An Analysis of 602,919 Primary Total Knee Arthroplasties. *J Bone Joint Surg Am*. 2023;105(21):1663-75. <https://doi.org/10.2106/JBJS.22.01351>.
15. Osan JK, Harris IA, Harries D, Peng Y, Yates PJ, Jones CW. Stemmed Tibial Fixation for Primary Total Knee Arthroplasty in Obese Patients-A National Registry Study. *J Arthroplasty*. 2024;39(2):355-62. <https://doi.org/10.1016/j.arth.2023.08.028>.
16. Docking S, Ademi Z, Barton C, Wallis JA, Harris IA, de Steiger R, Buchbinder R, Brusco N, Young K, Pazzinatto MF, Harries D, Vertullo CJ, Ackerman IN. Lifetime Cost-Effectiveness of Structured Education and Exercise Therapy for Knee Osteoarthritis in Australia. *JAMA Network Open*. 2024;7(10):e2436715-e. <https://doi.org/10.1001/jamanetworkopen.2024.36715>.
17. Roerink AMC, Nelissen RGHH, Holder C, Graves SE, Dunbar M, Bohm E, Grimberg AW, Steinbrück A, Dale H, Fenstad AM, Blom AW, Lenguerrand E, Frampton C, Willems T, Victor J, Espallargues M, Arias-De La Torre J, Ciminello E, Torre M, Pijls BG. Sex-based differences in risk of revision for infection after hip, knee, shoulder, and ankle arthroplasty in osteoarthritis patients: a

Bibliography (2021-2026)

- multinational registry study of 4,800,000 implants. *Acta Orthop*. 2024;95:730–6.
<https://doi.org/10.2340/17453674.2024.42183>.
18. Wall CJ, Vertullo CJ, Gill DR, Page RS, Holder C, Smith PN. Reduced numbers of elective joint replacement procedures in Australia during the COVID-19 pandemic, 2020–2022: a registry data analysis study. *Med J Aust*. 2024;221(3):169–70. <https://doi.org/10.5694/mja2.52318>.
19. Scholes C, Holder C, Vertullo C, Broadhead M. Stay or go? Outcomes of lower limb arthroplasty in patients travelling away from home for surgery: A cross-sectional analysis of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) comparing patient residence and hospital remoteness. *Arch Orthop Trauma Surg*. 2025;145(1):343. <https://doi.org/10.1007/s00402-025-05944-3>.
20. Wall CJ, de Steiger RN, Vertullo CJ, Harries D, Kondalsamy-Chennakesavan S. ASA Class Is a Stronger Predictor of Early Revision Risk Following Primary Total Knee Arthroplasty than BMI. *JB JS Open Access*. 2025;10(1):e24.00064. <https://doi.org/10.2106/JBJS.OA.24.00064>.
21. Zhou Y, Fraval A, Vertullo CJ, Du P, Babazadeh S, Stevens J. Patient and Surgical Factors Associated with Long-term Mortality Outcomes up to Fifteen Years after Total Hip and Knee Arthroplasty: An Australian Orthopaedic Association National Joint Replacement Registry Study. *J Arthroplasty*. 2025;40(6):1471–7. <https://doi.org/10.1016/j.arth.2024.11.012>.
22. Bhanushali, A., E. C. Lourens, D. Harries, P. L. Lewis, and A. P. Kurmis. Exploring the Influence of Surgeon and Hospital Procedural Volume on the Outcomes of Distal Femoral Replacement: An Australian National Joint Replacement Registry Analysis. *ANZ J Surg*. 2026. 96(3): p. 458–471. <https://dx.doi.org/10.1111/ans.70413>.
23. Bhanushali, A., C. Holder, M. J. McAuliffe, D. Martin, and P. J. Smitham. Revision Rates After Total Knee Arthroplasty Among Surgeons of Varying Experience: An Australian Orthopaedic Association National Joint Replacement Study. *J Arthroplasty*. 2026. 41(2): p. 443–450. <https://doi.org/10.1016/j.arth.2025.06.050>

FRACTURE

24. Aebischer AS, Hau R, de Steiger RN, Holder C, Wall CJ. Distal femoral arthroplasty for native knee fractures : results from the Australian Orthopaedic Association National Joint Replacement Registry. *Bone Joint J*. 2022;104-B(7):894–901. <https://doi.org/10.1302/0301-620X.104B7.BJJ-2021-1136.R3>.
25. Aebischer AS, Hau R, de Steiger RN, Holder C, Wall CJ. Distal Femoral Replacement for Periprosthetic Fractures After TKA: Australian Orthopaedic Association National Joint Replacement Registry Review. *J Arthroplasty*. 2022;37(7):1354–8. <https://doi.org/10.1016/j.arth.2022.02.115>.

INTERNATIONAL

26. Lewis PL, Robertsson O, Graves SE, Paxton EW, Prentice HA, A WD. Variation and trends in reasons for knee replacement revision: a multi-registry study of revision burden. *Acta Orthop*. 2021;92(2):182–8. <https://doi.org/10.1080/17453674.2020.1853340>.
27. Klasan A, Parker DA, Lewis PL, Young SW. Low percentage of surgeons meet the minimum recommended unicompartmental knee arthroplasty usage thresholds: Analysis of 3037 Surgeons from Three National Joint Registries. *Knee Surg Sports Traumatol Arthrosc*. 2022;30(3):958–64. <https://doi.org/10.1007/s00167-021-06437-7>.
28. Lewis PL, A WD, Robertsson O, Lorimer M, Prentice HA, Graves SE, Paxton EW. The effect of patient and prosthesis factors on revision rates after total knee replacement using a multi-registry meta-analytic approach. *Acta Orthop*. 2022;93:284–93. <https://doi.org/10.2340/17453674.2022.1997>.
29. Lewis PL, A WD, Robertsson O, Prentice HA, Graves SE. Impact of patient and prosthesis characteristics on common reasons for total knee replacement revision: a registry study of 36,626 revision cases from Australia, Sweden, and USA. *Acta Orthop*. 2022;93:623–33. <https://doi.org/10.2340/17453674.2022.3512>.
30. Leta TH, Fenstad AM, Lygre SHL, Lie SA, Lindberg-Larsen M, Pedersen AB, A WD, Rolfson O, Bulow E, Ashforth JA, Van Steenberg LN, Nelissen R, Harries D, De Steiger R, Lutro O, Hakulinen E, Makela K, Willis J, Wyatt M, Frampton C, Grimberg A, Steinbrück A, Wu Y, Armaroli C, Molinari M, Picus R, Mullen K, Illgen R, Stoica IC, Vorovenci AE, Dragomirescu D, Dale H, Brand C, Christen B, Shapiro J, Wilkinson JM, Armstrong R, Wooster K, Hallan G, Gjertsen JE, Chang RN, Prentice HA, Paxton EW, Furnes O. The use of antibiotic-loaded bone cement and systemic antibiotic prophylactic use in 2,971,357 primary total knee arthroplasties from 2010 to 2020: an international register-based observational study among countries in Africa, Europe, North America, and Oceania. *Acta Orthop*. 2023;94:416–25. <https://doi.org/10.2340/17453674.2023.17737>.
31. Leta TH, Lie SA, Fenstad AM, Lygre SHL, Lindberg-Larsen M, Pedersen AB, W-Dahl A, Rolfson O, Bülow E, van Steenberg LN, Nelissen RGHH, Harries D, de Steiger R, Lutro O, Mäkelä K, Venäläinen MS, Willis J, Wyatt M, Frampton C, Grimberg A, Steinbrück A, Wu Y, Armaroli C, Gentilini MA, Picus R, Bonetti M, Dragosloveanu S, Vorovenci AE, Dragomirescu D, Dale H, Brand C, Christen B, Shapiro J, Wilkinson JM, Armstrong R, Wooster K, Hallan G, Gjertsen J-E, Chang RN, Prentice HA, Sedrakyan A, Paxton EW, Furnes O. Periprosthetic Joint Infection After Total Knee Arthroplasty With or Without Antibiotic Bone Cement. *JAMA Netw Open*. 2024;7(5). <https://doi.org/10.1001/jamanetworkopen.2024.12898>.
32. Roerink AMC, Nelissen RGHH, Holder C, Graves SE, Dunbar M, Bohm E, Grimberg AW, Steinbrück A, Dale H,



Bibliography (2021-2026)

Fenstad AM, Blom AW, Lenguerrand E, Frampton C, Willems T, Victor J, Espallargues M, Arias-De La Torre J, Ciminello E, Torre M, Pijls BG. Sex-based differences in risk of revision for infection after hip, knee, shoulder, and ankle arthroplasty in osteoarthritis patients: a multinational registry study of 4,800,000 implants. *Acta Orthop*. 2024;95:730–6. <https://doi.org/10.2340/17453674.2024.42183>.

MORTALITY

33. Kirwan DP, YP BI, Harris IA. Increased Early Mortality in Bilateral Simultaneous TKA Using Conventional Instrumentation Compared with Technology-Assisted Surgery: A Study of 34,908 Procedures from a National Registry. *J Bone Joint Surg Am*. 2021;103(23):2177–80. <https://doi.org/10.2106/JBJS.21.00029>.
34. Harris IA, Kirwan DP, Peng Y, Lewis PL, de Steiger RN, Graves SE. Increased early mortality after total knee arthroplasty using conventional instrumentation compared with technology-assisted surgery: an analysis of linked national registry data. *BMJ Open*. 2022;12(5):e055859. <https://doi.org/10.1136/bmjopen-2021-055859>.
35. Zhou Y, Fraval A, Vertullo CJ, Du P, Babazadeh S, Stevens J. Patient and Surgical Factors Associated with Long-term Mortality Outcomes up to Fifteen Years after Total Hip and Knee Arthroplasty: An Australian Orthopaedic Association National Joint Replacement Registry Study. *J Arthroplasty*. 2025;40(6):1471–7. <https://doi.org/10.1016/j.arth.2024.11.012>.

PROMS

36. Heath EL, Ackerman IN, Cashman K, Lorimer M, Graves SE, Harris IA. Patient-reported outcomes after hip and knee arthroplasty : results from a large national registry. *Bone Jt Open*. 2021;2(6):422–32. <https://doi.org/10.1302/2633-1462.26.BJO-2021-0053.R1>.
37. Ackerman IN, Harris IA, Cashman K, Rowden N, Lorimer M, Graves SE. Poor Knee-specific and Generic Patient-reported Outcome Measure Scores at 6 Months Are Associated with Early Revision Knee Arthroplasty: A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res*. 2022;480(10):1899–909. <https://doi.org/10.1097/CORR.0000000000002301>.
38. Heath EL, Ackerman IN, Holder C, Lorimer MF, Graves SE, Harris IA. Between-hospital and between-surgeon variation in thresholds for hip and knee replacement. *ANZ J Surg*. 2022;92(9):2229–34. <https://doi.org/10.1111/ans.17811>.
39. Soh SE, Harris IA, Cashman K, Graves SE, Ackerman IN. Crosswalks between the Oxford hip and knee scores and the HOOS-12 and KOOS-12 instruments. *Osteoarthritis Cartilage*. 2022;30(4):570–7. <https://doi.org/10.1016/j.joca.2022.01.004>.
40. Mulford JS, Ackerman I, Holder C, Cashman KS, Graves SE, Harris IA. The association between body mass index and

patient-reported outcome measures before and after primary total hip or knee arthroplasty: a registry. *ANZ J Surg*. 2023;93(6):1665–73.

<https://doi.org/10.1111/ans.18449>.

41. Lewin AM, Cashman K, Harries D, Ackerman IN, Naylor JM, Harris IA. First knee for pain and function versus second knee for quality of life. *Bone Jt Open*. 2024;5(3):202–9. <https://doi.org/10.1302/2633-1462.53.BJO-2023-0035.R1>.
42. Ackerman IN, Norman R, Harris IA, Cashman K, Lorimer M, Gill S, Lewis P, Soh SE. How Does the New Australian EQ-5D-5L Value Set Impact Utility Scores? Analysis of Data from the Australian Orthopaedic Association National Joint Replacement Registry. *Appl Health Econ Health Policy*. 2024;22(5):717–24. <https://doi.org/10.1007/s40258-024-00894-0>.
43. Van Meirhaeghe JP, Harris IA, Cuthbert A, Lorimer M, McAuliffe M, Adie S, Molnar R. The influence of implant factors on patient outcomes in primary total knee arthroplasty. *J Orthop*. 2024;58:154–60. <https://doi.org/10.1016/j.jor.2024.07.011>.
44. Gill, S. D., R. S. Page, Q. Xu, I. A. Harris, D. Gill, and I. N. Ackerman. Quality of Life before and during the Covid-19 Pandemic for People Undergoing Hip, Knee and Shoulder Arthroplasty-Nationwide Results from the Australian Orthopaedic Association National Joint Replacement Registry. *Int Orthop*. 2026: 731–45. <https://dx.doi.org/10.1007/s00264-026-06778-3>.
45. Fidler HL, Kiroff GK, Du P, Ackerman IN, Oakey H, Lewis PL. Similar Patient-Reported Outcomes 6 Months after Unicompartmental and Total Knee Replacement for Osteoarthritis: A Prospective Cohort Study of 60,145 Patients from the Australian Orthopaedic Association National Joint Replacement Registry. *Acta Orthop*. 2026. 97: 471–77. <https://doi.org/10.2340/17453674.2026.46224>

PROSTHESIS FACTORS

46. Kannan A, Lewis PL, Dyer C, Jiranek WA, McMahon S. Do Fixed or Mobile Bearing Implants Have Better Survivorship in Medial Unicompartmental Knee Arthroplasty? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res*. 2021;479(7):1548–58. <https://doi.org/10.1097/CORR.0000000000001698>.
47. Khan M, Inglis M, Samson A, Lewis PL, Peng Y, Wilson CJ. The effect of polyethylene thickness on revision rates of contemporary cruciate retaining knee replacements. A registry analysis. *Knee*. 2021;33:243–51. <https://doi.org/10.1016/j.knee.2021.09.012>.
48. Dalton P, Holder C, Rainbird S, Lewis PL. Survivorship Comparisons of Ultracongruent, Cruciate-Retaining and Posterior-Stabilized Tibial Inserts Using a Single Knee System Design: Results from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty*. 2022;37(3):468–75. <https://doi.org/10.1016/j.arth.2021.11.001>.

Bibliography (2021-2026)

49. Klasan A, Rainbird S, Peng Y, Holder C, Parkinson B, Young SW, Lewis PL. No Difference in Revision Rate Between Low Viscosity and High Viscosity Cement Used in Primary Total Knee Arthroplasty. *J Arthroplasty*. 2022;37(10):2025-34. <https://doi.org/10.1016/j.arth.2022.04.043>.
50. Osan JK, Harris IA, Harries D, Peng Y, Yates PJ, Jones CW. Utilizing Stems in Primary Total Knee Arthroplasty: Analysis of the Australian Orthopaedic Association National Joint Replacement Registry Data. *J Arthroplasty*. 2024. <https://doi.org/10.1016/j.arth.2024.01.031>.
51. Zhou Y, Harries D, Stoney JD. A Polished Cobalt-Chrome Baseplate is not Associated with a Lower Revision Rate Than Matt Titanium in a Single Total Knee Arthroplasty Implant System with Identical Baseplate Design. *J Arthroplasty*. 2024;39(4):896-903. <https://doi.org/10.1016/j.arth.2023.10.003>.

REVISION OUTCOMES

52. Lewis PL, Campbell DG, Lorimer MF, Requicha F, A WD, Robertsson O. Primary Total Knee Arthroplasty Revised for Instability: A Detailed Registry Analysis. *J Arthroplasty*. 2022;37(2):286-97. <https://doi.org/10.1016/j.arth.2021.11.002>.
53. Hoskins W, Rainbird S, Lorimer M, Graves SE, Bingham R. What Can We Learn from Surgeons Who Perform THA and TKA and Have the Lowest Revision Rates? A Study from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res*. 2022;480(3):464-81. <https://doi.org/10.1097/CORR.0000000000002007>.
54. Vaotuuva D, O'Connor P, Belford M, Lewis P, Hatton A, Holder C, McAuliffe M. The Effect of Surgeon Volume on Revision for Periprosthetic Joint Infection: An Analysis of 602,919 Primary Total Knee Arthroplasties. *J Bone Joint Surg Am*. 2023;105(21):1663-75. <https://doi.org/10.2106/JBJS.22.01351>.
55. Strudwick, T., J. Sires, P. N. Smith, E. Jackman, C. Holder, and C. Wilson. Comparison of Midterm Results between the ATTUNE and PFC Sigma Total Knee Arthroplasty Systems. *J Knee Surg*. 2026. 39(5): p. 257-263. <https://dx.doi.org/10.1055/a-2716-4635>.
56. Scanlon, J. P., M. J. McAuliffe, P. Du, and M. Leie. Obesity is associated with higher rates of revision following medial unicompartmental knee arthroplasty. *Knee*. 2026. 61: p. 104419. <https://dx.doi.org/10.1016/j.knee.2026.104419>.
57. Brown ZG, Loch AR, Holder C, Wall CJ. Does Relative Femoral and Tibial Component Size Influence Revision Risk Following Primary Total Knee Arthroplasty? *J Arthroplasty*. 2026. 41(1): p. 125-131. <https://dx.doi.org/10.1016/j.arth.2025.06.033>.

AOA CLINICAL STUDIES

58. Sidhu VS, Kelly TL, Pratt N, Graves S, Buchbinder R, Naylor J, de Steiger R, Ackerman I, Adie S, Lorimer M, Bastiras D, Cashman K, Harris I. CRISTAL (a cluster-randomised, crossover, non-inferiority trial of aspirin compared to low molecular weight heparin for venous thromboembolism

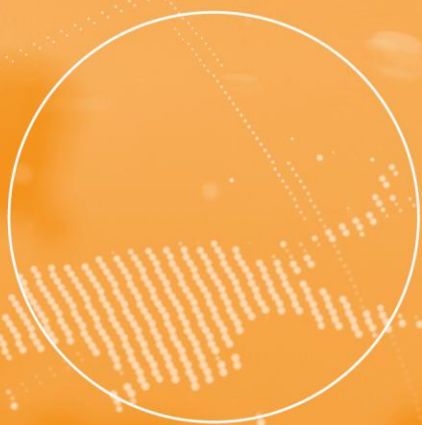
prophylaxis in hip or knee arthroplasty, a registry nested study): statistical analysis plan. *Trials*. 2021;22(1):564.

<https://doi.org/10.1186/s13063-021-05486-0>.

59. Cristal Study Group, Sidhu VS, Kelly TL, Pratt N, Graves SE, Buchbinder R, Adie S, Cashman K, Ackerman I, Bastiras D, Brighton R, Burns AWR, Chong BH, Clavisi O, Cripps M, Dekkers M, de Steiger R, Dixon M, Ellis A, Griffith EC, Hale D, Hansen A, Harris A, Hau R, Horsley M, James D, Khorshid O, Kuo L, Lewis P, Lieu D, Lorimer M, MacDessi S, McCombe P, McDougall C, Mulford J, Naylor JM, Page RS, Radovanovic J, Solomon M, Sorial R, Summersell P, Tran P, Walter WL, Webb S, Wilson C, Wysocki D, Harris IA. Effect of Aspirin vs Enoxaparin on Symptomatic Venous Thromboembolism in Patients Undergoing Hip or Knee Arthroplasty: The CRISTAL Randomized Trial. *JAMA*. 2022;328(8):719-27. <https://doi.org/10.1001/jama.2022.13416>.
60. MacDessi SJ, Wernecke GC, Bastiras D, Hooper T, Heath E, Lorimer M, Harris I, Group RS. Robotic-assisted surgery and kinematic alignment in total knee arthroplasty (RASKAL study): a protocol of a national registry-nested, multicentre, 2x2 factorial randomised trial assessing clinical, intraoperative, functional, radiographic and survivorship outcomes. *BMJ Open*. 2022;12(6):e051088. <https://doi.org/10.1136/bmjopen-2021-051088>.
61. Cristal Study Group, Sidhu VS, Kelly TL, Pratt N, Graves SE, Buchbinder R, Adie S, Cashman K, Ackerman IN, Bastiras D, Brighton R, Burns AWR, Chong BH, Clavisi O, Cripps M, Dekkers M, de Steiger R, Dixon M, Ellis A, Griffith EC, Hale D, Hansen A, Harris A, Hau R, Horsley M, James D, Khorshid O, Kuo L, Lewis PL, Lieu D, Lorimer M, MacDessi SJ, McCombe P, McDougall C, Mulford J, Naylor JM, Page RS, Radovanovic J, Solomon M, Sorial R, Summersell P, Tran P, Walter WL, Webb S, Wilson C, Wysocki D, Harris IA. Effect of Aspirin vs Enoxaparin on 90-Day Mortality in Patients Undergoing Hip or Knee Arthroplasty: A Secondary Analysis of the CRISTAL Cluster Randomized Trial. *JAMA Netw Open*. 2023;6(6):e2317838. <https://doi.org/10.1001/jamanetworkopen.2023.17838>.
62. Sidhu V, Naylor JM, Adie S, Bastiras D, Buchbinder R, Ackerman I, Harris IA. Post-discharge patient-reported non-adherence to aspirin compared to enoxaparin for venous thromboembolism prophylaxis after hip or knee arthroplasty. *ANZ J Surg*. 2023;93(4):989-94. <https://doi.org/10.1111/ans.18284>.
63. Sidhu V, Kelly TL, Pratt N, Graves SE, Buchbinder R, Adie S, Cashman K, Ackerman IN, Bastiras D, Brighton R. Aspirin or enoxaparin for VTE prophylaxis after primary partial, total or revision hip or knee arthroplasty: A secondary analysis from the CRISTAL cluster randomized trial. *PLoS One*. 2024;19(4):e0298152. <https://doi.org/10.1371/journal.pone.0298152>.
64. MacDessi SJ, Wernecke GC, Bastiras D, Ghadirinejad K, Harries D, Cashman K, Heath E, Lorimer M, Holder C, Harris IA. Statistical analysis plan for the Robotic-Assisted Surgery and Kinematic ALIGNment in total knee

Bibliography (2021-2026)

- arthroplasty (RASKAL) registry-nested randomized trial. *Bone Joint Open*. 2025;6(3):352-60.
<https://doi.org/10.1302/2633-1462.63.Bjo-2024-0206>.
65. MacDessi SJ, Wernecke GC, Ghadirinejad K, Wood JA, Holder C, Lorimer M, Harris IA, and the RSG, Bastiras D, Boyle R, Chen DB, Du P, Fritsch B, Guzman M, Kirsh G, Leong A, Limbers J, McEwen P, McMahon S, Mulford J, Oakey H, Penn D, Yu J. Robotic-assisted surgery and functional alignment in total knee arthroplasty: the RASKAL registry-nested 2 x 2 factorial randomized trial. *Bone Joint J*, 2026. 108-B: p. 622-633.
<https://dx.doi.org/10.1302/0301-620X.108B.BJJ-2025-1472.R2>.
- STATISTICAL MODELLING**
66. Ghadirinejad K, Graves S, de Steiger R, Pratt N, Solomon LB, Taylor M, Hashemi R. What Is the Most Appropriate Comparator to Use in Assessing the Comparative Performance of Primary Total Knee Prostheses? A Registry-Based Study. *Arthroplast Today*. 2024;27:101344.
<https://doi.org/10.1016/j.artd.2024.101344>.
67. Ghadirinejad K, Milimonfared R, Taylor M, Solomon LB, Graves S, Pratt N, de Steiger R, Hashemi R. Supervised machine learning for the prediction of post-operative clinical outcomes of hip and knee replacements: a review. *ANZ J Surg*. 2024. <https://doi.org/10.1111/ans.19003>.
68. Ghadirinejad, K., S. Graves, R. de Steiger, N. Pratt, L. B. Solomon, M. Taylor, and R. Hashemi. Can a machine learning approach contribute to monitoring post-market surveillance of total knee arthroplasty prostheses? *Knee*, 2026. 58: p. 104266.
<https://dx.doi.org/10.1016/j.knee.2025.10.020>.
- SURGEON ASSISTIVE TOOLS**
69. McAuliffe M, Darwish I, Anderson J, Nicholls A, Corfield S, Harries D, Vertullo C. Association of Technology Usage and Decreased Revision TKA Rates for Low-Volume Surgeons Using an Optimal Prosthesis Combination: An Analysis of 53,264 Primary TKAs. *J Bone Joint Surg Am*. 2024;106(22):2063-72.
<https://doi.org/10.2106/JBJS.24.00539>.
70. Saidy, E., P. Du, A. R. Cuthbert, P. L. Lewis, and M. Leie. Can Robotic-Assisted Arthroplasty Change the High Early Revision Rate After Patello-femoral Arthroplasty? An Analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty*, 2026. 41(2): p. 423-429.
<https://dx.doi.org/10.1016/j.arth.2025.06.035>.
71. Hoskins, W., C. Gussho, M. McAuliffe, C. Wall, Q. Xu, and K. G. Vince. The AAHKS Surgical Techniques and Technologies Award: What Is the Ideal Technique and Implant in Aseptic Revision Total Knee Arthroplasty? An Analysis of Second Revision and Component Loosening Rates from the Australian Orthopaedic Association National Joint Replacement Registry. *J Arthroplasty*, 2026.
<https://dx.doi.org/10.1016/j.arth.2026.05.046>.
72. Hoskins, W., C. Gussho, R. Bingham, P. Du, H. Oakey, K. G. Vince, and M. McAuliffe. Does Transitioning to Robotic-Assisted Total Knee Arthroplasty Change Surgeon Revision Risk or Failure Modes? A Baseline Comparative Analysis Before and After Robotic Adoption. *JBJS Open Access*, 2026. 11(2).
<https://dx.doi.org/10.2106/JBJS.OA.26.00127>.



Shoulder Replacement

Shoulder Replacement

Categories of Shoulder Replacement

Shoulder replacement is grouped into three broad categories: primary partial, primary total, and revision shoulder replacement.

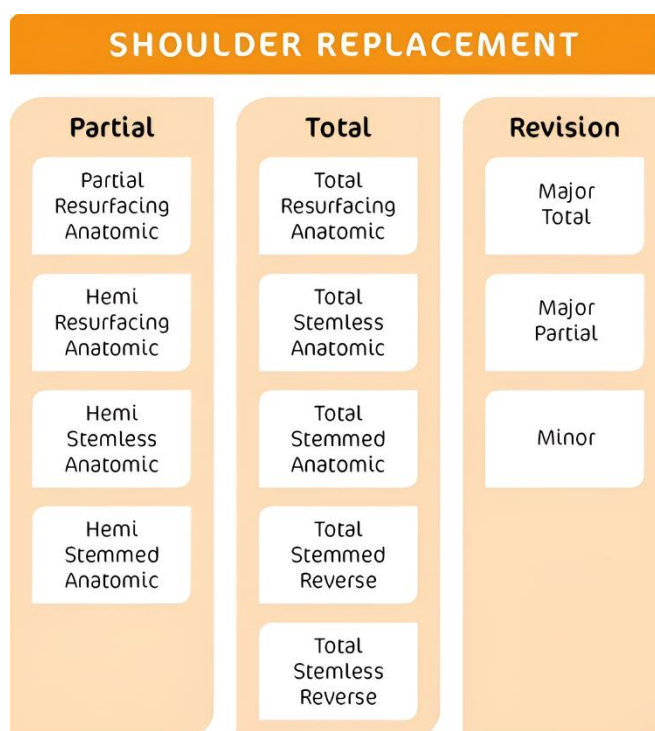
A primary replacement is an initial procedure undertaken on a joint and involves replacing either one side (partial) or both sides (total) of the glenohumeral joint.

Primary partial and primary total shoulder replacements are further categorised into subclasses depending on the type of prosthesis used. Partial shoulder subclasses include partial resurfacing anatomic, hemi resurfacing anatomic, hemi stemless anatomic and hemi stemmed anatomic.

Primary total shoulder replacement is subcategorised into five classes. These are defined by the type of prosthesis used. The use of stemless anatomic shoulder replacement has been growing considerably. As such mid head humeral prostheses are now classified as stemless anatomic and stemless reverse to reflect their differing polarity.

Total shoulder subclasses include total resurfacing anatomic, total stemless anatomic, total stemmed anatomic, total stemmed reverse and total stemless reverse. Definitions for each of these classes are detailed in the subsequent sections.

Revision shoulder replacements are re-operations of previous shoulder replacements where one or more of the prosthetic components are replaced, removed, or another component is added. Revisions include subsequent operations of primary partial, primary total, or previous revision procedures. Shoulder revision procedures are categorised into three subclasses: major total, major partial and minor shoulder replacement.



Detailed demographic information on shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>



Shoulder Replacement

Executive Summary Reference Tables

Table S1 and Table ST2 index the analyses within this chapter. Variables are listed, and where there is a significant finding for a comparison, a red diamond is shown in the table. There are hyperlinks to the relevant tables and figures.

Throughout this chapter, CPR figures showing no significant differences will not be displayed. Confirmation of this will be

noted at the foot of the relevant CPR table.

These figures and their corresponding tables will instead be published in the [Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report](#).

Table S1 Indexing Significant Characteristic Comparisons: Total Shoulder Anatomic Replacements

Characteristic	Variable	Total Stemless Anatomic Significant HR	Figure No.	Total Stemmed Anatomic Significant HR	Figure No.
	Primary Diagnosis	NS		NS	
	Procedure Year	NT		♦	Figure ST41
	Procedure Year and Polyethylene Glenoid	NT		NT	
Patient					
	Age	♦	Figure ST20	♦	Figure ST44
	Sex	♦	Figure ST21	♦	Figure ST45
	Sex by Age	♦	Figure ST23	♦	Figure ST46
	ASA Score	NS		NS	
	ASA by Sex	NT		♦	Figure ST47
	BMI Category	NS		♦	Figure ST48
	BMI by Sex	♦	Figure ST24	♦	Figure ST50
	Glenoid Morphology	NS		NS	
Prosthesis					
	Fixation	♦	Figure ST25	NS	
	Fixation and Age	NT		♦	Figure ST51
	Glenoid Type	♦	Figure ST26	♦	Figure ST52
	Bearing Surface	NS		♦	Figure ST53
	Humeral Head Size	NS		♦	Figure ST54
	Bearing Surface and Humeral Head Size	NS		♦	Figure ST55 Figure ST56
Implant Sizing Variations					
	Augmented Glenoid	NS			Figure ST58
	Glenoid Morphology and Glenoid Augmentation	NS		♦	Figure ST60 Figure ST61
	Bearing Surface and Glenoid Augmentation*	NS	Figure ST28	♦	Figure ST63
	Humeral Stem Length	NT		♦	Figure ST64
	Bearing Surface and Humeral Stem Length*	NT		♦	Figure ST66
Surgeon Assistive Tools					
	IDI	♦	Figure ST29	♦	Figure ST67
	IDI and Glenoid Morphology	♦	Figure ST30	♦	Figure ST68
	IDI and Glenoid Augmentation*	NS	Figure ST31	NT	
Operative Technique					
	Rotator Cuff Repair	NS		NS	

♦ Significant Hazard Ratio difference between categories where $p < 0.05$

NS Figure not shown (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$).

NT Not tested: Insufficient numbers to make statistical comparisons

*New analysis for this year's Annual Report

Table S2 Indexing Significant Characteristic Comparisons: Total Stemmed Reverse Shoulder Replacements

Characteristic	Variable	Total Stemmed Reverse					
		Osteoarthritis Significant HR	Figure No.	Rotator Cuff Arthropathy Significant HR	Figure No.	Significant t HR	Fracture Figure No.
Patient	Primary Diagnosis		Figure ST76	◆	Figure ST76	◆	
	Procedure year	◆	Figure ST80	◆	Figure ST80		
	Age	◆	Figure ST83	◆	Figure ST84	◆	Figure ST85
	Sex	◆	Figure ST86	◆	Figure ST87	◆	Figure ST88
	ASA Score	◆	Figure ST90	◆	Figure ST91	◆	Figure ST91
	BMI Category	◆		◆	Figure ST93	◆	Figure ST94
	Glenoid Morphology	NS		NS		NS	
Prosthesis	Fixation	◆	Figure ST95	◆	Figure ST96	NS	
	Cementless Fixation and Age*	◆	Figure ST97	◆	Figure ST99	◆	Figure ST101
	Hybrid (Humerus Cemented) and Age*	NS	Figure ST97	NS	Figure ST100	◆	Figure ST101
	Bearing Surface	◆	Figure ST103	◆	Figure ST104	◆	Figure ST105
	Glenosphere Size	◆	Figure ST105	◆	Figure ST107	◆	Figure ST107
	Bearing Surface and Glenosphere Size*	◆	Figure ST109 Figure ST110	◆	Figure ST111	◆	Figure ST111
	Glenosphere Size and Glenosphere Material*	◆	Figure ST113 Figure ST113	◆	Figure ST115 Figure ST115	NS	Figure ST117 Figure ST117
Implant Sizing Variations	Glenoid Augmentation	◆	Figure ST119	◆	Figure ST120	◆	Figure ST121
	Glenoid Augmentation and Glenoid Morphology	◆	Figure ST122 Figure ST122 Figure ST124	NS		NS	
	Humeral Stem Type	NT		NT		◆	Figure ST125
	Humeral Stem Type and Fixation	NT		NT		◆	Figure ST126
	Humeral Stem Length	◆	Figure ST127	NS		NS	
	Humeral Stem Length and Bearing Surface*	◆					
	Standard Prostheses and ISVs*	◆					
	Glenosphere Lateralisation						
Surgeon Assistive Tools	IDI						
	Glenoid Augmentation and IDI*	◆	Figure ST138				
Operative Technique							
	Rotator Cuff Repair			◆	Figure ST146	◆	Figure ST147

◆ Significant Hazard Ratio difference between categories where $p < 0.05$ NS Figure not shown (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$).

NT Not tested: Insufficient numbers to make statistical comparisons

*New analysis for this year's Annual Report



Shoulder Replacement

Use of Shoulder Replacement

There are 120,345 shoulder replacements with a procedure date up to and including 31 December 2025. This is an additional 12,764 shoulder procedures since the last report.

For further information on the **closure of the database**, please see the **Glossary** of this report.

Registry shoulder data collection commenced in 2004, and full national collection was implemented by November 2007.

The number of shoulder replacement procedures undertaken in 2025 increased by 736 (6.3%) compared to the previous year and has increased by 369.7% since 2008.

When considering all shoulder replacement procedures currently recorded by the Registry, primary total shoulder replacement is the most common, followed by revision and primary partial procedures (Table S3).

In 2025, the proportion of revision procedures has declined to 7.9%. This equates to 373 fewer revisions compared to the peak of 10.9% in 2015.

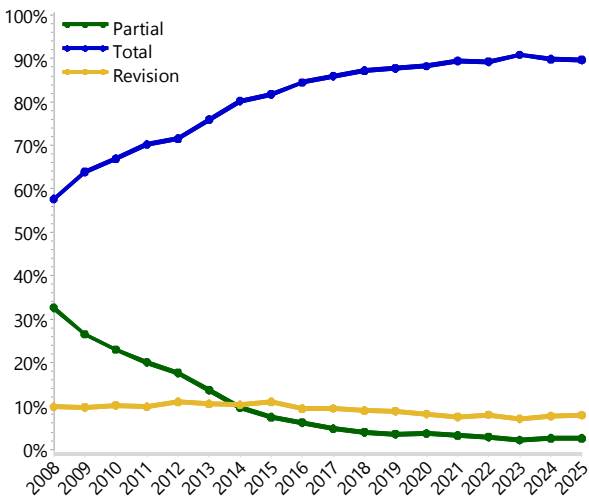
Table S3 Number of Shoulder Replacements

Shoulder Category	Number	Percent
Partial	8718	7.2
Total	101145	84.0
Revision	10482	8.7
TOTAL	120345	100.0

Since 2008, there has been a proportional increase in the use of total shoulder replacement, a decline in the use of partial shoulder replacement and a decrease in the proportion of revision procedures (Figure S1).

The proportion of total shoulder replacements has increased from 57.6% in 2008 to 89.7% in 2025.

Figure S1 Proportion of Shoulder Replacements





Shoulder Replacement

ASA and BMI in Shoulder Replacement

Data are reported on shoulder replacement procedures for both the American Society of Anaesthesiologists Physical Status Classification (ASA score) and Body Mass Index (BMI). ASA score and BMI are both known to impact the outcome of shoulder replacement surgery. The Registry commenced collection of ASA score in 2012 and BMI data in 2015.

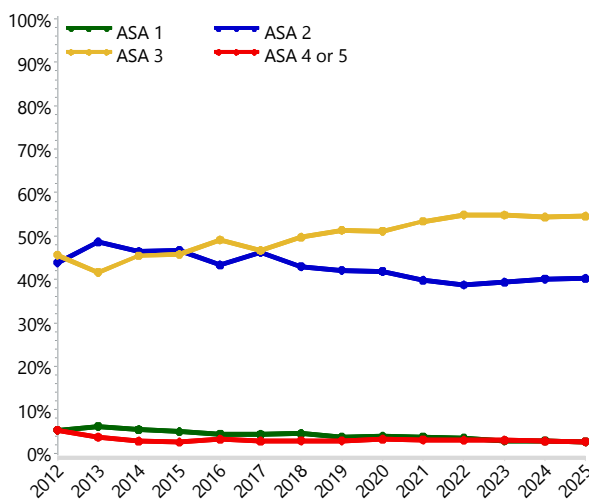
There are ASA score data on 98,702 and BMI data on 86,744 shoulder replacement procedures. Since its initial collection, ASA score has been recorded for 96.9% of procedures. BMI has been recorded for 93.4% of procedures since collection commenced.

ASA SCORE

There are five ASA score classifications:¹⁴

1. A normal healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation

Figure S2 Proportion of Shoulder Replacements by ASA Score



Whilst the proportions of normal and severely ill are not changing, ASA 2 and 3 are increasing with time (Figure S2).

BMI CATEGORY

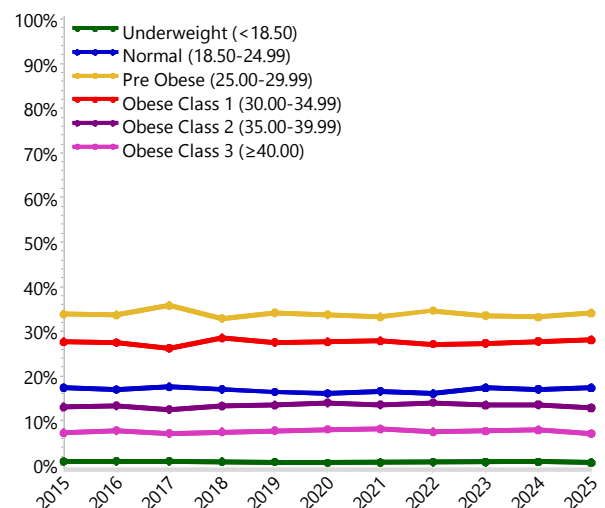
BMI for adults is classified into six main categories:¹⁵

Underweight	<18.5
Normal	18.5 – 24.9
Pre-obese	25.0 – 29.9
Obese Class 1	30.0 – 34.9
Obese Class 2	35.0 – 39.9
Obese Class 3	≥40.0

For all shoulder replacements, the majority of procedures are undertaken in patients who are pre-obese or obese class 1. Proportions of BMI classes over time are not changing (Figure S3).

Additional ASA and BMI data can be found in the **Primary Partial, Primary Total and Revision Shoulder Data Supplementary Report**

Figure S3 Proportion of Shoulder Replacements by BMI Category



¹<https://doi.org/10.1097/aop9.0000000000000002>

² <https://www.health.gov.au/topics/overweight-and-obesity/bmi-and-waist>



Shoulder Replacement

CT Scan and Glenoid Morphology

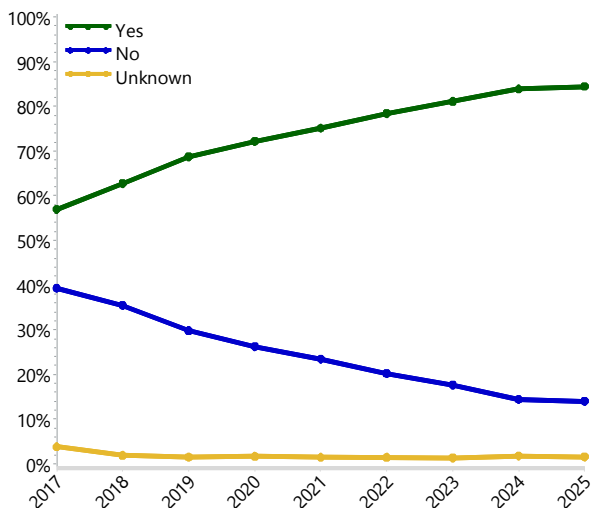
Data are reported on shoulder replacement procedures for both CT scans and glenoid morphology. The Registry commenced collection of CT scan usage and glenoid morphology in January 2017.

CT SCANS

There is a difference depending on the class of shoulder replacement. Total shoulder replacement procedures have a higher proportion of CT scans compared to revision shoulder replacement and partial shoulder replacement. CT utilisation for shoulder replacement cases has risen from under 60% in 2017 to 84.4% in 2025 (Figure S4). In contrast, the relative percentages of glenoid morphology categories have not changed (Figure S5).

A CT scan was undertaken in 75.8% of all reported shoulder replacements.

Figure S4 Proportion of Shoulder Replacements by CT Scan Usage



GLENOID MORPHOLOGY

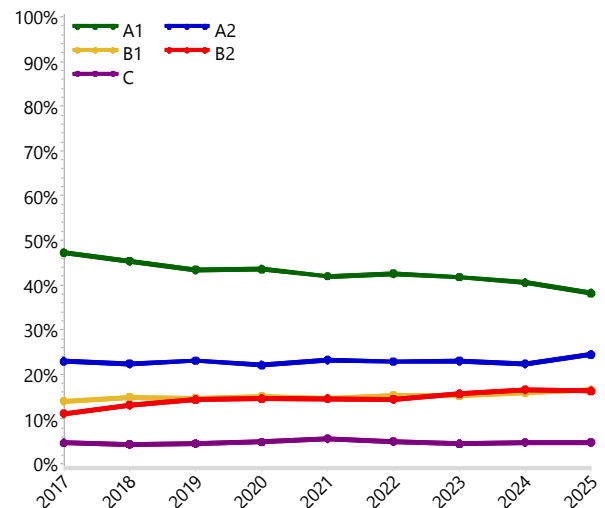
There are 5 glenoid morphology categories based on the Walch classification:¹⁶

- A1. Humeral head centred – minor erosion
- A2. Humeral head centred – major erosion
- B1. Humeral head posteriorly subluxated, narrowing of the posterior joint space, subchondral sclerosis and osteophytes
- B2. Humeral head posteriorly subluxated – posterior rim erosion with a biconcave glenoid
- C. Glenoid retroversion of more than 25 degrees, regardless of the erosion

The most common glenoid morphology category is A1 for all shoulder procedure categories. The second most common is A2 for total and revision shoulder replacement, with A2 and B2 for partial shoulder replacement (Figure S5).

Additional CT scan and glenoid morphology data can be found in the **Primary Partial, Primary Total and Revision Shoulder Data Supplementary Report**

Figure S5 Proportion of Shoulder Replacements by Glenoid Morphology



¹⁶ Walch G, Badet R, Boulahia A, Khoury A. Morphologic study of the glenoid in primary glenohumeral osteoarthritis. J Arthroplasty. 1999 Sep 1;14(6):756-60.

Primary Partial Shoulder Replacement Summary

Introduction

This section provides summary information on partial shoulder replacement. Detailed information on partial shoulders is available on the AOANJRR website as a separate supplementary report.

Classes of Partial Shoulder Replacement

Primary partial shoulder replacement is subcategorised into four main classes. These are defined by the type of prostheses used.

Partial resurfacing anatomic involves the use of one or more button prostheses to replace part of the natural articulating surface, on one or both sides of the shoulder joint.

Hemi resurfacing anatomic involves the use of a humeral prosthesis that replaces the humeral articular surface only, without resecting the humeral head.

Hemi stemless anatomic involves resection of part of the humeral head and replacement with a humeral head and an epiphyseal fixation prosthesis.

Hemi stemmed anatomic involves the resection of the humeral head and replacement with a humeral head and a humeral stem prosthesis. A humeral stem prosthesis may have either metaphyseal or diaphyseal fixation.

Use of Partial Shoulder Replacement

There are 8,718 primary partial shoulder replacement procedures. This is an additional 314 procedures compared to the number reported last year.

For further information on the **closure of the database**, please see the **Glossary** of this report.

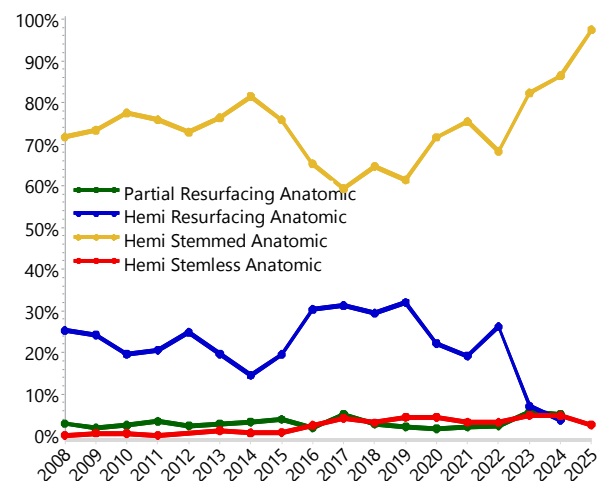
The most common class of primary partial shoulder replacement is hemi stemmed anatomic. This accounts for 74.1% of all partial shoulder replacements, followed by hemi resurfacing anatomic (21.6%), partial resurfacing anatomic (2.7%), and hemi stemless anatomic (1.5%) (Table SP1).

Over the last 10 years hemi stemmed anatomic replacements increased in use by 21.6% while hemi resurfacing anatomic declined by 19.5%. The number of hemi stemmed anatomic procedures decreased from 616 in 2008 to 299 in 2025. The number of hemi resurfacing anatomic procedures decreased from 217 in 2008 to none in 2025 (Figure SP1).

Table SP1 Primary Partial Shoulder Replacement by Class

Shoulder Class	Number	Percent
Partial Resurfacing Anatomic	239	2.7
Hemi Resurfacing Anatomic	1885	21.6
Hemi Stemmed Anatomic	6464	74.1
Hemi Stemless Anatomic	130	1.5
TOTAL	8718	100.0

Figure SP1 Primary Partial Shoulder Replacement by Class



Detailed demographic information on primary partial shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee and Shoulder Arthroplasty' on the AOANJRR website:

<https://registry.aoa.org.au/annual-reports-2026>



Primary Partial Shoulder Replacement Summary

Primary Hemi Stemmed Anatomic Shoulder Replacement

There are 6,464 primary hemi stemmed anatomic shoulder replacement procedures. This is an additional 306 procedures compared to the last report.

For further information on the **closure of the database**, please see the **Glossary** of this report.

This procedure is more commonly undertaken in females (63.8%). The mean age is 71.2 years for females and 60.9 years for males (Table SP2 and Figure SP2).

The most common primary diagnosis is fracture (50.2%), followed by osteoarthritis (34.2%). In 2025, the number of primary hemi stemmed anatomic shoulder replacements undertaken for fracture decreased by 92.3% compared to 2008. In 2025, the number of primary hemi stemmed anatomic shoulder replacements undertaken for osteoarthritis increased by 21.9% compared to 2008 (Figure SP3).

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the following analyses, unless clearly specified.

The cumulative percent revision at 15 years for primary hemi stemmed anatomic shoulder replacement procedures undertaken for fracture is 16.9% and osteoarthritis is 12.0%. There is a higher rate of revision in the first 1.5 years when primary hemi stemmed anatomic shoulder replacement is performed for fracture compared to osteoarthritis. After this time, there is no difference (Table SP4 and Figure SP4).

For hemi stemmed anatomic performed for osteoarthritis, the rate of revision varies by the humeral head material. Metal humeral heads are associated with a higher rate of revision compared to pyrolytic carbon (pyrocarbon) heads (Table SP5 and Figure SP5). This is also observed for procedures with a primary diagnosis of fracture from 9 months onwards (Table SP6 and Figure SP6).

There are 441 revisions of primary hemi stemmed anatomic shoulder replacement. Reasons for revision vary depending on the primary diagnosis. Revision for rotator cuff insufficiency occurs more frequently in primary hemi stemmed anatomic shoulder replacement undertaken for fracture (26.7%), whereas revision for glenoid erosion occurs more frequently in procedures undertaken for osteoarthritis (27.1%).

The most common type of revision is to a total shoulder replacement for both primary diagnoses (72.2% for fracture and 63.6% for osteoarthritis). Most are revised to a total reverse shoulder replacement (97.9% when used for fracture and 86.8% for osteoarthritis). Isolated glenoid component only revision occurs more frequently in procedures undertaken for osteoarthritis (17.8% compared to 3.8% for fracture).

The outcomes of 12 prosthesis combinations with more than 20 procedures used in primary hemi stemmed anatomic shoulder replacement are listed in Table SP5.

A special clinical assessment, including hemi stemmed anatomic implants with pyrocarbon humeral heads for patients with osteoarthritis aged <60 years, is detailed in Figure ST148.

Primary Partial Shoulder Replacement Summary

Figure SP2 Primary Hemi Stemmed Anatomic Shoulder Replacement by Sex

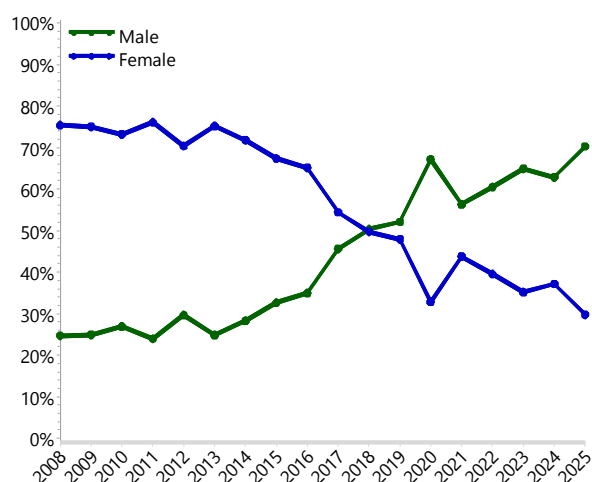


Table SP2 Age and Sex of Primary Hemi Stemmed Anatomic Shoulder Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	2342	36.2%	14	94	61	60.9	13.9
Female	4122	63.8%	13	101	72	71.2	11.9
TOTAL	6464	100.0%	13	101	69	67.5	13.6

Figure SP3 Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

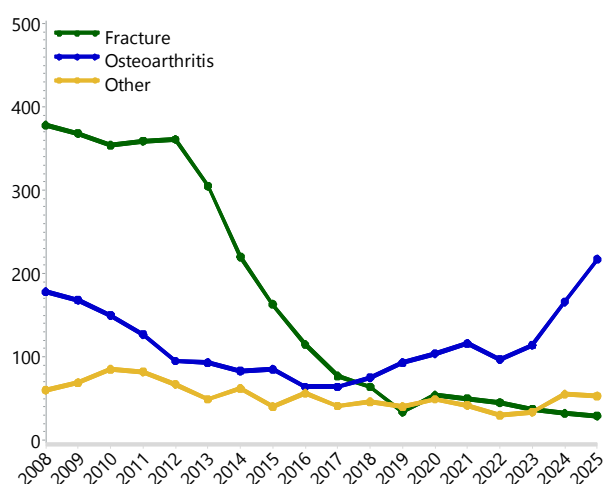


Table SP3 Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	Number	Percent
Fracture	3244	50.2
Osteoarthritis	2208	34.2
Rotator Cuff Arthropathy	280	4.3
Osteonecrosis	275	4.3
Tumour	219	3.4
Rheumatoid Arthritis	109	1.7
Instability	94	1.5
Other Inflammatory Arthritis	32	0.5
Other	3	0.0
TOTAL	6464	100.0



Primary Partial Shoulder Replacement Summary

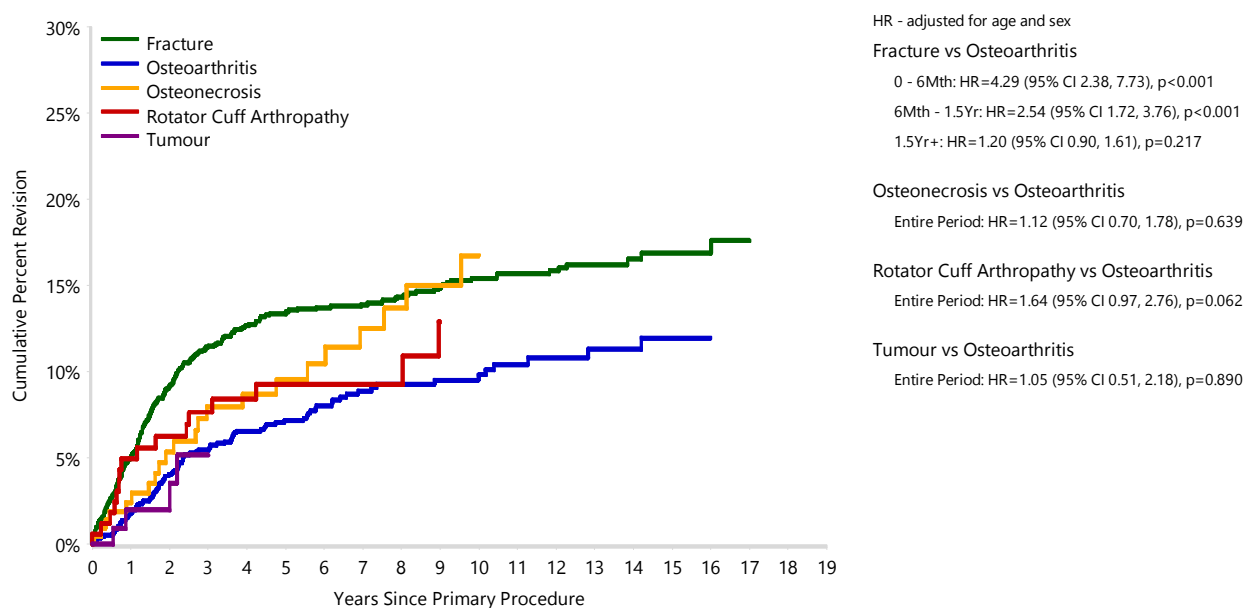
Table SP4 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	266	1926	5.1 (4.2, 6.2)	11.5 (10.1, 13.1)	13.4 (11.9, 15.1)	13.9 (12.3, 15.6)	15.4 (13.7, 17.3)	16.9 (14.9, 19.1)
Osteoarthritis	107	1610	1.8 (1.3, 2.7)	5.5 (4.3, 6.8)	7.2 (5.8, 8.8)	8.9 (7.3, 10.8)	9.8 (8.0, 12.0)	12.0 (9.5, 15.0)
Osteonecrosis	23	218	2.4 (1.0, 5.7)	8.0 (4.8, 13.2)	9.5 (5.9, 15.2)	12.5 (8.0, 19.3)	16.7 (10.9, 25.2)	
Rotator Cuff Arthropathy	17	166	4.9 (2.5, 9.6)	7.7 (4.4, 13.1)	9.3 (5.6, 15.2)	9.3 (5.6, 15.2)		
Tumour	8	151	2.0 (0.5, 7.7)	5.2 (1.9, 13.6)				
Other (4)	20	162	5.2 (2.6, 10.1)	9.5 (5.7, 15.5)	10.3 (6.3, 16.6)	11.6 (7.2, 18.4)		
TOTAL	441	4233						

Note: Restricted to modern prostheses

Only primary diagnoses with > 100 procedures have been listed

Figure SP4 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	1926	1732	1417	1195	988	691	163
Osteoarthritis	1610	1348	986	728	494	308	112
Osteonecrosis	218	184	133	108	78	42	17
Rotator Cuff Arthropathy	166	149	123	92	69	34	5
Tumour	151	86	47	29	20	9	1

Note: Restricted to modern prostheses

Only primary diagnoses with > 100 procedures have been listed

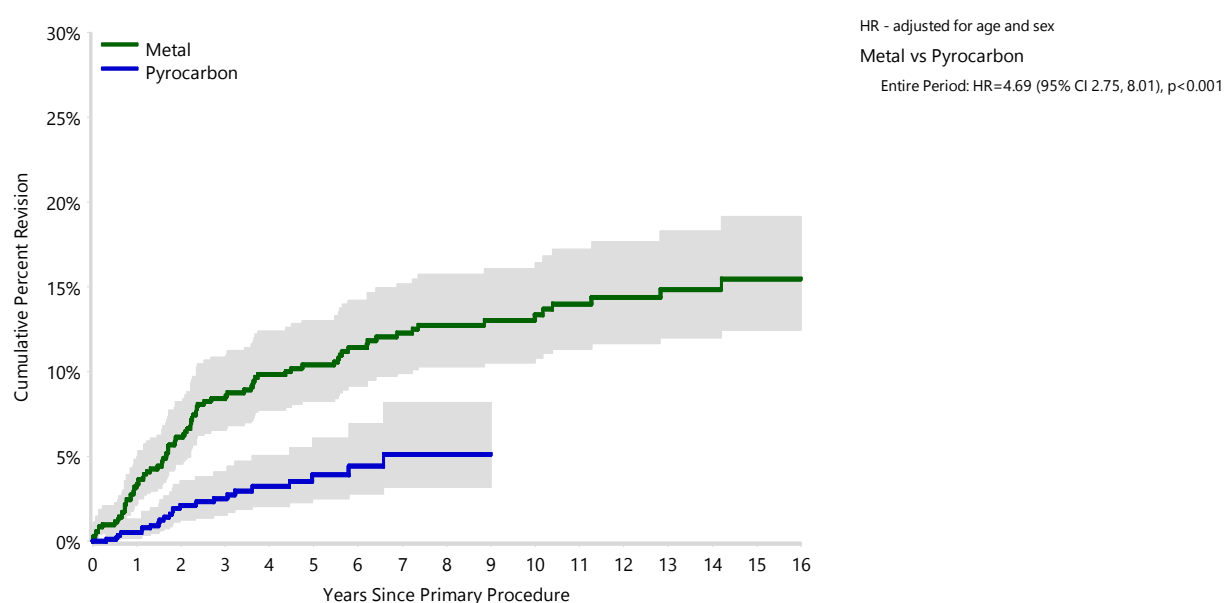
Primary Partial Shoulder Replacement Summary

Table SP5 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head Material (Primary Diagnosis OA)

Humeral Head Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Metal	84	701	3.4 (2.2, 5.0)	8.4 (6.5, 10.9)	10.4 (8.2, 13.0)	12.3 (9.9, 15.2)	13.4 (10.8, 16.4)	15.5 (12.5, 19.2)
Pyrocarbon	23	906	0.5 (0.2, 1.3)	2.5 (1.5, 4.1)	3.9 (2.5, 6.1)	5.1 (3.2, 8.2)		
TOTAL	107	1607						

Note: Restricted to modern prostheses

Figure SP5 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head Material (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Metal	701	648	537	470	385	273	112
Pyrocarbon	906	697	446	256	107	35	0

Note: Restricted to modern prostheses



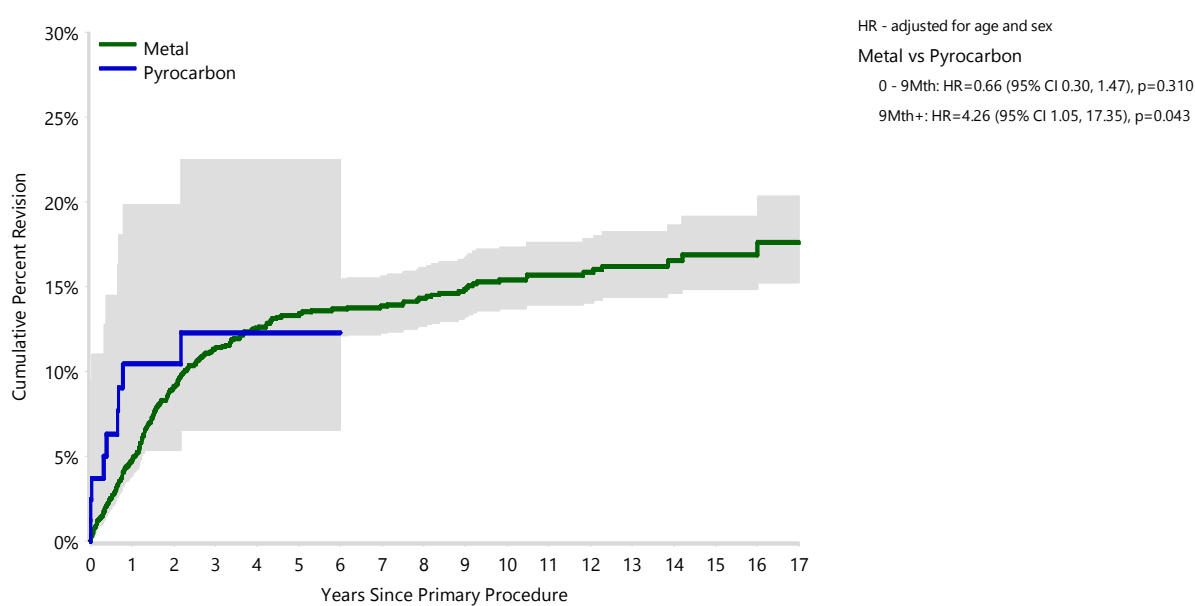
Primary Partial Shoulder Replacement Summary

Table SP6 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head Material (Primary Diagnosis Fracture)

Humeral Head Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Metal	251	1802	4.8 (3.9, 5.9)	11.4 (10.0, 13.0)	13.4 (11.8, 15.1)	13.9 (12.3, 15.6)	15.4 (13.7, 17.3)	16.9 (14.9, 19.1)
Pyrocarbon	9	81	10.4 (5.4, 19.8)	12.3 (6.5, 22.5)	12.3 (6.5, 22.5)			
TOTAL	260	1883						

Note: Restricted to modern prostheses

Figure SP6 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Humeral Head Material (Primary Diagnosis Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Metal	1802	1630	1349	1148	961	683	161
Pyrocarbon	81	62	37	20	7	0	0

Note: Restricted to modern prostheses



Primary Partial Shoulder Replacement Summary

Table SP7 Cumulative Percent Revision of Primary Hemi Stemmed Anatomic Shoulder Replacement by Prosthesis Combinations

Humeral Head	Humeral Stem	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	58	673	2.4 (1.5, 3.9)	6.5 (4.9, 8.7)	7.4 (5.6, 9.8)	8.3 (6.3, 10.8)	9.3 (7.2, 12.0)	10.2 (7.9, 13.1)
Affinis	Affinis	10	65	7.9 (3.4, 17.9)	13.0 (6.7, 24.3)	17.1 (9.5, 29.7)	17.1 (9.5, 29.7)	17.1 (9.5, 29.7)	
Ascend Flex	Ascend Flex	5	62	5.4 (1.8, 15.8)	7.5 (2.9, 18.7)	10.2 (4.3, 23.1)	10.2 (4.3, 23.1)		
Ascend Flex PyC	Aequalis Flex Revive	5	30	17.2 (7.5, 36.6)	17.2 (7.5, 36.6)				
	Ascend Flex	44	1132	1.1 (0.6, 2.0)	3.9 (2.7, 5.5)	5.2 (3.7, 7.2)	7.8 (5.4, 11.2)	10.7 (6.7, 16.8)	
Comprehensive	Comprehensive	17	194	4.4 (2.2, 8.6)	9.8 (6.1, 15.6)	9.8 (6.1, 15.6)	11.0 (6.9, 17.4)		
Delta Xtend	Delta Xtend	17	81	7.5 (3.5, 16.0)	19.3 (12.1, 30.1)	19.3 (12.1, 30.1)	21.1 (13.5, 32.3)	23.6 (15.1, 35.7)	
Equinox	Equinox	15	108	6.9 (3.3, 13.9)	13.6 (8.1, 22.3)	16.5 (10.2, 26.1)			
Global Unite	Global Unite	44	232	7.0 (4.3, 11.1)	16.5 (12.2, 22.1)	19.8 (15.0, 25.8)	19.8 (15.0, 25.8)	21.4 (16.3, 27.8)	
Mutars	Mutars	3	72	0.0 (0.0, 0.0)	2.6 (0.4, 17.2)	7.8 (1.9, 29.5)	13.5 (4.3, 38.0)		
SMR	SMR	190	1291	4.0 (3.0, 5.2)	10.2 (8.6, 12.0)	12.6 (10.8, 14.6)	13.7 (11.8, 15.8)	16.0 (14.0, 18.4)	19.0 (16.4, 22.0)
SMR CTA	SMR	29	277	5.2 (3.1, 8.7)	9.5 (6.4, 13.8)	11.0 (7.7, 15.7)	11.0 (7.7, 15.7)	13.3 (9.1, 19.2)	
Other (4)		4	16	27.5 (11.2, 57.9)	27.5 (11.2, 57.9)				
TOTAL		441	4233						

Note: Restricted to modern prostheses

Only prostheses with >20 procedures have been listed

More information regarding partial shoulder procedures is available in the 'Partial Shoulder Arthroplasty Supplementary Report' on the AOANJRR website:

<https://registry.aoa.org.au/annual-reports-2026>



Primary Total Shoulder Replacement

Classes of Total Shoulder Replacement

Primary total shoulder replacement is subcategorised into five classes. These are defined by the type of prosthesis used. The stemless anatomic class of shoulder replacement has increased considerably. As such, mid head humeral prostheses are now classified as stemless anatomic and stemless reverse to reflect their differing polarity.

Total Resurfacing Anatomic involves glenoid replacement and the use of a humeral prosthesis that replaces the humeral articular surface without resecting the humeral head.

Total Stemless Anatomic involves glenoid replacement combined with resection of the humeral head and replacement with a humeral head and an epiphyseal fixation prosthesis.

Total Stemmed Anatomic involves glenoid replacement combined with resection of the humeral head and replacement with humeral head and humeral stem prostheses. A humeral stem prosthesis may have metaphyseal or diaphyseal fixation.

Total Stemmed Reverse involves glenoid replacement with a glenosphere prosthesis combined with resection of the humeral head and replacement with humeral cup and humeral stem prosthesis. A humeral stem prosthesis may have metaphyseal or diaphyseal fixation.

Total Stemless Reverse involves glenoid replacement with a glenosphere combined with resection of the humeral head and replacement by a humeral cup and an epiphyseal fixation humeral prosthesis.

Primary total resurfacing anatomic shoulder replacement is no longer used. Therefore, detailed information on primary total resurfacing anatomic shoulder replacement is available in the supplementary report 'Prosthesis Types with No or Minimal Use' on the AOANJRR website: <https://registry.aoa.org.au/annual-reports-2026>

Primary total stemmed reverse shoulder replacement accounts for 76.0% of all primary total shoulder replacements.

Use of Total Shoulder Replacement

There are 100,910 primary total shoulder replacement procedures. Of these, total stemmed reverse is the most common, followed by total stemmed anatomic and total stemless anatomic. There have been no total resurfacing anatomic and total stemless reverse replacements in 2025.

The use of different prosthesis classes has changed over time with a major increase in the use of total stemmed reverse shoulder and a corresponding decline in the use of total stemmed anatomic shoulder replacement (Table ST1). Total stemless reverse replacements were first undertaken in 2016 (Figure ST1).

Figure ST1 Primary Total Shoulder Replacement by Class

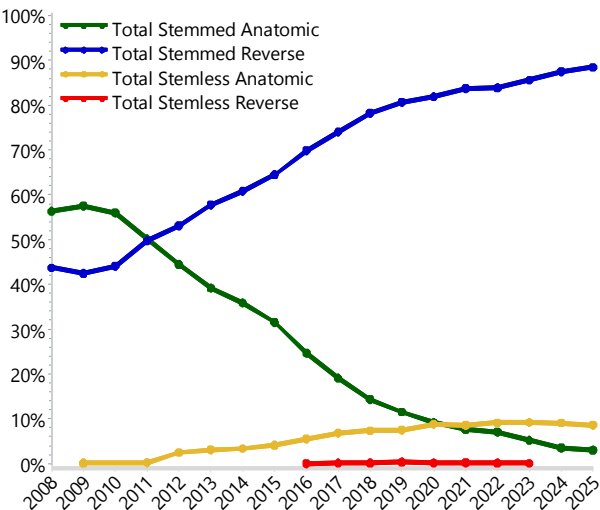


Table ST1 Primary Total Shoulder Replacement by Class

Shoulder Class	Number	Percent
Total Stemmed Anatomic	17240	17.1
Total Stemmed Reverse	76716	76.0
Total Stemless Anatomic	6886	6.8
Total Stemless Reverse	68	0.1
TOTAL	100910	100.0

Note: Excludes 235 total resurfacing procedures

Primary Total Shoulder Replacement

Primary total shoulder replacement is undertaken more often in females, and this is true of all classes except for total stemmed reverse, although numbers in this class are small (Table ST2). The percentage of males undergoing primary total shoulder replacement has increased by 4.4% since 2016. The mean age for females is higher than for males (Table ST3).

Most patients are aged ≥ 65 years. The proportion of the class of shoulder replacement varies between age groups, with total stemmed reverse predominating in the older age cohorts (Table ST4).

Osteoarthritis is the most common primary diagnosis followed by rotator cuff arthropathy and fracture (Table ST5).

Since 2016, the primary diagnosis of osteoarthritis has decreased in proportion by 11.4%, and rotator cuff arthropathy has increased by 12.7%.

The percentage of prostheses utilising highly cross-linked polyethylene (XLPE) and non-highly cross-linked polyethylene (non XLPE) in 2025 for primary total shoulder replacement was 46.1% and 45.8%, respectively. The relative percentages

had XLPE increase (6.6%) and non XLPE decrease (4.8%) compared to 2024 proportions.

To keep Registry data contemporaneous, only procedures using prostheses that were available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified.

The rate of revision varies by class, with total stemmed reverse and total stemmed anatomic having a lower cumulative percent revision at 10 years than total stemmed anatomic shoulder replacement with a polyethylene glenoid. A polyethylene glenoid includes all glenoid types except modular metal backed glenoids (Table ST6 and Figure ST2). There are no primary total stemmed anatomic shoulder replacements with modular metal backed glenoids undertaken in 2025.

Detailed demographic information on primary total shoulder replacement is available in the supplementary report 'Demographics of Hip, Knee & Shoulder Arthroplasty' on the AOANJRR website:

<https://registry.aoa.org.au/annual-reports-2026>

Table ST2 Primary Total Shoulder Replacement by Class and Sex

Shoulder Class	Male		Female		TOTAL	
	N	Row%	N	Row%	N	Row%
Total Stemmed Anatomic	7453	43.2	9787	56.8	17240	100.0
Total Stemmed Reverse	29891	39.0	46825	61.0	76716	100.0
Total Stemless Anatomic	3493	50.7	3393	49.3	6886	100.0
Total Stemless Reverse	47	69.1	21	30.9	68	100.0
TOTAL	40884	40.5	60026	59.5	100910	100.0

Table ST3 Age and Sex of Primary Total Shoulder Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	40884	40.5%	13	100	71	70.2	9.0
Female	60026	59.5%	12	102	74	73.4	8.3
TOTAL	100910	100.0%	12	102	73	72.1	8.7



Primary Total Shoulder Replacement

Table ST4 Primary Total Shoulder Replacement by Class and Age

Shoulder Class	<55		55-64		65-74		≥75		TOTAL	
	N	Row%	N	Row%	N	Row%	N	Row%	N	Row%
Total Stemmed Anatomic	1026	6.0	4145	24.0	7575	43.9	4494	26.1	17240	100.0
Total Stemmed Reverse	1367	1.8	8929	11.6	30131	39.3	36289	47.3	76716	100.0
Total Stemless Anatomic	757	11.0	1966	28.6	2894	42.0	1269	18.4	6886	100.0
Total Stemless Reverse	2	2.9	9	13.2	46	67.6	11	16.2	68	100.0
TOTAL	3152	3.1	15049	14.9	40646	40.3	42063	41.7	100910	100.0

Note: Restricted to modern prostheses

Excludes 235 total resurfacing anatomic shoulder procedures

Table ST5 Primary Total Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	Number	Percent
Osteoarthritis	56041	55.5
Rotator Cuff Arthropathy	29046	28.8
Fracture	11371	11.3
Rheumatoid Arthritis	1509	1.5
Osteonecrosis	1253	1.2
Instability	822	0.8
Other Inflammatory Arthritis	515	0.5
Tumour	328	0.3
Other	25	0.0
TOTAL	100910	100.0

Note: Restricted to modern prostheses

Excludes 235 total resurfacing anatomic shoulder procedures

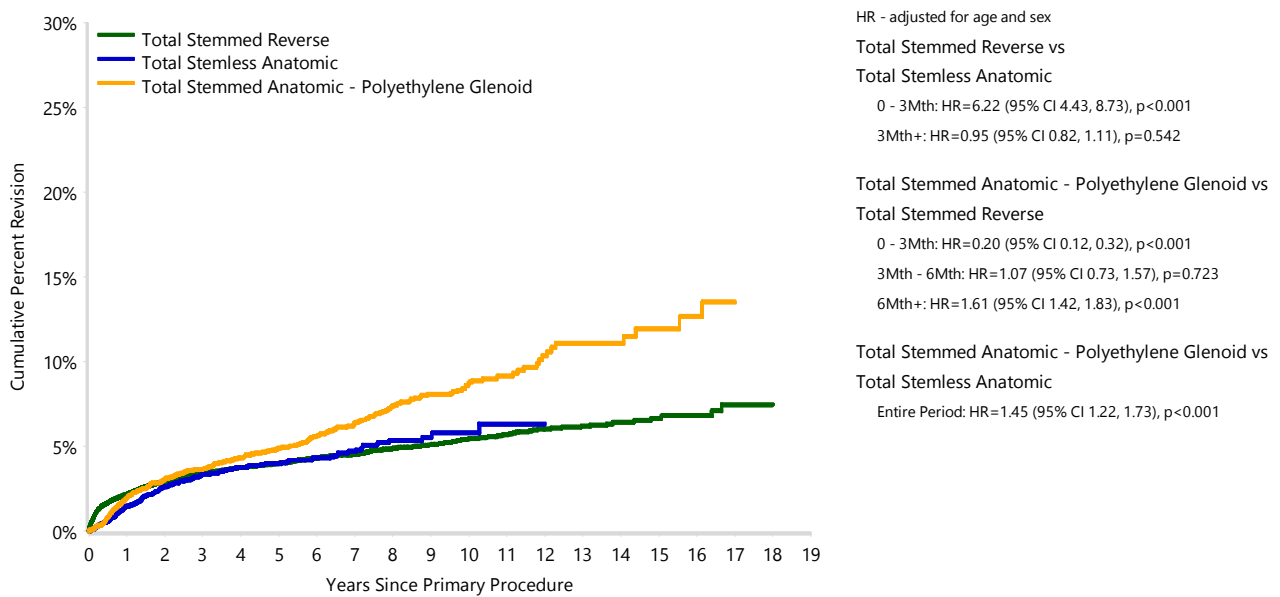
Primary Total Shoulder Replacement

Table ST6 Cumulative Percent Revision of Primary Total Shoulder Replacement by Class (All Diagnoses)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Total Stemmed Reverse	2739	74719	2.2 (2.1, 2.3)	3.4 (3.2, 3.5)	4.0 (3.8, 4.2)	4.5 (4.4, 4.7)	5.4 (5.2, 5.7)	6.7 (6.1, 7.3)
Total Stemless Anatomic	205	6197	1.5 (1.2, 1.8)	3.4 (2.9, 3.9)	4.0 (3.4, 4.6)	4.7 (4.0, 5.5)	5.8 (4.8, 6.9)	
Total Stemmed Anatomic - Polyethylene Glenoid	348	5757	2.0 (1.6, 2.4)	3.7 (3.2, 4.2)	4.9 (4.4, 5.6)	6.4 (5.7, 7.2)	8.7 (7.7, 9.8)	11.9 (10.1, 14.2)
TOTAL	3292	86673						

Note: Restricted to modern prostheses

Figure ST2 Cumulative Percent Revision of Primary Total Shoulder Replacement by Class (All Diagnoses)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Total Stemmed Reverse	74719	62540	43063	28533	17034	6138	639
Total Stemless Anatomic	6197	5155	3335	2029	1038	207	1
Total Stemmed Anatomic - Polyethylene Glenoid	5757	5295	4383	3355	2309	940	157

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Demographics of Total Shoulder Replacement Over Time

The overall population-based incidence of primary total shoulder replacement has steadily increased from 7.1 per 100,000 in 2008 to 40.2 per 100,000 in 2025. The incidence by state and territory confirms similar increases across the country (Figure ST3).

In 2025, primary total shoulder replacement is undertaken more commonly in private hospitals (75.2%), which has remained consistent since 2008 (Figure ST4). However, when assessed by volume of primary total shoulder replacement per hospital, the lowest 2 quartiles of hospitals represented 32.5% of cases in 2008 and reduced to 4.0% in 2025 (Figure ST5).

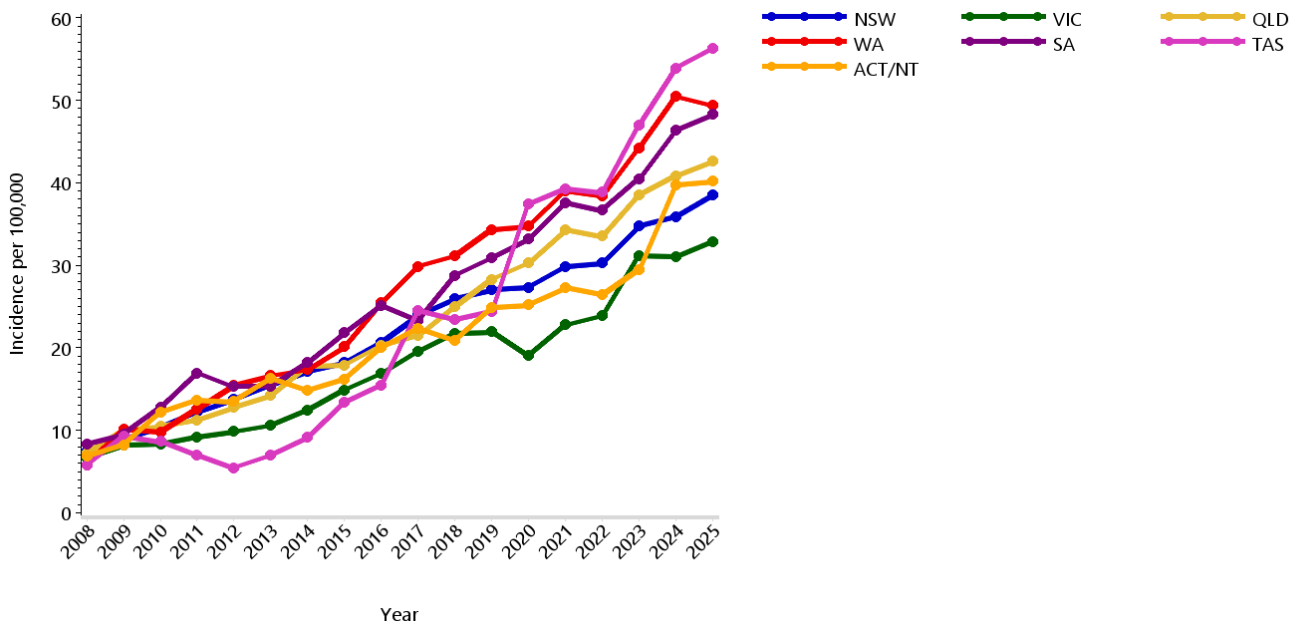
The proportion of primary total shoulder replacements per surgeon has also changed, with the highest quartile of surgeon volume undertaking 55.9% of all cases in 2025, in comparison to 11.9% in 2008 (Figure ST6). As volumes of surgeons performing total primary shoulder replacement and numbers of procedures have increased over time,

the experience of orthopaedic surgeons (number of years since first reported shoulder replacement procedure) performing most of the shoulder replacement has also grown. In 2025, 70.5% of primary total shoulder replacements are completed by orthopaedic surgeons with ≥ 9 years' experience (Figure ST7).

The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) is created by the Australian Bureau of Statistics as a summary measure of the socioeconomic status for each geographical area.¹⁷ An IRSAD rating of 1 indicates the most socioeconomically disadvantaged region, while a rating of 10 indicates the most advantaged. Each Australian region has differing rates of social advantage and disadvantage.

Percentages of primary shoulder replacements from regions rated IRSAD 1-2 and 9-10 by state and territory are shown in Figure ST8 and Figure ST9. Percentages of primary shoulder replacements from regions rated IRSAD 1-2 and 9-10 by hospital locality are shown in Figure ST10 and Figure ST11.

Figure ST3 Incidence of Primary Total Shoulder Replacement per 100,000 from 2008 to 2025



¹⁷ <https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/latest-release>



Primary Total Shoulder Replacement

Figure ST4 Primary Total Shoulder Replacement by Hospital Setting

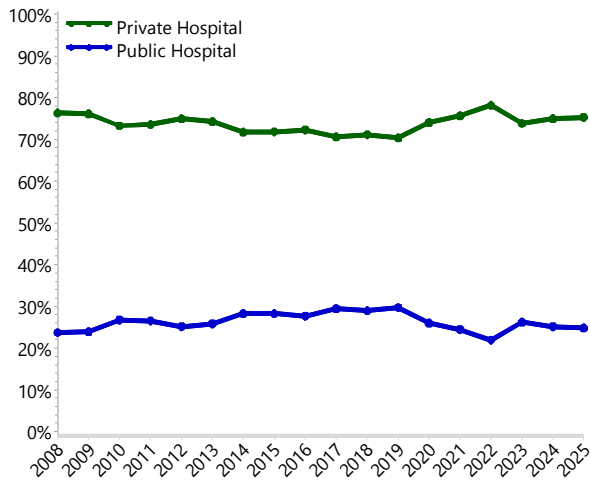


Figure ST6 Primary Total Shoulder Replacement by Surgeon Volume

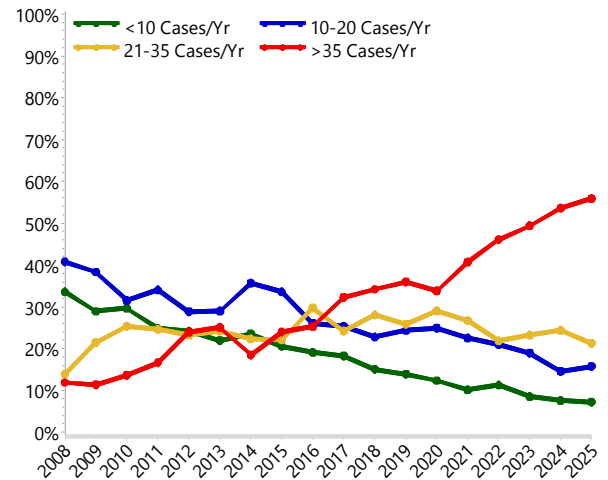


Figure ST5 Primary Total Shoulder Replacement by Hospital Volume

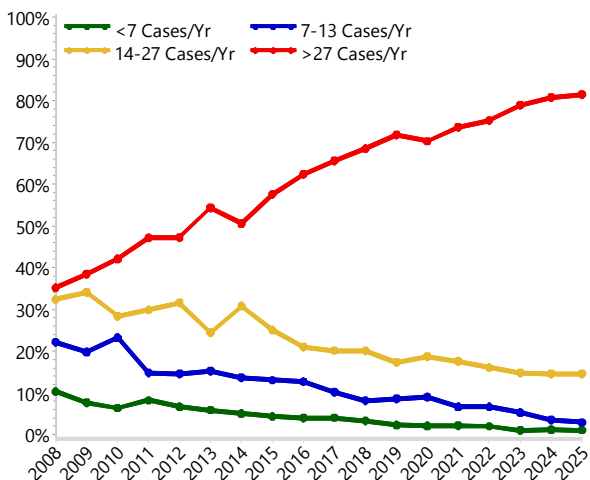
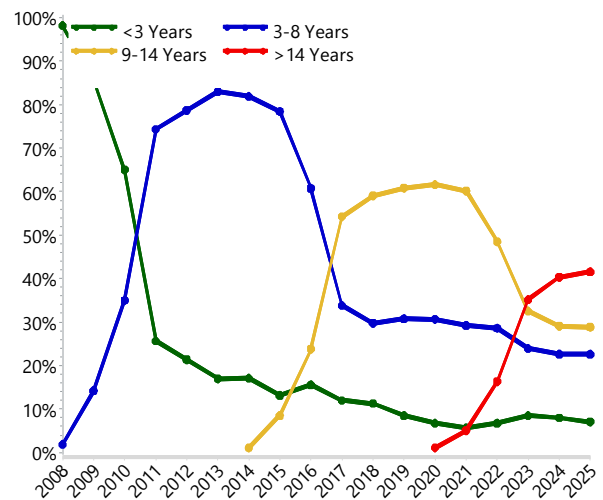


Figure ST7 Primary Total Shoulder Replacement by Surgeon Experience (All Diagnoses)





Primary Total Shoulder Replacement

Figure ST8 Percentage of Primary Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by State (All Diagnoses)

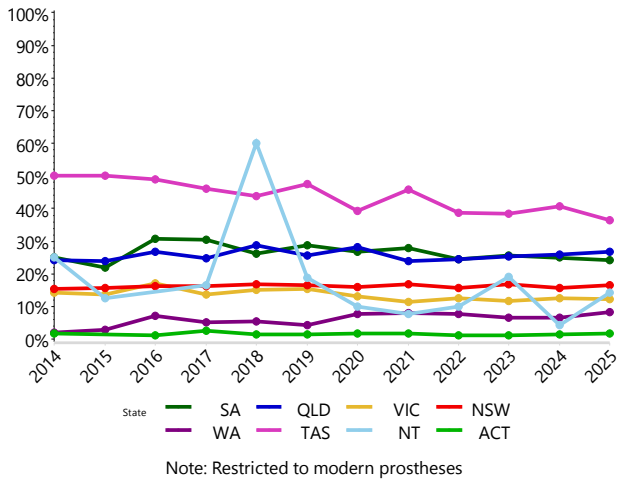


Figure ST10 Percentage of Primary Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by Hospital Locality (All Diagnoses)

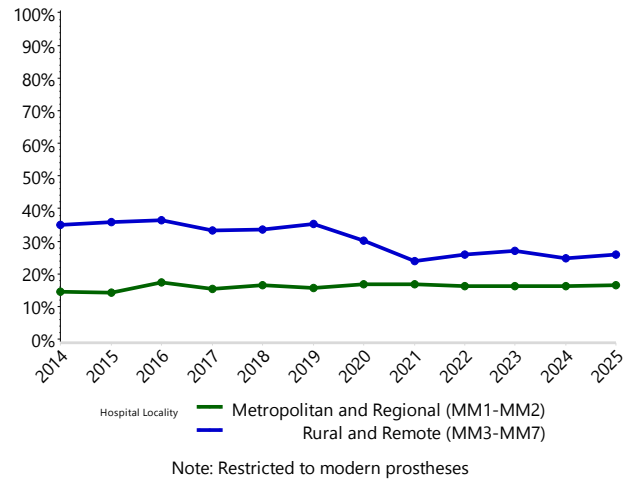


Figure ST9 Percentage of Primary Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by State (All Diagnoses)

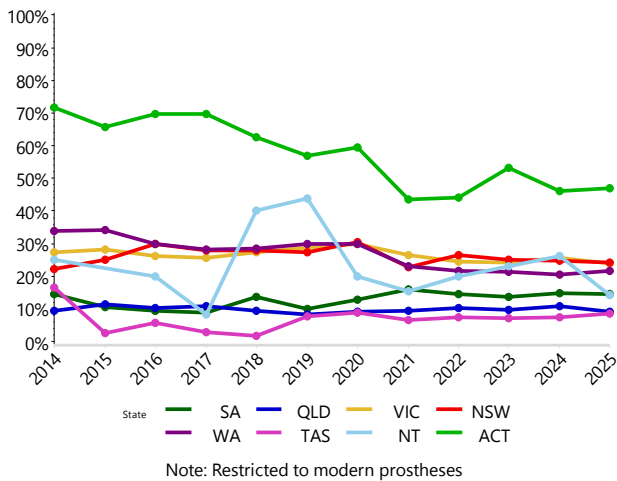
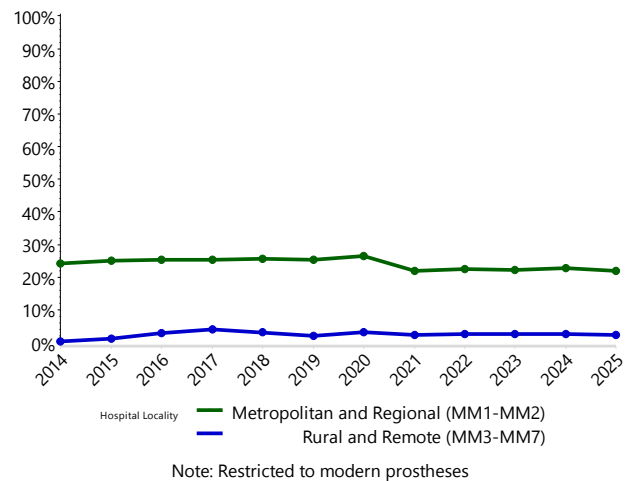


Figure ST11 Percentage of Primary Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by Hospital Locality (All Diagnoses)





Primary Total Shoulder Replacement

Primary Total Stemless Anatomic Shoulder Replacement

DEMOGRAPHICS

There are 6,886 primary total stemless anatomic shoulder replacements. This is an additional 970 procedures compared to the previous report.

For further information on the **closure of the database**, please see the **Glossary** of this report.

The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) is created by the Australian Bureau of Statistics as a summary measure of the socioeconomic status for each geographical area.¹⁸ An IRSAD rating of 1 indicates the most socioeconomically disadvantaged region, while a rating of 10 indicates the most advantaged. Each Australian region has differing rates of social advantage and disadvantage.

Percentages of primary total stemless anatomic shoulder replacements from regions rated IRSAD 1-2 and 9-10 by state and territory are shown in Figure ST12 and Figure ST13. Percentages of primary total stemless anatomic shoulder replacements from regions rated IRSAD 1-2 and 9-10 by hospital locality are shown in Figure ST14 and Figure ST15.

The use of primary total stemless anatomic shoulder replacement has increased by 1,238% since its first full year of use in 2012.

Primary total stemless anatomic shoulder replacement is more commonly performed in patients aged 65–74 years. Primary total stemless anatomic shoulder replacements are undertaken more often in males who are, on average, younger than females (Figure ST17). However, in 2025, 56.0% of primary total stemless shoulder replacements are undertaken in men. In 2025, 43.7% of total stemless shoulder replacements are cementless, 56.0% are hybrid (glenoid cemented), and 0.3% are cemented (Table ST8).

XLPE is more commonly used in total stemless anatomic replacement glenoid components (57.4%) (Table ST9). Osteoarthritis is the most common primary diagnosis. The most commonly used total stemless anatomic prostheses are listed in Table ST8 and Table ST9.

Figure ST12 Percentage of Primary Total Stemless Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by State (All Diagnoses)

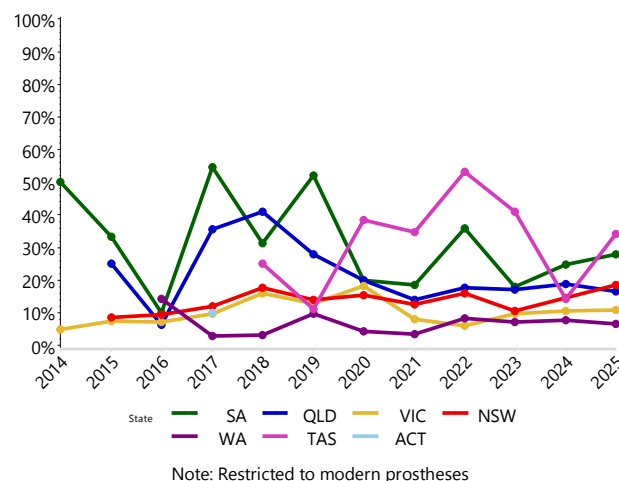


Figure ST13 Percentage of Primary Total Stemless Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by State (All Diagnoses)

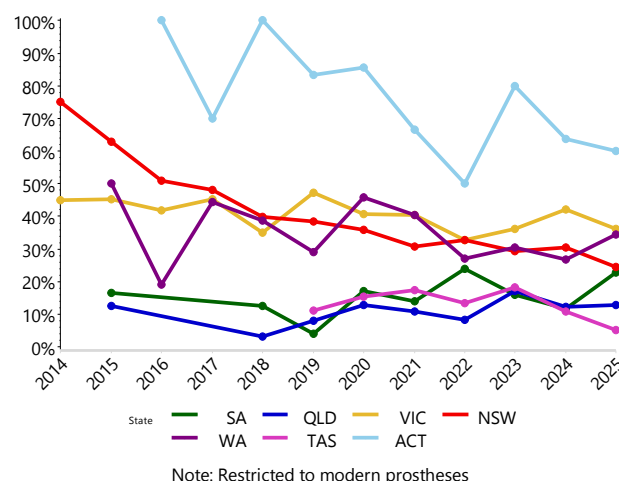


Table ST7 Age and Sex of Primary Total Stemless Anatomic Shoulder Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	3493	50.7%	31	95	65	64.1	9.4
Female	3393	49.3%	19	94	69	68.5	8.5
TOTAL	6886	100.0%	19	95	67	66.3	9.2

¹⁸ <https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/latest-release>



Primary Total Shoulder Replacement

Figure ST14 Percentage of Primary Total Stemless Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by Hospital Locality (All Diagnoses)

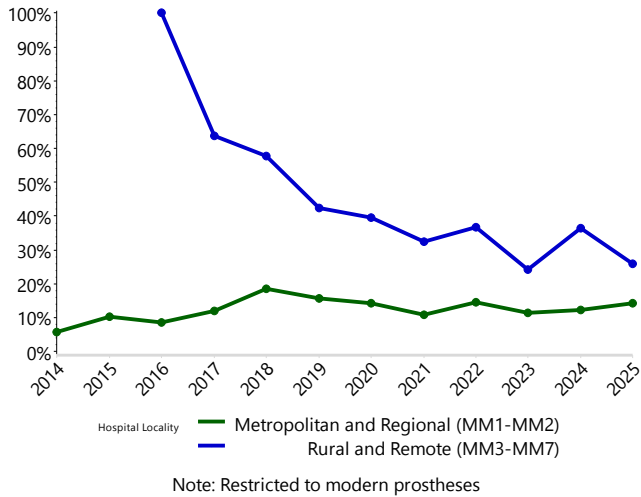


Figure ST15 Percentage of Primary Total Stemless Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by Hospital Locality (All Diagnoses)

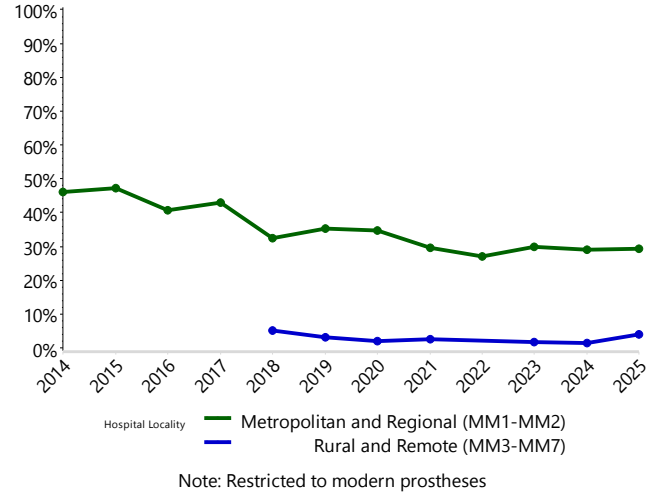


Figure ST16 Primary Total Stemless Anatomic Shoulder Replacement by Fixation (All Diagnoses)

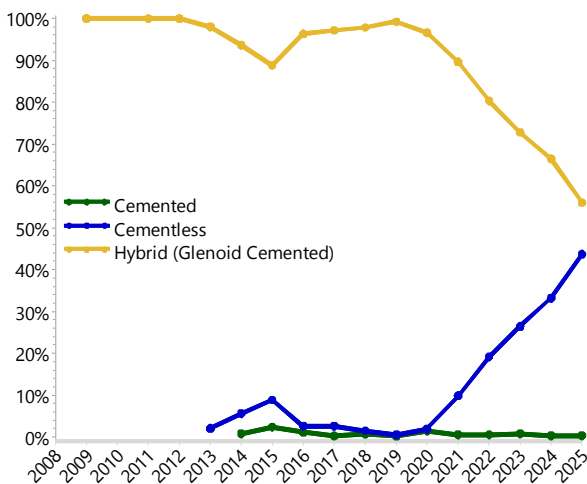
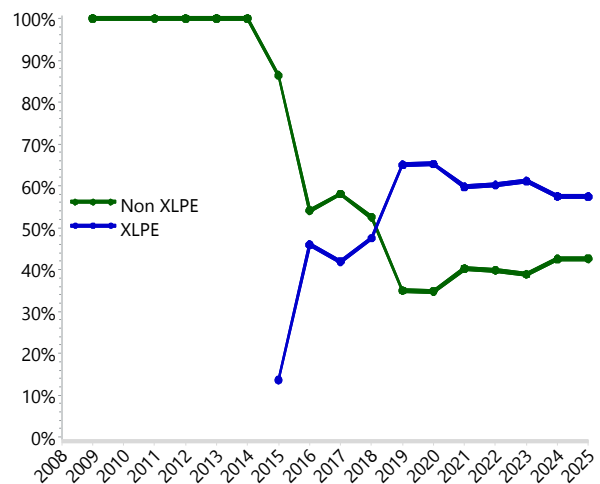


Figure ST17 Primary Total Stemless Anatomic Shoulder Replacement by Bearing Surface (All Diagnoses)





Primary Total Shoulder Replacement

Table ST8 Most Used Humeral Stem Prostheses in Primary Total Stemless Anatomic Shoulder Replacement (All Diagnoses)

2011		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
2	Simpliciti	400	Affinis	468	Affinis	494	Affinis	493	Affinis
2	TESS	216	Simpliciti	265	Simpliciti	289	Simpliciti	306	Simpliciti
1	Affinis	48	Comprehensive	73	Global Icon	66	Comprehensive	57	Comprehensive
		37	Global Icon	50	Comprehensive	54	Global Icon	48	Global Icon
		19	Equinox	25	Equinox	43	Equinox	33	Equinox
		6	SMR	4	SMR	2	SMR	9	Eclipse
								3	MSS
								1	SMR
Most Used									
5	(3) 100.0%	726	(6) 100.0%	885	(6) 100.0%	948	(6) 100.0%	950	(8) 100.0%

Table ST9 Most Used Glenoid Prostheses in Primary Total Stemless Anatomic Shoulder Replacement (All Diagnoses)

2011		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
2	Aequalis	365	Affinis	436	Affinis	453	Affinis	472	Affinis
1	Affinis	216	Perform	265	Perform	292	Perform	306	Perform
1	Comprehensive	72	Global	105	Global	91	Global	69	Global
1	TESS	37	Comprehensive	36	Comprehensive	44	Comprehensive	57	Alliance
		19	Equinox	25	Equinox	43	Equinox	33	Equinox
		11	Alliance	14	Alliance	22	Alliance	8	Univers 3D
		4	SMR L1	2	SMR	3	SMR	3	MSS
		2	SMR	2	SMR L1			1	SMR
								1	Univers VaultLock
Most Used									
5	(4) 100.0%	726	(8) 100.0%	885	(8) 100.0%	948	(7) 100.0%	950	(9) 100.0%



Primary Total Shoulder Replacement

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

The usage and availability of prostheses change with time, reflecting design changes and surgeon preference. In order to keep Registry data contemporaneous, only procedures utilising prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified.

At 10 years, the cumulative percent revision for primary total stemless anatomic shoulder replacement undertaken for osteoarthritis is 5.8%.

The most common diagnosis for primary total stemless shoulder replacement is osteoarthritis. There is no difference in the rate of revision when osteonecrosis is compared to osteoarthritis. The number of procedures undertaken for other diagnoses is small (Table ST10).

Reason for Revision

The main reasons for revision are instability/dislocation, rotator cuff insufficiency, loosening, and infection (Table ST11 and Figure ST18). Males have a higher cumulative incidence of rotator cuff insufficiency after 7 years, whereas females have a higher cumulative incidence of instability/dislocation. Compared to 2016, instability/dislocation has increased by 15.5%, and loosening by 14.3%, while infection decreased by 25.0%, and rotator cuff insufficiency reduced by 25.0%.

Type of Revision

The most common types of revision involve replacement of both the humeral and glenoid components (Table ST12). Overall, 89.6% of total stemless anatomic shoulder replacements are revised to a total reverse shoulder replacement. A humeral/glenoid 1st revision has increased in proportion by 4.8%, and humeral-only revisions have increased in proportion by 6.0% since 2016.

Prosthesis Types

The outcomes of humeral stem and glenoid prosthesis combinations with >30 procedures used in primary total stemless anatomic shoulder replacement are listed in Table ST13.

Primary Total Shoulder Replacement

Table ST10 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Osteoarthritis	191	5947	1.4 (1.1, 1.7)	3.3 (2.8, 3.8)	3.9 (3.3, 4.5)	4.6 (3.9, 5.4)	5.8 (4.7, 7.0)	6.3 (4.9, 8.1)	6.3 (4.9, 8.1)
Osteonecrosis	7	105	2.1 (0.5, 8.0)	5.8 (2.4, 13.4)					
Other (5)	7	145	4.4 (2.0, 9.6)	4.4 (2.0, 9.6)	4.4 (2.0, 9.6)				
TOTAL	205	6197							

Note: Restricted to modern prostheses

Only primary diagnoses with > 50 procedures have been listed

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report.

Table ST11 Primary Total Stemless Anatomic Shoulder Replacement by Reason for Revision (All Diagnoses)

Reason for Revision	Number	Percent
Instability/Dislocation	75	36.6
Rotator Cuff Insufficiency	49	23.9
Loosening	35	17.1
Infection	28	13.7
Pain	5	2.4
Malposition	3	1.5
Arthrofibrosis	3	1.5
Fracture	2	1.0
Lysis	2	1.0
Dissociation	1	0.5
Other	2	1.0
TOTAL	205	100.0

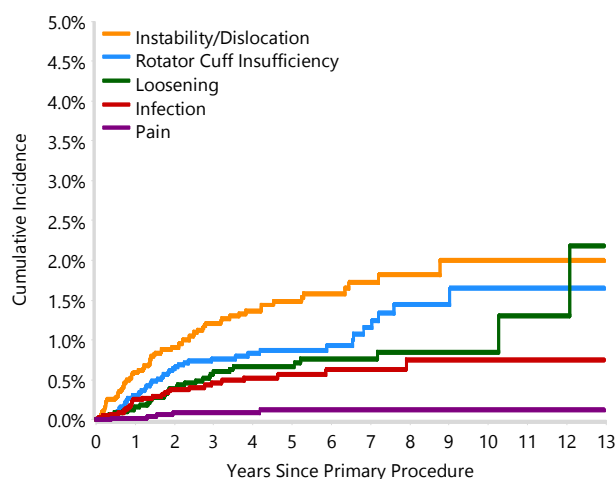
Note: Restricted to modern prostheses

Table ST12 Primary Total Stemless Anatomic Shoulder Replacement by Type of Revision (All Diagnoses)

Type of Revision	Number	Percent
Humeral/Glenoid	163	79.5
Cement Spacer	14	6.8
Head Only	12	5.9
Humeral Component	10	4.9
Removal of Prostheses	3	1.5
Cement Only	2	1.0
Reoperation	1	0.5
TOTAL	205	100.0

Note: Restricted to modern prostheses

Figure ST18 Cumulative Incidence Revision Diagnosis of Primary Total Stemless Anatomic Shoulder Replacement (All Diagnoses)



Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST13 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Prosthesis Combination (All Diagnoses)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Affinis	Affinis	146	3738	1.7 (1.3, 2.2)	2.9 (2.4, 3.5)	3.7 (3.1, 4.4)	4.1 (3.4, 4.9)	4.4 (3.7, 5.2)	4.7 (4.0, 5.6)	5.0 (4.2, 5.9)
	Global	2	206	0.5 (0.1, 3.7)	0.5 (0.1, 3.7)	1.3 (0.3, 5.1)	1.3 (0.3, 5.1)	1.3 (0.3, 5.1)		
Comprehensive	Alliance	1	110	0.0 (0.0, 0.0)						
Equinox	Equinox	7	128	1.7 (0.4, 6.6)	2.9 (0.9, 8.9)					
Global Icon	Global	7	276	1.3 (0.4, 3.8)	2.7 (1.2, 6.0)	3.3 (1.6, 6.9)	3.3 (1.6, 6.9)	3.3 (1.6, 6.9)		
SMR	SMR	7	60	3.4 (0.9, 12.9)	6.8 (2.6, 17.2)	8.6 (3.7, 19.4)	8.6 (3.7, 19.4)	8.6 (3.7, 19.4)	8.6 (3.7, 19.4)	11.6 (5.2, 24.8)
Simpliciti	Perform	35	1660	1.0 (0.6, 1.7)	2.0 (1.3, 2.9)	2.3 (1.6, 3.2)	2.7 (1.9, 3.9)	2.9 (2.0, 4.1)	3.2 (2.2, 4.7)	3.9 (2.5, 6.3)
Other (6)		0	19	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
TOTAL		205	6197							

Note: Restricted to modern prostheses

Only prostheses with >30 procedures have been listed

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

There are 5,947 (96.1%) primary total stemless anatomic shoulder replacement procedures with a primary diagnosis of osteoarthritis.

The cumulative percent revision of primary total stemless anatomic shoulder replacement for osteoarthritis at 10 years is 5.8% (Table ST14).

The main reasons for revision are instability/dislocation (36.1%), rotator cuff insufficiency (23.6%), loosening (17.8%) and infection (14.1%) (Table ST15 and Figure ST19). The most common types of revision involve replacement of both the humeral and glenoid component with 94.7% being revised to a total stemmed reverse shoulder replacement (Table ST16).

Age and Sex

Age is a risk factor for revision with patients aged <65 years having a higher risk of revision (Table ST17 and Figure ST20). Females have a higher rate of revision for total stemless anatomic shoulder replacement compared to males (Table ST18 and Figure ST21). Males are more commonly revised for rotator cuff insufficiency after 7 years and females for instability/dislocation (Figure ST22).

When sex is stratified by age, younger patients have higher rates of revision compared to older patients for both males and females. Among younger patients, females have a higher rate of revision than males.

There is no difference in the rate of revision risk between males and females in the older age group (Table ST18 and Figure ST23).

The rate of revision is higher for females compared to males for osteoarthritis.

ASA and BMI

Most patients have an ASA score of 2 or 3. The cumulative percent revision at 7 years is 4.4% for ASA 2 patients and 5.6% for ASA 3 patients (Table ST19). ASA score is not a risk factor for revision.

The most common BMI categories are pre-obese and obese class 1. BMI is not a risk factor for revision (Table ST20). However, when BMI is stratified by sex, obese females have a higher rate of revision than obese males (Table ST21 and Figure ST24).

Glenoid Morphology

Glenoid morphology is not a risk factor for revision (Table ST22).

Primary Total Shoulder Replacement

Table ST14 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement (Primary Diagnosis OA)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Total Stemless Anatomic	191	5947	1.4 (1.1, 1.7)	3.3 (2.8, 3.8)	3.9 (3.3, 4.5)	4.6 (3.9, 5.4)	5.8 (4.7, 7.0)	6.3 (4.9, 8.1)	6.3 (4.9, 8.1)
TOTAL	191	5947							

Note: Restricted to modern prostheses

Table ST15 Primary Total Stemless Anatomic Shoulder Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Instability/Dislocation	69	36.1
Rotator Cuff Insufficiency	45	23.6
Loosening	34	17.8
Infection	27	14.1
Pain	4	2.1
Malposition	3	1.6
Arthrofibrosis	3	1.6
Fracture	2	1.0
Lysis	2	1.0
Dissociation	1	0.5
Other	1	0.5
TOTAL	191	100.0

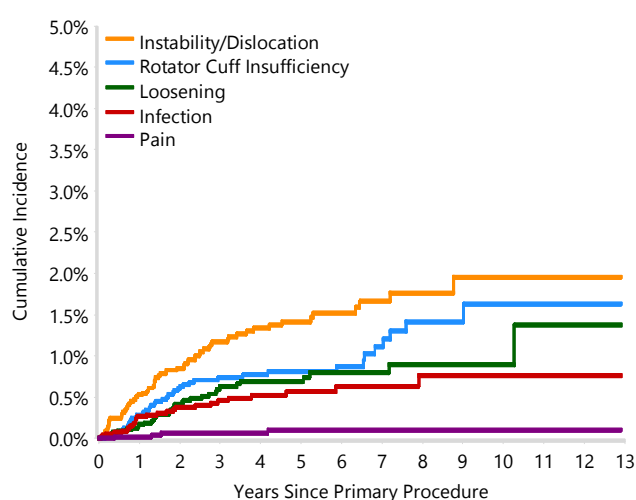
Note: Restricted to modern prostheses

Table ST16 Primary Total Stemless Anatomic Shoulder Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Humeral/Glenoid	152	79.6
Cement Spacer	13	6.8
Head Only	12	6.3
Humeral Component	10	5.2
Reoperation	2	1.0
Removal of Prostheses	1	0.5
Cement Only	1	0.5
TOTAL	191	100.0

Note: Restricted to modern prostheses

Figure ST19 Cumulative Incidence Revision Diagnosis of Primary Total Stemless Anatomic Shoulder Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses



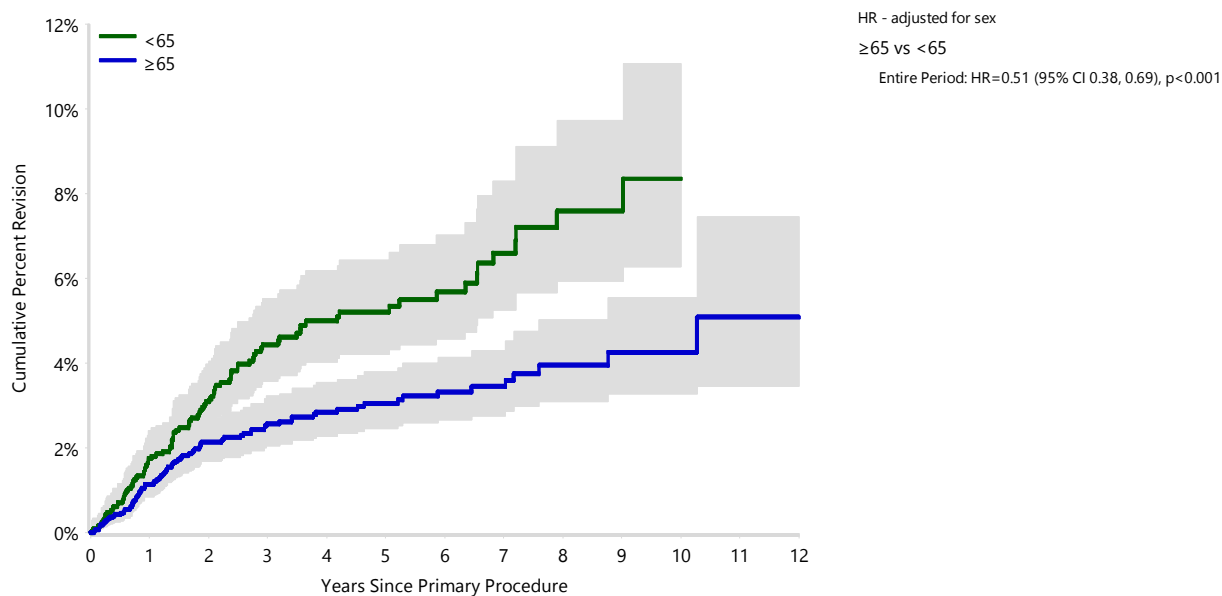
Primary Total Shoulder Replacement

Table ST17 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11Yrs	12 Yrs
<65	98	2321	1.8 (1.3, 2.4)	4.4 (3.6, 5.5)	5.2 (4.2, 6.4)	6.6 (5.2, 8.3)	8.4 (6.3, 11.1)		
≥65	93	3626	1.1 (0.8, 1.6)	2.6 (2.1, 3.2)	3.0 (2.5, 3.8)	3.4 (2.8, 4.3)	4.3 (3.3, 5.5)	5.1 (3.5, 7.5)	5.1 (3.5, 7.5)
TOTAL	191	5947							

Note: Restricted to modern prostheses

Figure ST20 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
<65	2321	1912	1168	708	349	56	33	25
≥65	3626	3031	2029	1234	637	138	81	56

Note: Restricted to modern prostheses

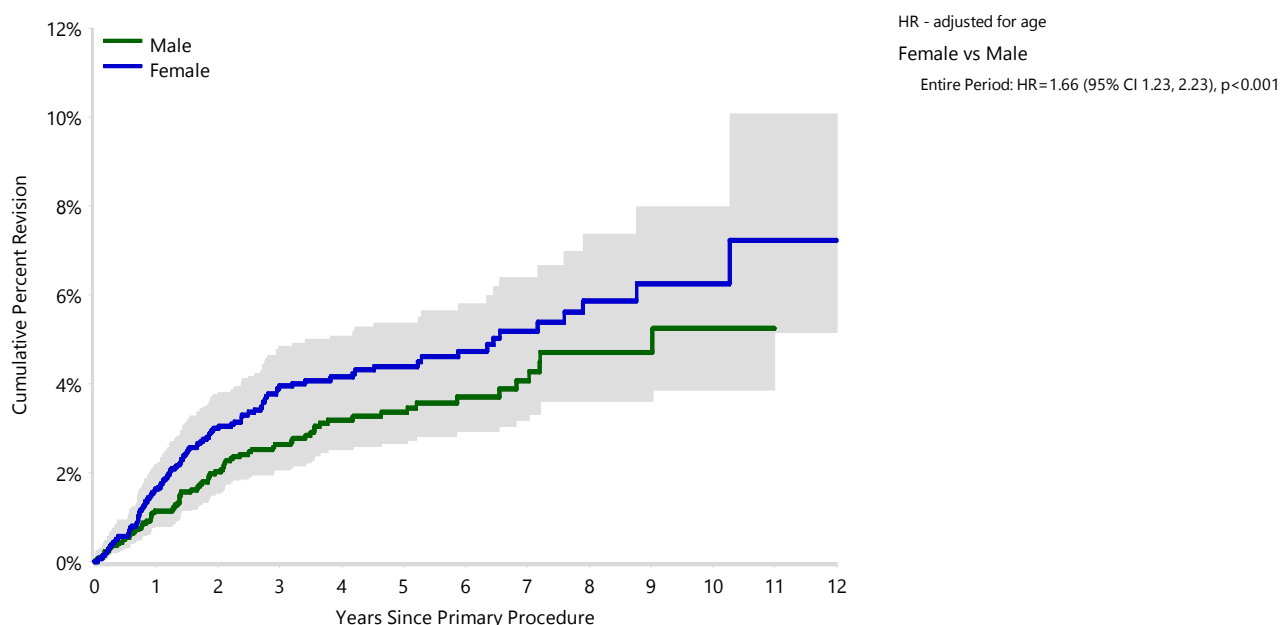
Primary Total Shoulder Replacement

Table ST18 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Age and Sex (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Male		83	3076	1.1 (0.8, 1.6)	2.6 (2.1, 3.4)	3.4 (2.7, 4.2)	4.1 (3.2, 5.2)	5.2 (3.9, 7.1)	5.2 (3.9, 7.1)	
	<65	52	1520	1.3 (0.8, 2.1)	3.3 (2.4, 4.5)	4.3 (3.2, 5.7)	5.5 (4.0, 7.6)			
	≥65	31	1556	1.0 (0.6, 1.7)	2.1 (1.4, 3.0)	2.5 (1.7, 3.6)	2.7 (1.9, 3.9)	3.1 (2.1, 4.7)		
Female		108	2871	1.6 (1.2, 2.2)	3.9 (3.2, 4.8)	4.4 (3.6, 5.4)	5.2 (4.2, 6.4)	6.3 (4.9, 8.0)	7.2 (5.2, 10.1)	7.2 (5.2, 10.1)
	<65	46	801	2.6 (1.7, 4.0)	6.7 (4.9, 9.0)	7.0 (5.2, 9.4)	8.6 (6.2, 11.9)			
	≥65	62	2070	1.3 (0.8, 1.9)	3.0 (2.2, 3.9)	3.4 (2.6, 4.5)	4.0 (3.0, 5.2)	5.0 (3.6, 6.9)	6.2 (3.9, 9.8)	
TOTAL		191	5947							

Note: Restricted to modern prostheses

Figure ST21 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Sex (Primary Diagnosis OA)



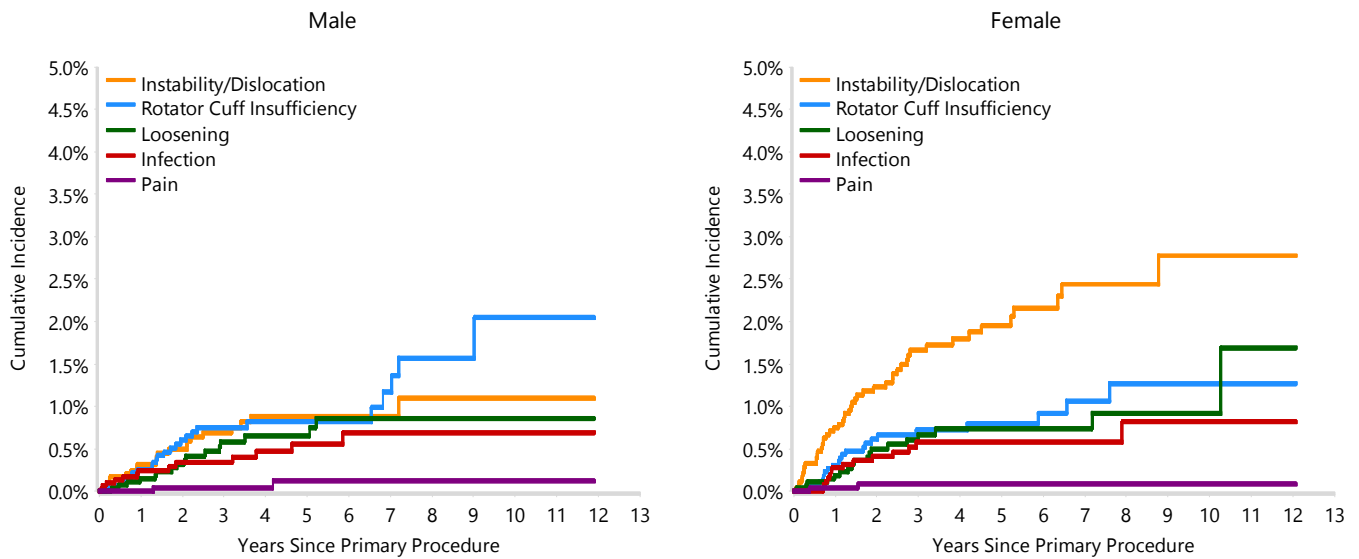
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Male	3076	2514	1629	961	468	78	49	38
Female	2871	2429	1568	981	518	116	65	43

Note: Restricted to modern prostheses



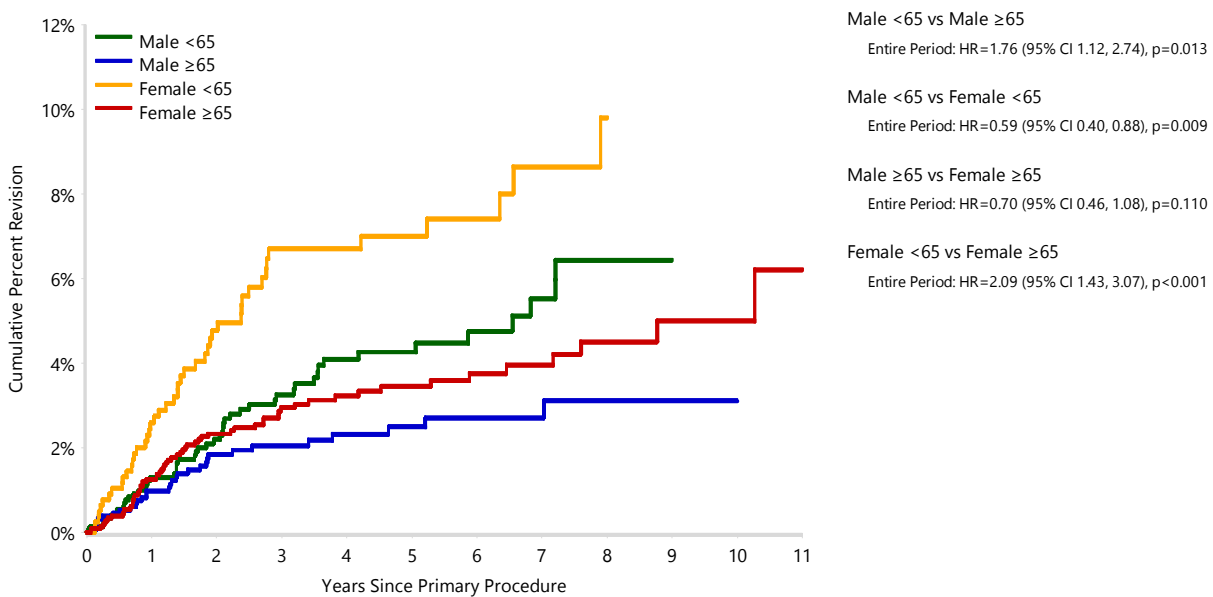
Primary Total Shoulder Replacement

Figure ST22 Cumulative Incidence Revision Diagnosis of Primary Total Stemless Anatomic Shoulder Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Figure ST23 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Sex and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Male	<65	1520	1250	777	460	226	33	21	17
	≥65	1556	1264	852	501	242	45	28	21
Female	<65	801	662	391	248	123	23	12	8
	≥65	2070	1767	1177	733	395	93	53	35

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST19 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs
ASA 1	10	392	1.1 (0.4, 3.0)	2.5 (1.2, 4.9)	2.9 (1.5, 5.5)	2.9 (1.5, 5.5)	4.5 (2.0, 10.1)		
ASA 2	87	2927	1.1 (0.8, 1.6)	3.1 (2.4, 3.9)	3.7 (2.9, 4.6)	4.4 (3.5, 5.6)	5.1 (3.9, 6.6)	5.6 (4.2, 7.6)	5.6 (4.2, 7.6)
ASA 3	91	2463	1.7 (1.3, 2.4)	3.9 (3.1, 4.8)	4.5 (3.6, 5.6)	5.6 (4.4, 7.1)	6.2 (4.8, 8.0)	6.2 (4.8, 8.0)	6.9 (5.1, 9.4)
ASA 4	1	60	1.8 (0.3, 12.2)	1.8 (0.3, 12.2)	1.8 (0.3, 12.2)	1.8 (0.3, 12.2)			
TOTAL	189	5842							

Note: Restricted to modern prostheses

Excludes 105 procedures with no recorded ASA score

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report.

Table ST20 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Underweight (<18.5)	0	14	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	
Normal (18.5-24.9)	23	802	1.0 (0.5, 2.0)	3.0 (1.9, 4.7)	3.3 (2.1, 5.2)	3.7 (2.4, 5.9)	4.9 (2.8, 8.8)	
Pre Obese (25.0-29.9)	53	2000	1.3 (0.8, 1.9)	2.7 (2.0, 3.6)	3.2 (2.4, 4.3)	4.0 (2.9, 5.5)	5.2 (3.6, 7.3)	5.2 (3.6, 7.3)
Obese Class 1 (30.0-34.9)	55	1666	1.0 (0.6, 1.7)	3.4 (2.5, 4.6)	4.2 (3.2, 5.6)	5.4 (3.9, 7.3)	5.8 (4.2, 8.0)	5.8 (4.2, 8.0)
Obese Class 2 (35.0-39.9)	32	793	2.7 (1.8, 4.2)	4.4 (3.1, 6.3)	5.0 (3.5, 7.2)	5.4 (3.8, 7.8)	5.4 (3.8, 7.8)	
Obese Class 3 (≥ 40.0)	16	387	1.7 (0.8, 3.7)	4.6 (2.7, 7.7)	5.1 (3.1, 8.4)	6.3 (3.6, 10.9)		
TOTAL	179	5662						

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤ 19 years

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report.



Primary Total Shoulder Replacement

Table ST21 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by BMI Category and Sex (Primary Diagnosis OA)

BMI Category	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Not Obese	Male	37	1469	1.2 (0.7, 2.0)	2.6 (1.8, 3.7)	3.2 (2.3, 4.5)	3.7 (2.5, 5.4)	4.7 (3.1, 7.3)	4.7 (3.1, 7.3)
	Female	39	1347	1.1 (0.7, 1.9)	2.9 (2.0, 4.1)	3.2 (2.3, 4.6)	4.1 (2.8, 5.8)	5.3 (3.5, 8.1)	6.7 (4.0, 11.3)
Obese	Male	45	1485	1.2 (0.7, 1.9)	2.8 (2.0, 4.0)	3.8 (2.7, 5.2)	5.0 (3.5, 7.0)	5.5 (3.8, 7.9)	5.5 (3.8, 7.9)
	Female	58	1361	2.0 (1.4, 3.0)	4.9 (3.7, 6.4)	5.4 (4.1, 7.0)	6.1 (4.6, 8.1)	6.1 (4.6, 8.1)	6.1 (4.6, 8.1)
TOTAL		179	5662						

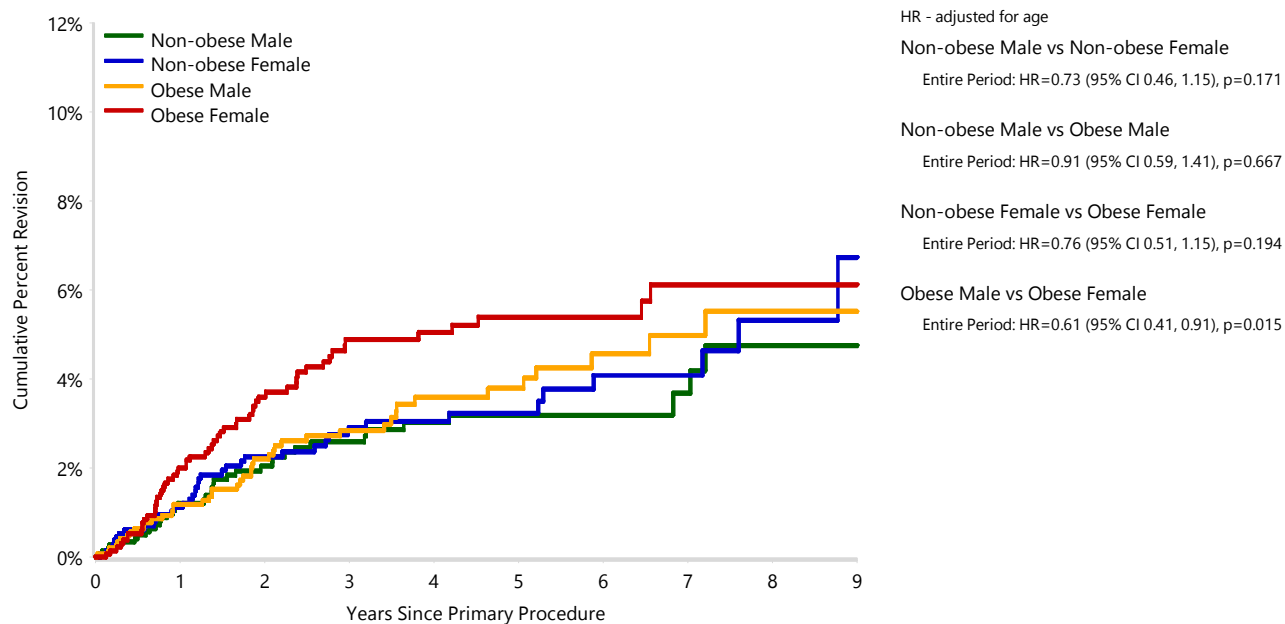
Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Figure ST24 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by BMI Category and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
Not Obese	Male	1469	1183	740	433	187	106	52
	Female	1347	1126	689	409	192	114	56
Obese	Male	1485	1212	779	428	193	110	56
	Female	1361	1149	737	446	210	132	62

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Primary Total Shoulder Replacement

Table ST22 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Morphology (Primary Diagnosis OA)

Glenoid Morphology	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
A1	64	1951	1.5 (1.1, 2.2)	3.5 (2.6, 4.6)	4.2 (3.2, 5.5)	6.4 (4.6, 8.8)	7.3 (5.0, 10.6)
A2	23	974	1.2 (0.7, 2.2)	2.8 (1.8, 4.2)	3.0 (2.0, 4.6)	3.5 (2.2, 5.4)	
B1	26	1030	1.3 (0.7, 2.3)	3.0 (2.0, 4.5)	3.2 (2.2, 4.8)	3.2 (2.2, 4.8)	
B2	29	928	1.1 (0.6, 2.1)	3.3 (2.2, 4.9)	4.1 (2.8, 6.0)	5.0 (3.3, 7.6)	
C	3	125	0.9 (0.1, 6.4)	1.9 (0.5, 7.3)			
TOTAL	145	5008					

Note: Restricted to modern prostheses

Excludes 939 procedures with a B3 or missing glenoid morphology

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report



Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Fixation

The majority of primary total stemless anatomic shoulder replacement procedures utilise hybrid (cementless humeral component with a cemented glenoid) fixation. Cementless primary stemless anatomic prostheses have a higher revision rate than procedures with hybrid fixation (Table ST23 and Figure ST25).

Glenoid Types

There are four types of glenoids, all with polyethylene bearing surface but differing methods of fixation to bone. Non-modular metal back glenoids have a polyethylene bearing surface with a backside integrated metallic coating. Hybrid metal/polyethylene glenoids have a polyethylene bearing surface and one or more metallic fixation pegs. Cemented polyethylene glenoids with a modified central peg are all polyethylene, but the central peg is further engineered for additional fixation to bone. All polyethylene glenoids are polyethylene fixed by cemented pegs or keels alone without further fixation features.

Cemented all polyethylene glenoids are the most common type of glenoid used (Table ST24). Modified central peg glenoids have a lower rate of revision than cemented all polyethylene glenoids, non-modular metal backed glenoids and hybrid metal/polyethylene glenoids (Figure ST26).

Bearing Surface

There is no difference in the rate of revision when ceramic/non XLPE, ceramic/XLPE, metal/XLPE and metal/non XLPE bearing surfaces (humeral head/glenoid) are compared (Table ST25).

Humeral Heads

Humeral head size is not a risk factor for revision of primary total stemless anatomic shoulder replacement (Table ST26). There is no difference in the rate of revision for polyethylene types when stratified by humeral head size (Table ST27 and Figure ST27).

Humeral head size is not a risk factor for revision of primary total stemless anatomic shoulder replacement.

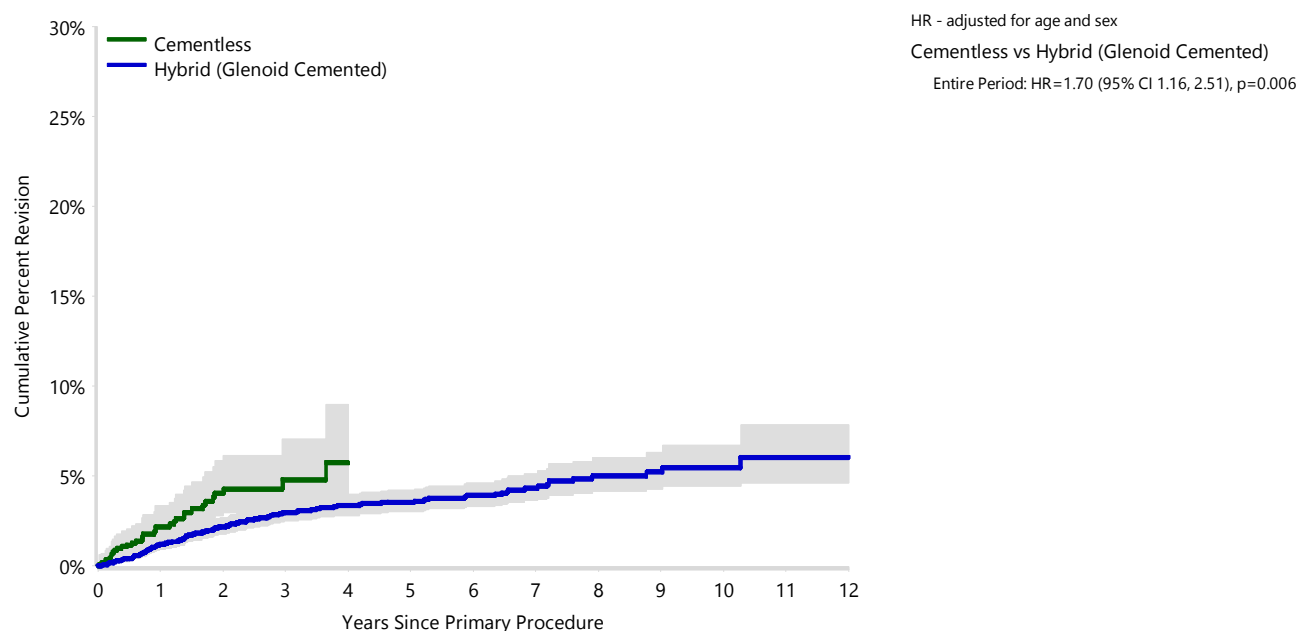
Primary Total Shoulder Replacement

Table ST23 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Cemented	3	36	6.1 (1.6, 22.1)	9.2 (3.1, 25.9)	9.2 (3.1, 25.9)	9.2 (3.1, 25.9)			
Cementless	33	1114	2.2 (1.4, 3.4)	4.8 (3.3, 7.0)					
Hybrid (Glenoid Cemented)	155	4797	1.2 (0.9, 1.5)	3.0 (2.5, 3.6)	3.6 (3.0, 4.2)	4.3 (3.6, 5.1)	5.5 (4.4, 6.7)	6.0 (4.6, 7.9)	6.0 (4.6, 7.9)
TOTAL	191	5947							

Note: Restricted to modern prostheses

Figure ST25 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Fixation (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Cementless	1114	696	183	8	0	0	0	0
Hybrid (Glenoid Cemented)	4797	4216	2993	1918	977	191	114	81

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

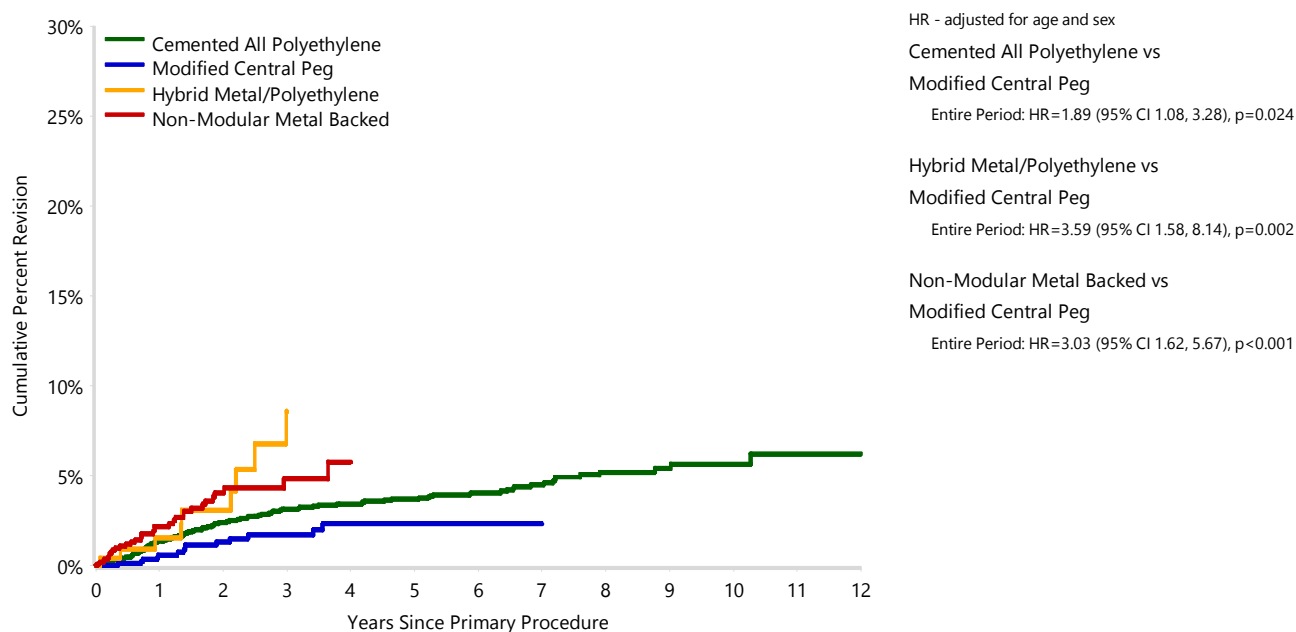
Table ST24 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)

Glenoid Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Cemented All Polyethylene	134	3602	1.4 (1.0, 1.8)	3.2 (2.6, 3.8)	3.7 (3.1, 4.4)	4.5 (3.7, 5.4)	5.6 (4.6, 6.9)	6.2 (4.8, 8.1)	6.2 (4.8, 8.1)
Modified Central Peg	14	999	0.6 (0.2, 1.4)	1.7 (1.0, 3.0)	2.3 (1.3, 4.0)	2.3 (1.3, 4.0)			
Hybrid Metal/Polyethylene	10	242	1.6 (0.5, 4.8)	8.6 (4.2, 16.9)					
Non-Modular Metal Backed	33	1103	2.2 (1.4, 3.4)	4.8 (3.3, 7.1)					
TOTAL	191	5946							

Note: Restricted to modern prostheses

Excludes 1 procedure with unknown glenoid type

Figure ST26 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Cemented All Polyethylene	3602	3320	2561	1743	936	194	114	81
Modified Central Peg	999	780	402	180	50	0	0	0
Hybrid Metal/Polyethylene	242	152	51	11	0	0	0	0
Non-Modular Metal Backed	1103	691	183	8	0	0	0	0

Note: Restricted to modern prostheses

Excludes 1 procedure with unknown glenoid type



Primary Total Shoulder Replacement

Table ST25 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)

Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Ceramic/Non XLPE	28	523	1.1 (0.5, 2.5)	3.7 (2.4, 5.7)	4.5 (3.0, 6.6)	5.1 (3.5, 7.4)	5.3 (3.6, 7.6)	5.9 (4.0, 8.6)	5.9 (4.0, 8.6)
Ceramic/XLPE	109	3248	1.6 (1.2, 2.1)	3.4 (2.8, 4.2)	3.9 (3.2, 4.8)	4.7 (3.8, 5.9)			
Metal/Non XLPE	43	1862	1.1 (0.7, 1.7)	2.8 (2.0, 3.8)	3.4 (2.5, 4.6)	4.4 (2.9, 6.8)			
Metal/XLPE	11	313	1.4 (0.5, 3.8)	3.6 (1.9, 6.8)	3.6 (1.9, 6.8)	5.5 (2.5, 12.1)			
TOTAL	191	5946							

Note: Restricted to modern prostheses

Reported as humeral head/glenoid

Excludes 1 procedures with missing bearing surface

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Table ST26 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)

Humeral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
<44mm	78	1873	1.6 (1.1, 2.3)	4.3 (3.4, 5.5)	4.5 (3.5, 5.7)	5.6 (4.4, 7.2)	7.3 (5.5, 9.5)	8.6 (5.9, 12.4)
44-50mm	89	3086	1.5 (1.1, 2.0)	3.0 (2.3, 3.7)	3.7 (3.0, 4.6)	4.1 (3.3, 5.2)	4.9 (3.6, 6.6)	4.9 (3.6, 6.6)
>50mm	24	974	0.8 (0.4, 1.7)	2.4 (1.5, 3.8)	3.2 (2.0, 4.9)	4.2 (2.6, 6.8)		
TOTAL	191	5933						

Note: Restricted to modern prostheses

Excludes 14 procedures with unknown head size

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report



Primary Total Shoulder Replacement

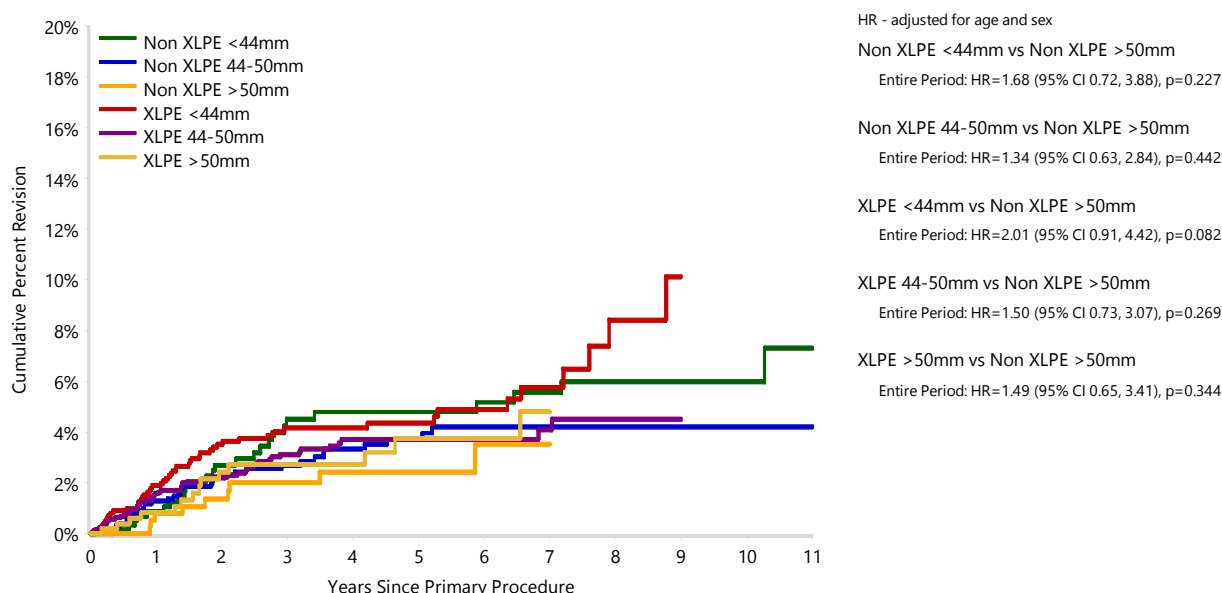
Table ST27 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Bearing Surface and Humeral Head Size (Primary Diagnosis OA)

Bearing Surface	Humeral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
Non XLPE	<44mm	26	617	0.9 (0.4, 2.1)	4.5 (2.9, 6.9)	4.8 (3.2, 7.2)	5.6 (3.7, 8.3)	6.0 (4.0, 8.9)	7.3 (4.5, 11.7)
	44-50mm	36	1308	1.3 (0.8, 2.1)	2.7 (1.9, 3.9)	3.7 (2.6, 5.3)	4.2 (3.0, 5.9)	4.2 (3.0, 5.9)	4.2 (3.0, 5.9)
	>50mm	9	452	0.8 (0.3, 2.4)	2.0 (1.0, 4.2)	2.4 (1.2, 4.9)	3.5 (1.6, 7.5)		
XLPE	<44mm	52	1255	1.9 (1.3, 2.9)	4.2 (3.1, 5.6)	4.3 (3.2, 5.8)	5.8 (4.1, 8.0)		
TOTAL		191	5932						

Note: Restricted to modern prostheses

Excludes 15 procedures with unknown head size or bearing surface

Figure ST27 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Bearing Surface and Humeral Head Size (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
Non XLPE	<44mm	617	536	356	274	231	83	46
	44-50mm	1308	1058	681	416	250	76	50
	>50mm	452	373	256	135	54	22	18
XLPE	<44mm	1255	1054	677	398	150	6	0
	44-50mm	1778	1492	972	561	228	5	0
	>50mm	522	425	255	158	73	2	0

Note: Restricted to modern prostheses

Excludes 15 procedures with unknown head size or bearing surface

Primary Total Shoulder Replacement

IMPLANT SIZING VARIATIONS (ISV)

ISV are modifications to a prosthesis design range beyond simple size change.

Glenoid Augmentation

A glenoid component is categorised as augmented if the backside has been modified for glenoid deformity (e.g. wedged, stepped, angulated, or lateralised).

Augmented glenoids are not a revision risk factor (Table ST28). When stratified by glenoid morphology or by polyethylene type there continues to be no difference in the rate of revision between augmented and non-augmented glenoids (Table ST29, Table ST30 and Figure ST28).

Table ST28 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA, Excluding Modular Metal Backed Glenoids)

Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
Augmented	6	236	0.0 (0.0, 0.0)	3.9 (1.7, 9.3)				
Non-augmented	185	5711	1.4 (1.1, 1.8)	3.3 (2.8, 3.8)	3.8 (3.3, 4.5)	4.6 (3.9, 5.4)	5.7 (4.7, 6.9)	6.3 (4.9, 8.1)
TOTAL	191	5947						

Note: to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Table ST29 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Glenoid Morphology and Glenoid Augmentation (Primary Diagnosis OA, Excluding Modular Metal Backed Glenoids)

Glenoid Morphology	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
A	Augmented	1	14	0.0 (0.0, 0.0)	25.0 (3.9, 87.2)			
	Non-augmented	86	2911	1.4 (1.0, 2.0)	3.2 (2.5, 4.0)	3.8 (3.0, 4.7)	5.4 (4.1, 7.1)	6.0 (4.3, 8.2)
B	Augmented	5	189	0.0 (0.0, 0.0)	4.0 (1.5, 10.3)			
	Non-augmented	50	1769	1.3 (0.9, 2.0)	3.1 (2.3, 4.2)	3.5 (2.6, 4.7)	3.9 (2.9, 5.2)	5.2 (3.4, 7.7)
C	Augmented	0	16	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Non-augmented	3	109	1.1 (0.1, 7.2)	2.2 (0.5, 8.3)			
TOTAL		145	5008					

Note: Restricted to modern prostheses

Excludes 939 procedures with unknown/B3 glenoid morphology or glenoid augmentation

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report



Primary Total Shoulder Replacement

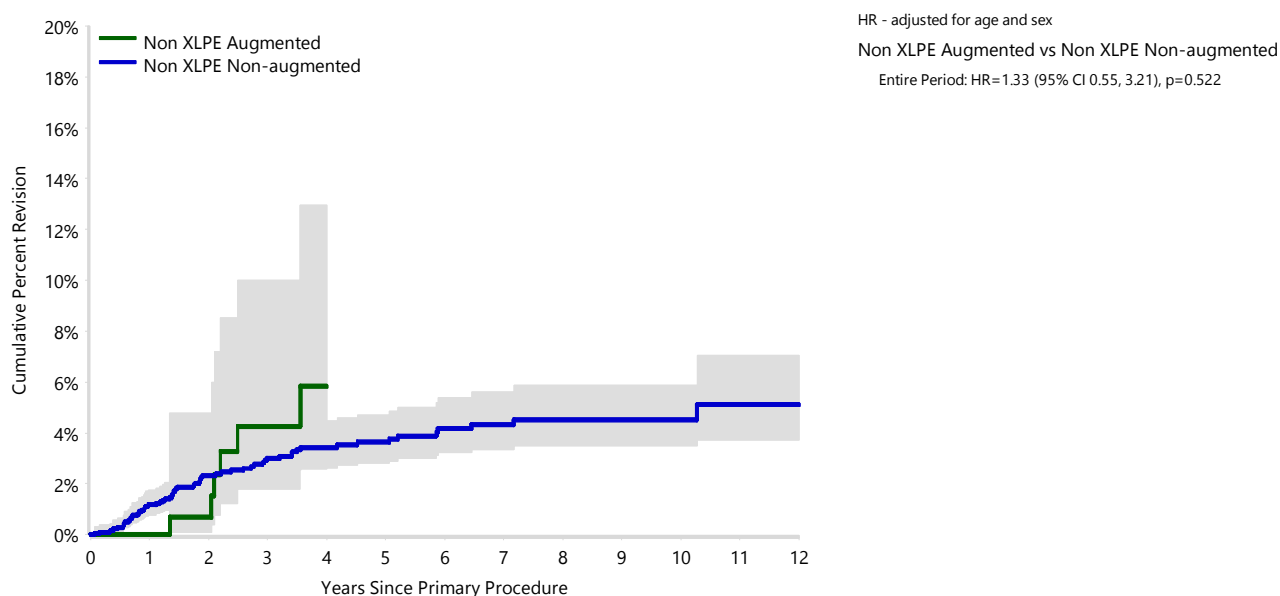
Table ST30 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Bearing Surface and Glenoid Augmentation (Primary Diagnosis OA)

Bearing Surface	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Non XLPE	Augmented	6	224	0.0 (0.0, 0.0)	4.3 (1.8, 10.0)					
	Non-augmented	65	2161	1.2 (0.8, 1.8)	3.0 (2.3, 3.9)	3.6 (2.8, 4.7)	4.3 (3.3, 5.6)	4.5 (3.5, 5.9)	5.1 (3.7, 7.0)	5.1 (3.7, 7.0)
XLPE	Augmented	0	11	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
	Non-augmented	120	3550	1.6 (1.2, 2.1)	3.4 (2.8, 4.2)	3.9 (3.3, 4.8)	4.8 (3.9, 6.0)			
TOTAL		191	5946							

Note: Restricted to modern prostheses

Excludes 1 procedure with unknown glenoid augmentation or bearing surface

Figure ST28 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Using Non XLPE by Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs
Non XLPE	Augmented	224	157	81	19	2	0	0	0
	Non-augmented	2161	1812	1212	806	533	181	114	81

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

SURGEON ASSISTIVE TOOLS

The first stemless anatomic shoulder replacement with robotic assistance has been recorded since the last annual report. An image derived instrument (IDI) is defined as custom made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient. Traditional instrumentation is defined as no SAT has been recorded in the implantation of the prosthesis.

There are 2,082 total stemless anatomic shoulder replacements for osteoarthritis utilising an IDI since their first use in 2016. In 2025, IDI are used in 49% of all total stemless anatomic shoulder replacement procedures.

The rate of revision is higher when IDI is used compared to when IDI is not used (Table ST31 and Figure ST29).

When stratified by glenoid morphology, the use of an IDI increases the rate of revision for glenoid morphology class A (Table ST32, Table ST33 and Figure ST30). There is no difference in revision rates for glenoid morphology class B (Table ST34). There are insufficient numbers to analyse IDI usage in glenoid morphology class C (Table ST32). IDI use does not change the rate of revision when augmented and non-augmented glenoids are compared (Table ST35 and Figure ST31).

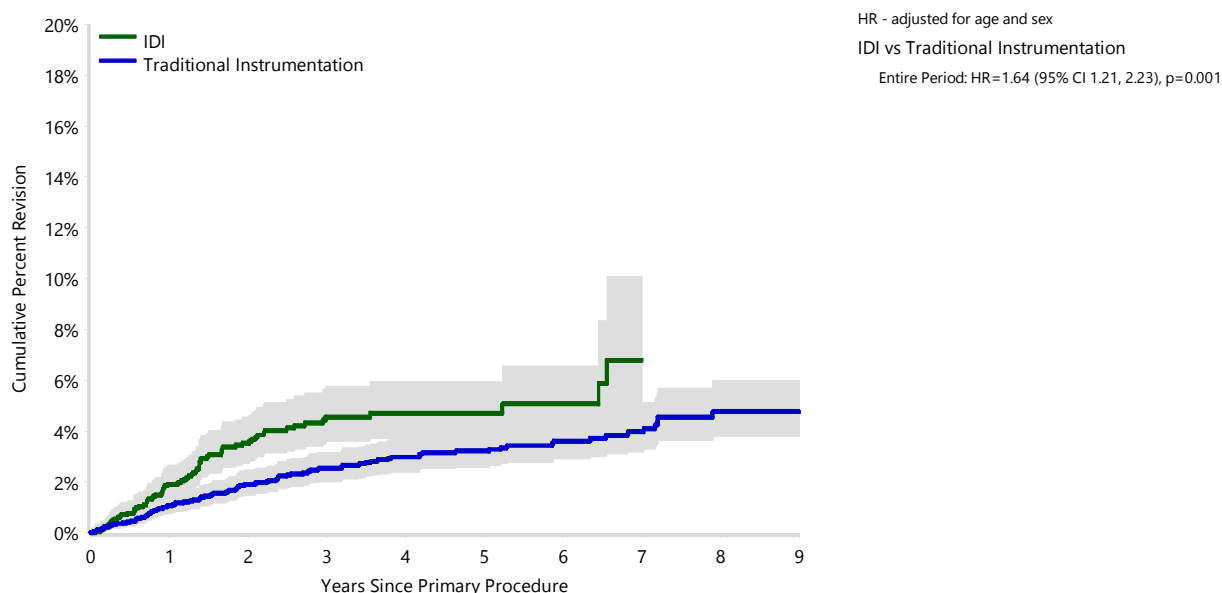
Table ST31 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage (Primary Diagnosis OA)

IDI Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI Used	74	2082	1.9 (1.4, 2.7)	4.6 (3.6, 5.8)	4.7 (3.7, 6.0)	4.7 (3.7, 6.0)	5.1 (3.9, 6.6)	6.8 (4.6, 10.1)
Traditional Instrumentation	102	3608	1.1 (0.8, 1.5)	2.5 (2.0, 3.2)	3.0 (2.4, 3.7)	3.2 (2.6, 4.0)	3.6 (2.9, 4.5)	4.0 (3.2, 4.9)
TOTAL	176	5690						

Note: Restricted to modern prostheses

Excludes 3 procedures that used non-IDI surgeon assistive tools

Figure ST29 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by IDI Usage Since 2016 (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	2082	1598	819	312	66	11	0
Traditional Instrumentation	3608	3095	2140	1405	701	423	186

Note: Restricted to modern prostheses

Excludes 3 procedures that used non-IDI surgeon assistive tools



Primary Total Shoulder Replacement

Table ST32 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI and Glenoid Morphology Usage (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
IDI Used		73	1987	2.0 (1.4, 2.8)	4.7 (3.7, 6.0)	4.9 (3.9, 6.2)	5.3 (4.1, 6.9)	7.2 (4.8, 10.9)	
	A1	35	754	2.7 (1.7, 4.2)	5.6 (3.9, 8.0)	5.6 (3.9, 8.0)	6.7 (4.3, 10.2)		
	A2	7	288	0.7 (0.2, 3.0)	3.9 (1.8, 8.2)				
	B1	16	453	2.0 (1.0, 4.1)	4.7 (2.8, 7.9)	5.4 (3.2, 8.9)			
	B2	14	450	1.6 (0.7, 3.4)	4.1 (2.4, 6.9)	4.1 (2.4, 6.9)	4.1 (2.4, 6.9)		
	C	1	42	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)	2.8 (0.4, 18.1)			
Traditional Instrumentation		72	3018	0.9 (0.6, 1.3)	2.3 (1.7, 2.9)	2.9 (2.3, 3.7)	3.4 (2.6, 4.4)	4.0 (3.0, 5.2)	4.5 (3.4, 6.1)
	A1	29	1196	0.8 (0.4, 1.6)	2.3 (1.5, 3.5)	3.3 (2.2, 4.9)	3.6 (2.4, 5.4)	4.6 (3.0, 7.0)	4.6 (3.0, 7.0)
	A2	16	685	1.4 (0.7, 2.7)	2.4 (1.4, 4.1)	2.7 (1.6, 4.5)	3.2 (1.9, 5.5)	3.2 (1.9, 5.5)	
	B1	10	577	0.7 (0.3, 2.0)	1.9 (1.0, 3.6)	1.9 (1.0, 3.6)	1.9 (1.0, 3.6)	1.9 (1.0, 3.6)	
	B2	15	477	0.7 (0.2, 2.1)	2.5 (1.3, 4.9)	3.9 (2.2, 7.0)	5.4 (3.1, 9.3)	5.4 (3.1, 9.3)	
	C	2	83	0.0 (0.0, 0.0)	1.4 (0.2, 9.6)	1.4 (0.2, 9.6)	1.4 (0.2, 9.6)	9.0 (1.7, 40.0)	
TOTAL		145	5005						

Note: Restricted to modern prostheses

Excludes 688 procedures with either unknown or B3 glenoid morphology or that used non-IDI surgeon assistive tools

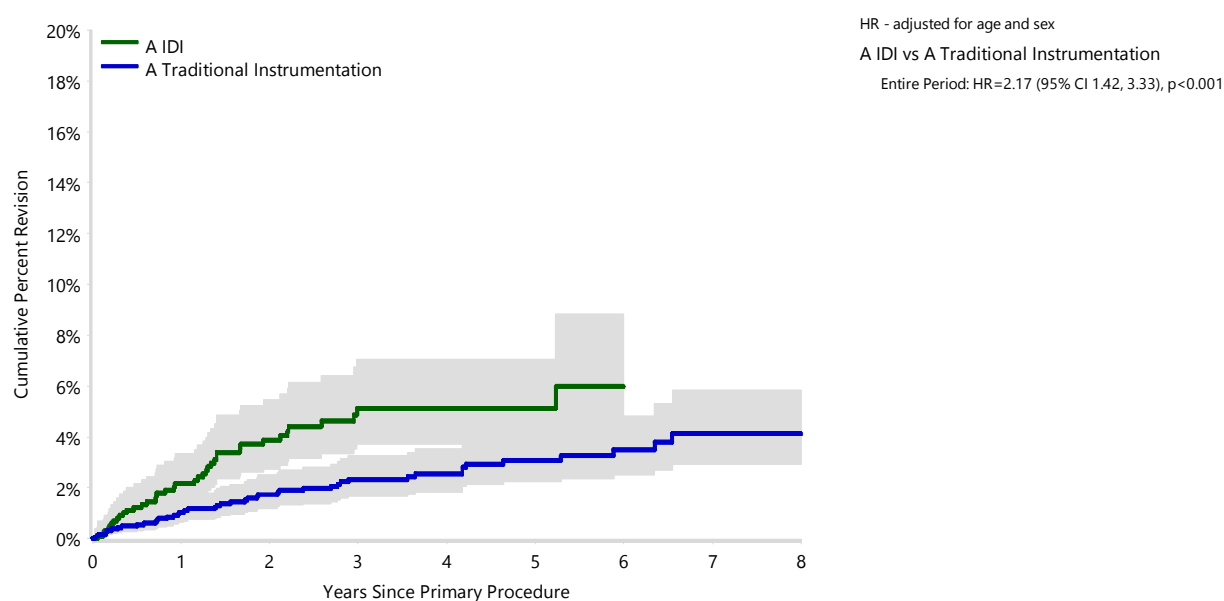
Primary Total Shoulder Replacement

Table ST33 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
IDI Used	A	42	1042	2.2 (1.4, 3.3)	5.1 (3.7, 7.1)	5.1 (3.7, 7.1)	6.0 (4.0, 8.8)		
Traditional Instrumentation	A	45	1881	1.0 (0.7, 1.6)	2.3 (1.7, 3.2)	3.1 (2.2, 4.2)	3.5 (2.5, 4.8)	4.1 (2.9, 5.8)	4.1 (2.9, 5.8)
TOTAL		87	2923						

Note: Restricted to modern prostheses

Figure ST30 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
IDI	A	1042	782	379	128	74	23	3
Traditional Instrumentation	A	1881	1562	1020	605	388	226	97

Note: Restricted to modern prostheses

Table ST34 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement Since 2016 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	3Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
IDI Used	B	30	903	1.8 (1.1, 3.0)	4.4 (3.1, 6.3)	4.7 (3.3, 6.8)	4.7 (3.3, 6.8)		
Traditional Instrumentation	B	25	1054	0.7 (0.3, 1.5)	2.2 (1.4, 3.4)	2.7 (1.8, 4.2)	3.3 (2.2, 5.1)	3.3 (2.2, 5.1)	4.8 (2.9, 8.0)
TOTAL									

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report



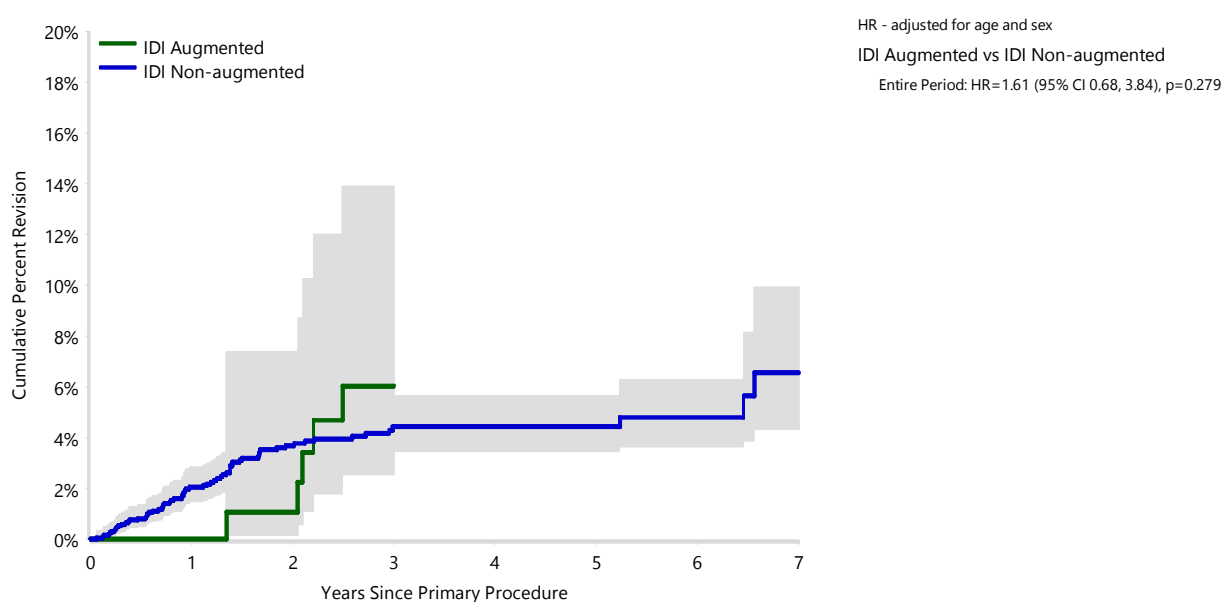
Primary Total Shoulder Replacement

Table ST35 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by IDI Usage and Glenoid Augmentation Since 2016 (Primary Diagnosis OA)

IDI Usage	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI		74	2082	1.9 (1.4, 2.7)	4.6 (3.6, 5.8)	4.7 (3.7, 6.0)	6.8 (4.6, 10.1)		
	Augmented	6	140	0.0 (0.0, 0.0)	6.0 (2.5, 13.9)				
	Non-augmented	68	1942	2.0 (1.5, 2.8)	4.4 (3.5, 5.7)	4.4 (3.5, 5.7)	6.6 (4.3, 9.9)		
Traditional Instrumentation		102	3608	1.1 (0.8, 1.5)	2.5 (2.0, 3.2)	3.2 (2.6, 4.0)	4.0 (3.2, 4.9)	4.8 (3.8, 6.0)	4.8 (3.8, 6.0)
TOTAL		176	5690						

Note: Restricted to modern prostheses
Excludes 3 procedures using non-IDI surgeon assistive tools

Figure ST31 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by IDI Usage and Glenoid Augmentation Since 2016 (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs
IDI	Augmented	140	101	59	14	1	0	0
	Non-augmented	1942	1497	760	298	65	11	0

Note: Restricted to modern prostheses
Excludes 3 procedures using non-IDI surgeon assistive tools

Primary Total Shoulder Replacement

OPERATIVE TECHNIQUE

Rotator Cuff Repair

A rotator cuff repair undertaken during the implantation of a primary total stemless anatomic shoulder replacement does not change the early rate of revision (Table ST36).

Table ST36 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis OA)

Rotator Cuff Repair	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs
Yes	23	875	1.8 (1.1, 3.1)	3.6 (2.3, 5.6)	4.5 (2.8, 6.9)	
No	43	1844	1.4 (0.9, 2.1)	2.7 (2.0, 3.7)	3.6 (2.6, 5.0)	3.6 (2.6, 5.0)
TOTAL	66	2719				

Note: Restricted to modern prostheses

Excludes 3,228 procedures with unknown rotator cuff repair

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

PROSTHESIS COMBINATIONS BY PRIMARY DIAGNOSIS

The outcome of the most used primary total stemless anatomic prosthesis combinations >30 procedures are listed in Table ST37.

Table ST37 Cumulative Percent Revision of Primary Total Stemless Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	10 Yrs	11 Yrs
Affinis	Affinis	135	3571	1.6 (1.2, 2.1)	3.6 (3.0, 4.3)	4.2 (3.5, 5.1)	4.9 (4.1, 5.9)	5.5 (4.6, 6.7)	6.0 (4.9, 7.3)	6.6 (5.1, 8.4)
	Global	2	197	0.5 (0.1, 3.8)	1.3 (0.3, 5.2)	1.3 (0.3, 5.2)				
Comprehensive	Alliance	1	110	0.0 (0.0, 0.0)						
Equinox	Equinox	7	117	1.9 (0.5, 7.3)						
Global Icon	Global	7	268	1.3 (0.4, 4.0)	3.4 (1.6, 7.0)	3.4 (1.6, 7.0)				
SMR	SMR	6	58	3.5 (0.9, 13.3)	7.1 (2.7, 17.8)	7.1 (2.7, 17.8)	10.2 (4.2, 23.5)	13.6 (6.1, 29.0)		
Simpliciti	Perform	33	1607	1.0 (0.6, 1.7)	2.3 (1.6, 3.3)	2.7 (1.9, 3.9)	3.8 (2.3, 6.3)			
Other (6)		0	19	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
TOTAL		191	5947							

Note: Restricted to modern prostheses

Only prostheses with >30 procedures have been listed



Primary Total Shoulder Replacement

Primary Total Stemmed Anatomic Shoulder Replacement

DEMOGRAPHICS

There are 17,240 total stemmed anatomic shoulder replacement procedures. This is an additional 347 procedures compared to the previous report.

The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) is created by the Australian Bureau of Statistics as a summary measure of the socioeconomic status for each geographical area.¹⁹ An IRSAD rating of 1 indicates the most socioeconomically disadvantaged region, while a rating of 10 indicates the most advantaged. Each Australian region has differing rates of social advantage and disadvantage.

Percentages of primary total stemmed anatomic shoulder replacements from regions rated IRSAD 1-2 and 9-10 by state and territory are shown in Figure ST32 and Figure ST33.

Percentages of primary total stemmed anatomic shoulder replacements from regions rated IRSAD 1-2 and 9-10 by hospital locality are shown in Figure ST34 and Figure ST35.

The majority of procedures are undertaken in females. However, the proportion of males has increased 2.8% since 2016. The mean age of females is older than males (Table ST38).

Most procedures are undertaken in the 65–74 year age group. The proportional use in patients aged ≥75 years has declined from 23.0% in 2022 to 22.2% in 2025 (Figure ST36).

In 2025, non XLPE (75.9%) is more commonly used in total stemmed anatomic replacement glenoids than XLPE (24.1%) (Figure ST37).

The most common type of fixation is hybrid fixation (cementless humerus and cemented glenoid) (Figure ST38).

The 10 most used humeral stem and glenoid prostheses are listed in Table ST39 and Table ST40.

Hybrid fixation with a cemented glenoid has increased from 55.8% in 2010 to 82.9% in 2025.

Figure ST32 Percentage of Primary Total Stemmed Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by State (All Diagnoses)

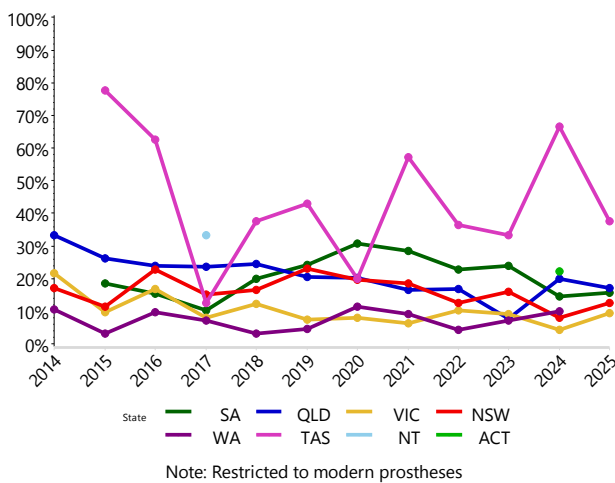
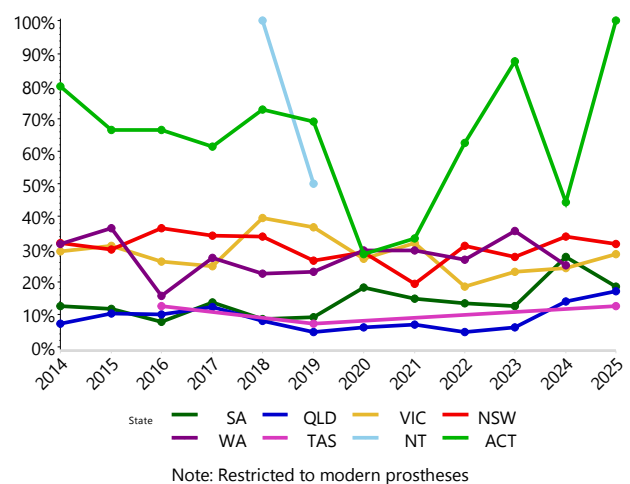


Figure ST33 Percentage of Primary Total Stemmed Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by State (All Diagnoses)



¹⁹ <https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/latest-release>

Primary Total Shoulder Replacement

Figure ST34 Percentage of Primary Total Stemmed Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by Hospital Locality (All Diagnoses)

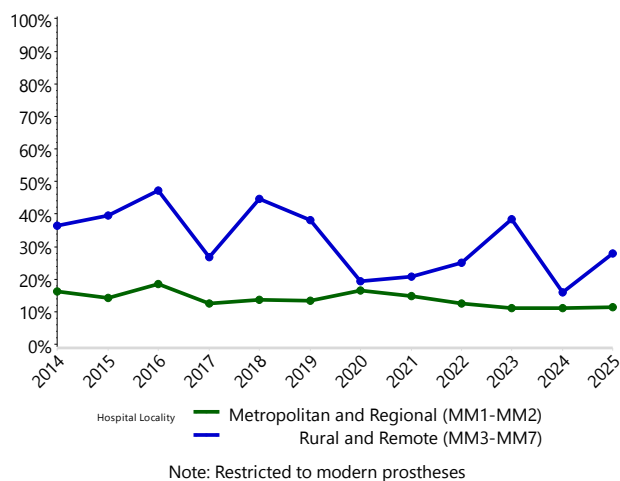


Figure ST35 Percentage of Primary Total Stemmed Anatomic Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by Hospital Locality (All Diagnoses)

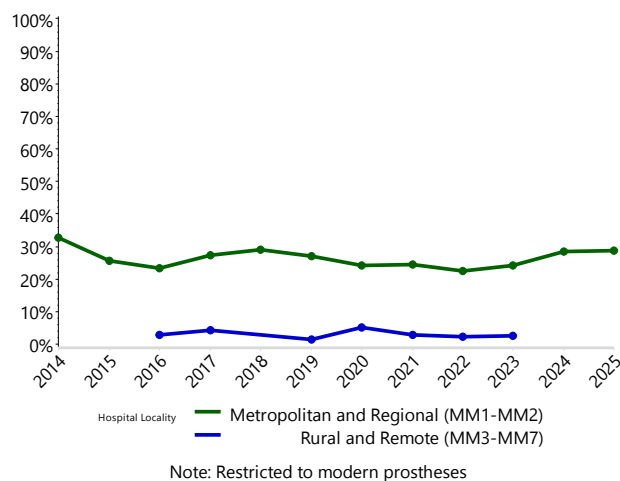
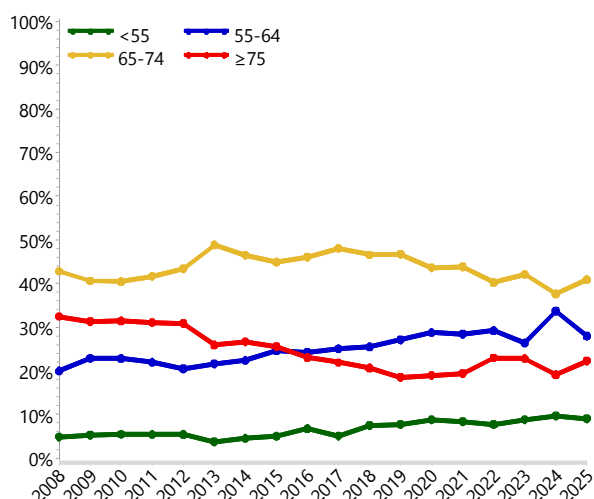


Table ST38 Age and Sex of Primary Total Stemmed Anatomic Shoulder Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	7453	43.2%	21	93	67	66.5	9.0
Female	9787	56.8%	19	96	70	70.2	8.5
TOTAL	17240	100.0%	19	96	69	68.6	8.9

Figure ST36 Primary Total Stemmed Anatomic Shoulder Replacements by Age (All Diagnoses)





Primary Total Shoulder Replacement

Figure ST37 Primary Total Stemmed Anatomic Shoulder Replacement by Polyethylene Type

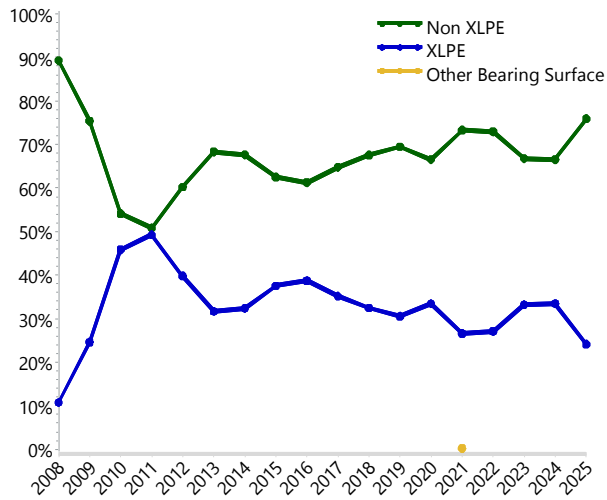
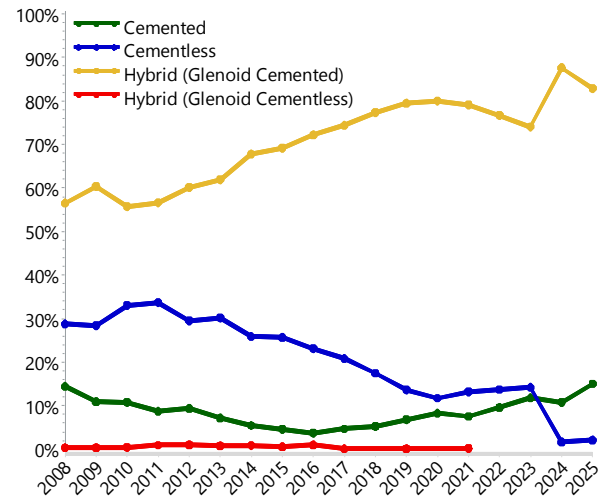


Figure ST38 Primary Total Stemmed Anatomic Shoulder Replacement by Fixation





Primary Total Shoulder Replacement

Table ST39 Most Used Humeral Stem Prostheses in Primary Total Stemmed Anatomic Shoulder Replacement

2008		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
298	SMR	186	Ascend Flex	158	Ascend Flex	131	Ascend Flex	146	Ascend Flex
167	Aequalis	103	Global Unite	127	Global Unite	79	Global Unite	70	Comprehensive
117	Global Advantage	87	Equinox	80	SMR	73	Comprehensive	46	Global Unite
91	Global AP	77	SMR	62	Comprehensive	36	SMR	30	SMR
40	Bigliani/Flatow	72	Comprehensive	48	Equinox	24	Equinox	22	Equinox
37	Bigliani/Flatow TM	30	Global AP	23	Global AP	11	Affinis	9	Affinis
32	Solar	4	Affinis	1	Affinis	8	MSS	9	MSS
27	Affinis	2	Delta Xtend	1	Delta Xtend			1	Custom Made (Signature)
11	Univers 3D	1	Bigliani/Flatow TM	1	MSS				
10	Cofield 2								
10 Most Used									
830	(10) 97.9%	562	(9) 100.0%	501	(9) 100.0%	362	(7) 100.0%	333	(8) 100.0%
Remainder									
18	(7) 2.1%	0	(0) 0%	0	(0) 0%	0	(0) 0%	0	(0) 0%
TOTAL									
848	(17) 100.0%	562	(9) 100.0%	501	(9) 100.0%	362	(7) 100.0%	333	(8) 100.0%

Table ST40 Most Used Glenoid Prostheses in Primary Total Stemmed Anatomic Shoulder Replacement

2008		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
237	SMR L1	185	Perform	158	Perform	131	Perform	146	Perform
209	Global	135	Global	151	Global	79	Global	64	Alliance
167	Aequalis	87	Equinox	66	SMR L1	56	Comprehensive	46	Global
79	Bigliani/Flatow	65	SMR L1	48	Comprehensive	36	SMR	30	SMR
57	SMR	62	Comprehensive	48	Equinox	24	Equinox	22	Equinox
32	Solar	12	SMR	14	Alliance	17	Alliance	9	Affinis
27	Affinis	10	Alliance	14	SMR	11	Affinis	9	MSS
11	Univers 3D	5	Affinis	1	Affinis	8	MSS	6	Comprehensive
10	Cofield 2	1	Bigliani/Flatow	1	MSS			1	Custom Made (Signature)
7	Promos								
10 Most Used									
836	(10) 98.6%	562	(9) 100.0%	501	(9) 100.0%	362	(8) 100.0%	333	(9) 100.0%
Remainder									
12	(6) 1.4%	0	(0) 0%	0	(0) 0%	0	(0) 0%	0	(0) 0%
TOTAL									
848	(16) 100.0%	562	(9) 100.0%	501	(9) 100.0%	362	(8) 100.0%	333	(9) 100.0%



Primary Total Shoulder Replacement

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

The usage and availability of prostheses change with time, reflecting design change and surgeon preference. In order to keep Registry data contemporaneous, only procedures utilising prostheses that have been available and used in 2025 (described as modern prostheses) are included in analyses, unless clearly specified.

The most common diagnosis for primary total stemmed anatomic shoulder replacement is osteoarthritis (94.6%) (Table ST41). There is no difference in the rate of revision between osteoarthritis, osteonecrosis and rheumatoid arthritis (Table ST42).

Reason for Revision

The main reasons for revision are loosening, rotator cuff insufficiency, and instability/dislocation (Table ST43 and Figure ST39). Since the last annual report there has been 1 revision of a total stemmed anatomic shoulder replacement. 2

Type of Revision

The most common type of revision involves replacement of the humeral and glenoid components (74.7%) (Table ST44).

The majority of total stemmed anatomic replacements are revised to reverse replacements (90.7%) with 53.4% retaining the humeral stem.

The cumulative incidence revision diagnosis of primary total stemmed anatomic shoulder replacement shows that loosening becomes the predominant reason for revision after 7 years (Figure ST39), with this effect occurring earlier in males (year 6) than females (year 10) (Figure ST40).

Table ST41 Primary Total Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	Number	Percent
Osteoarthritis	5449	94.6
Osteonecrosis	111	1.9
Rheumatoid Arthritis	73	1.3
Fracture	35	0.6
Other Inflammatory Arthritis	33	0.6
Rotator Cuff Arthropathy	32	0.6
Instability	19	0.3
Tumour	6	0.1
TOTAL	5758	100.0

Note: Restricted to modern prostheses

Table ST42 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	322	5449	2.0 (1.6, 2.4)	3.6 (3.1, 4.1)	4.8 (4.2, 5.5)	6.3 (5.6, 7.1)	8.4 (7.5, 9.5)	11.7 (9.7, 14.0)
Osteonecrosis	7	111	0.9 (0.1, 6.5)	3.0 (1.0, 9.1)	4.7 (1.7, 12.4)			
Rheumatoid Arthritis	6	73	2.8 (0.7, 10.8)	4.2 (1.4, 12.6)	5.9 (2.2, 14.9)	5.9 (2.2, 14.9)	11.1 (3.9, 29.2)	
Fracture	6	35	2.9 (0.4, 18.6)	15.9 (6.9, 34.1)	15.9 (6.9, 34.1)	15.9 (6.9, 34.1)	21.9 (10.0, 43.9)	
Other Inflammatory Arthritis	4	33	3.1 (0.4, 20.2)	6.4 (1.6, 23.1)	10.6 (3.5, 29.8)	10.6 (3.5, 29.8)		
Rotator Cuff Arthropathy	2	32	3.1 (0.4, 20.2)	3.1 (0.4, 20.2)	3.1 (0.4, 20.2)	9.2 (2.2, 34.1)	9.2 (2.2, 34.1)	
Other (2)	1	25	0.0 (0.0, 0.0)	5.3 (0.8, 31.9)	5.3 (0.8, 31.9)	5.3 (0.8, 31.9)		
TOTAL	348	5758						

Note: Restricted to modern prostheses

Only primary diagnoses with > 30 procedures have been listed

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Primary Total Shoulder Replacement

Table ST43 Primary Total Stemmed Anatomic Shoulder Replacement by Reason for Revision (All Diagnoses)

Reason for Revision	Number	Percent
Loosening	107	30.7
Rotator Cuff Insufficiency	92	26.4
Instability/Dislocation	72	20.7
Infection	22	6.3
Pain	12	3.4
Lysis	10	2.9
Fracture	8	2.3
Implant Breakage Glenoid	6	1.7
Incorrect Sizing	5	1.4
Arthrofibrosis	4	1.1
Malposition	3	0.9
Implant Breakage Glenoid Insert	2	0.6
Wear Glenoid Insert	1	0.3
Dissociation	1	0.3
Metal Related Pathology	1	0.3
Other	2	0.6
TOTAL	348	100.0

Note: Restricted to modern prostheses

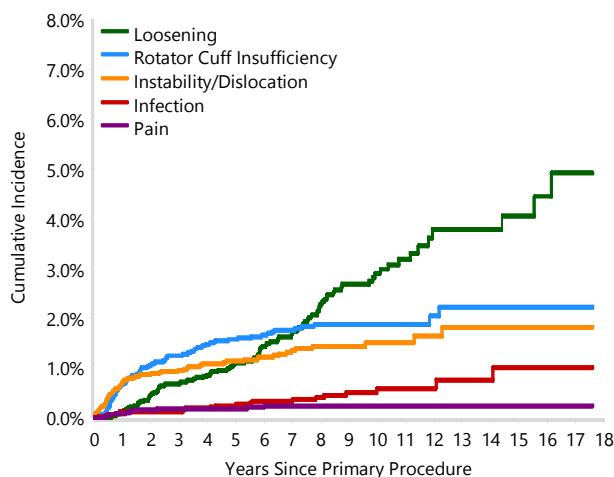
Table ST44 Primary Total Stemmed Anatomic Shoulder Replacement by Type of Revision (All Diagnoses)

Type of Revision	Number	Percent
Humeral/Glenoid	260	74.7
Head Only	35	10.1
Cement Spacer	18	5.2
Humeral Component	15	4.3
Glenoid Component	15	4.3
Removal of Prostheses	3	0.9
Reoperation	1	0.3
Cup Only	1	0.3
TOTAL	348	100.0

Note: Restricted to modern prostheses

Humeral heads are replaced when the humeral component is revised

Figure ST39 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement (All Diagnoses)

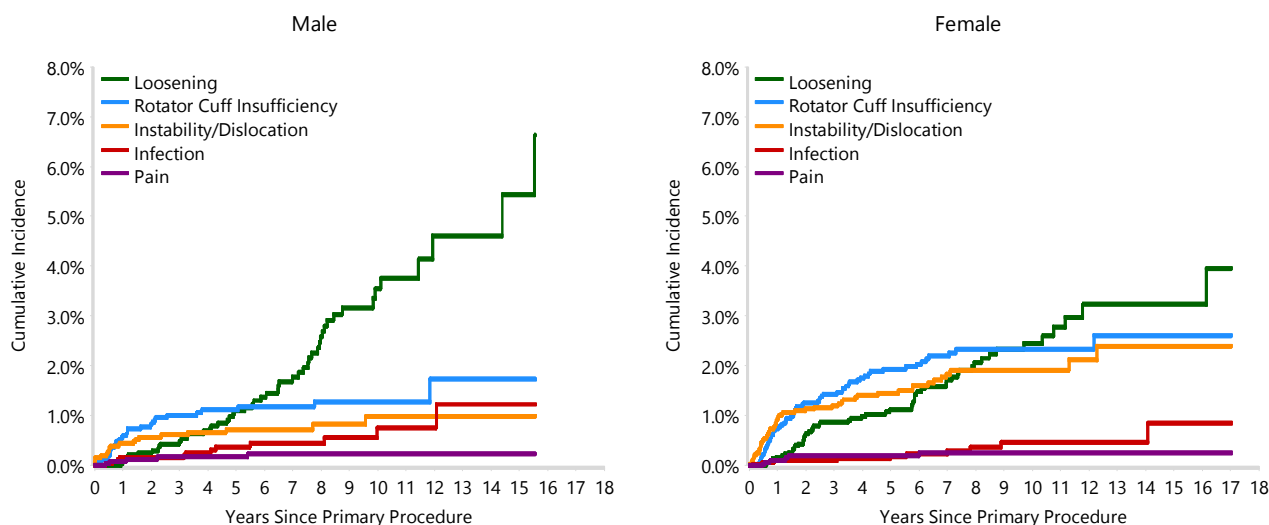


Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST40 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Sex



PROSTHESIS TYPES

The outcome of the most used humeral stem and glenoid prosthesis combinations with >50 procedures used in primary total stemmed anatomic shoulder replacement are listed in Table ST45.

The most commonly used cementless prosthesis combinations are listed in Table ST46. Prosthesis combinations with hybrid (glenoid cemented) fixation are listed in Table ST47.

Table ST45 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (All Diagnoses)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Affinis	Affinis	23	218	0.0 (0.0, 0.0)	2.5 (1.1, 6.0)	5.3 (2.9, 9.6)	6.4 (3.7, 11.0)	8.9 (5.5, 14.2)	14.1 (9.3, 21.0)
Ascend Flex	Perform	67	1621	0.9 (0.5, 1.5)	2.5 (1.8, 3.5)	3.6 (2.7, 4.8)	5.2 (3.9, 6.8)	8.5 (6.1, 11.6)	
Comprehensive	Alliance	2	120	2.3 (0.6, 8.9)					
	Comprehensive	66	985	3.8 (2.7, 5.2)	5.0 (3.8, 6.6)	5.8 (4.5, 7.5)	6.5 (5.1, 8.4)	7.8 (6.0, 10.0)	
Equinox	Equinox	104	782	2.9 (1.9, 4.3)	6.1 (4.6, 8.1)	9.4 (7.5, 11.9)	14.2 (11.5, 17.6)	24.5 (19.5, 30.5)	
Global Unite	Global	46	1410	1.4 (0.9, 2.2)	2.2 (1.6, 3.2)	2.9 (2.1, 4.0)	3.8 (2.8, 5.1)	4.2 (3.1, 5.6)	
SMR	SMR	38	593	2.3 (1.3, 3.9)	4.7 (3.2, 6.8)	5.3 (3.7, 7.5)	6.0 (4.3, 8.4)	6.8 (4.9, 9.4)	7.7 (5.6, 10.7)
Other (5)		2	29	9.2 (2.4, 32.3)	9.2 (2.4, 32.3)	9.2 (2.4, 32.3)			
TOTAL		348	5758						

Note: Restricted to modern prostheses

Only prostheses with >50 procedures have been listed



Primary Total Shoulder Replacement

Table ST46 Cumulative Percent Revision of Cementless Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Affinis	Affinis	0	12	0.0 (0.0, 0.0)					
Equinox	Equinox	10	58	7.0 (2.7, 17.6)	10.5 (4.9, 21.9)	12.7 (6.3, 25.0)	12.7 (6.3, 25.0)	24.2 (13.0, 42.2)	24.2 (13.0, 42.2)
Other (2)		0	3	0.0 (0.0, 0.0)					
TOTAL		10	73						

Note: Restricted to modern prostheses

Only prostheses with > 10 procedures have been listed

Table ST47 Cumulative Percent Revision of Hybrid (Glenoid Cemented) Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Affinis	Affinis	21	197	0.0 (0.0, 0.0)	1.6 (0.5, 4.9)	4.5 (2.3, 8.7)	5.6 (3.1, 10.3)	8.2 (4.9, 13.5)	13.5 (8.8, 20.5)
Ascend Flex	Perform	58	1355	0.9 (0.5, 1.6)	2.6 (1.9, 3.7)	3.9 (2.9, 5.2)	4.9 (3.7, 6.5)	8.1 (5.7, 11.4)	
Comprehensive	Alliance	2	117	2.3 (0.6, 9.1)					
	Comprehensive	66	970	3.8 (2.8, 5.2)	5.1 (3.9, 6.7)	5.9 (4.5, 7.6)	6.6 (5.1, 8.5)	7.9 (6.1, 10.2)	
Equinox	Equinox	91	693	2.5 (1.6, 4.0)	5.6 (4.1, 7.6)	9.1 (7.0, 11.7)	14.6 (11.6, 18.3)	25.1 (19.5, 31.9)	
Global Unite	Global	39	1267	1.2 (0.7, 2.0)	2.0 (1.3, 3.0)	2.8 (1.9, 3.9)	3.6 (2.6, 4.9)	3.9 (2.9, 5.4)	
SMR	SMR	35	568	2.3 (1.4, 4.0)	4.5 (3.0, 6.6)	5.1 (3.6, 7.4)	5.6 (3.9, 8.0)	6.5 (4.6, 9.1)	7.4 (5.2, 10.4)
Other (5)		2	29	9.2 (2.4, 32.3)					
TOTAL		314	5196						

Note: Restricted to modern prostheses

Only prostheses with > 50 procedures have been listed



Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS – PATIENT CHARACTERISTICS

There are 5,449 primary total stemmed anatomic shoulder replacement procedures with a primary diagnosis of osteoarthritis.

The cumulative percent revision of primary total stemmed anatomic shoulder replacement with a polyethylene glenoid for osteoarthritis at 15 years is 11.7%. A polyethylene glenoid includes all glenoid types except modular metal backed glenoids (Table ST48).

For primary total stemmed anatomic shoulder replacements undertaken prior to 2016, there is a decreased rate of revision compared to those procedures performed in the period 2016-2025 (Table ST49 and Figure ST41). The most common reasons for revision are loosening (31.4%), rotator cuff insufficiency (25.8%), and instability/dislocation (21.7%) (Table ST50 and Figure ST42). Males are predominantly revised for loosening while the reason for revision varies for females (Figure ST43).

The most common type of revision is of the humeral/glenoid component combination (74.2%) (Table ST51). Of note, a humeral component revision may include epiphysis and/or humeral stem and additional minor components, such as the humeral head/glenosphere and/or removal of the glenoid component. Primary total stemmed anatomic replacements undertaken for osteoarthritis are revised to a total stemmed reverse shoulder replacement (90.2%) with retention of the original stem in 54.1% of occasions.

Age and Sex

Patients aged ≥65 years have a lower rate of revision compared to patients aged <65 years (Table ST52 and Figure ST44).

Females have a higher rate of revision than males (Table ST53 and Figure ST45). When age is stratified by sex, the rate of revision difference between age groups remains the same for males. Females and males aged ≥65 years have a lower rate of revision compared to females aged <65 years (Figure ST46).

Females have a higher rate of revision compared to males.

ASA and BMI

Most patients have an ASA score of 2 or 3. ASA score is not a risk factor for revision (Table ST54). Males with ASA scores 1-2 and 3-5 have a lower rate of revision than females with the same ASA scores (Table ST55 and Figure ST47).

The most common BMI categories are pre-obese and obese class 1. Normal BMI patients have a higher rate of revision than those of BMI class 3, with normal weight patients being predominantly revised for loosening (Table ST56, Figure ST48 and Figure ST49). Obese and females have a higher rate of revision than their male counterparts (Table ST57 and Figure ST50).

Glenoid Morphology

The category of glenoid morphology is not a risk factor for revision (Table ST58).

Table ST48 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)

Glenoid Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Polyethylene Glenoid	322	5448	2.0 (1.6, 2.4)	3.6 (3.1, 4.1)	4.8 (4.2, 5.5)	6.3 (5.6, 7.1)	8.4 (7.5, 9.5)	11.7 (9.7, 14.0)
TOTAL	322	5448						

Note: Restricted to modern prostheses
Excludes 1 procedure with unknown glenoid type

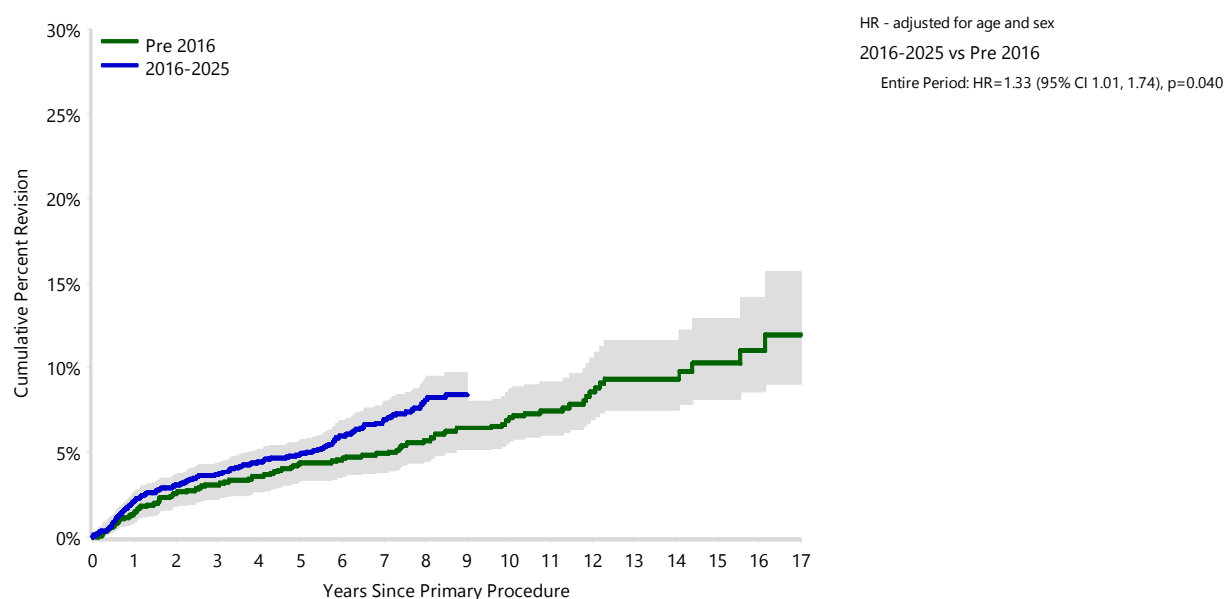
Primary Total Shoulder Replacement

Table ST49 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Procedure Year (Primary Diagnosis OA)

Procedure Year	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Pre 2016	95	1211	1.4 (0.9, 2.3)	3.1 (2.2, 4.2)	4.4 (3.4, 5.7)	4.9 (3.8, 6.3)	7.0 (5.6, 8.6)	10.3 (8.1, 12.9)
2016-2025	227	4238	2.1 (1.7, 2.6)	3.7 (3.2, 4.4)	4.9 (4.3, 5.7)	7.0 (6.0, 8.0)		
TOTAL	322	5449						

Note: Restricted to modern prostheses

Figure ST41 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Procedure Year (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Pre 2016	1211	1184	1138	1080	1023	897	149
2016-2025	4238	3826	3025	2102	1170	0	0

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST50 Primary Total Stemmed Anatomic Shoulder Replacement by Reason for Revision (Primary Diagnosis OA)

Reason for Revision	Number	Percent
Loosening	101	31.4
Rotator Cuff Insufficiency	83	25.8
Instability/Dislocation	70	21.7
Infection	18	5.6
Pain	11	3.4
Lysis	9	2.8
Fracture	7	2.2
Implant Breakage Glenoid	6	1.9
Incorrect Sizing	5	1.6
Malposition	3	0.9
Arthrofibrosis	2	0.6
Implant Breakage Glenoid Insert	2	0.6
Wear Glenoid Insert	1	0.3
Dissociation	1	0.3
Metal Related Pathology	1	0.3
Other	2	0.6
TOTAL	322	100.0

Note: Restricted to modern prostheses

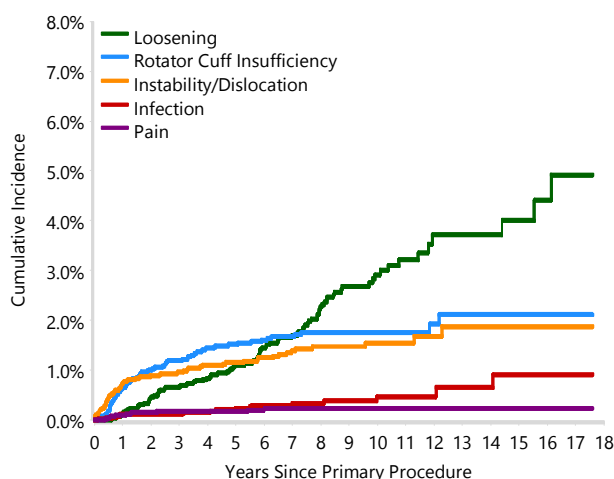
Table ST51 Primary Total Stemmed Anatomic Shoulder Replacement by Type of Revision (Primary Diagnosis OA)

Type of Revision	Number	Percent
Humeral/Glenoid	239	74.2
Head Only	34	10.6
Cement Spacer	18	5.6
Glenoid Component	14	4.3
Humeral Component	13	4.0
Removal of Prostheses	2	0.6
Reoperation	1	0.3
Cup Only	1	0.3
TOTAL	322	100.0

Note: Restricted to modern prostheses

Humeral heads are replaced when the humeral component is revised

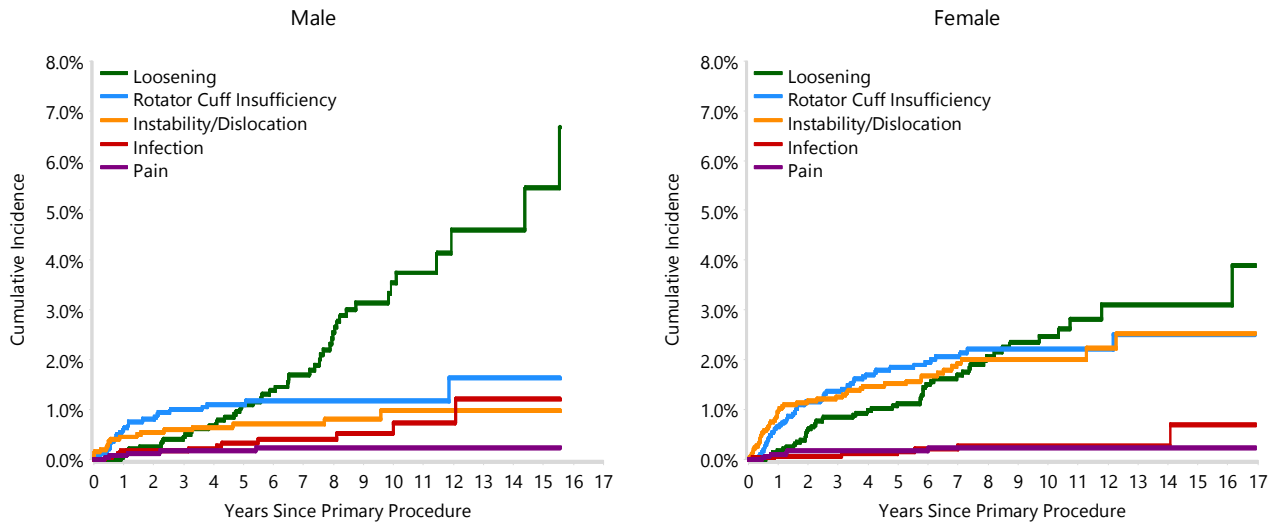
Figure ST42 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST43 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Sex (Primary Diagnosis OA)



Note: Restricted to modern prostheses



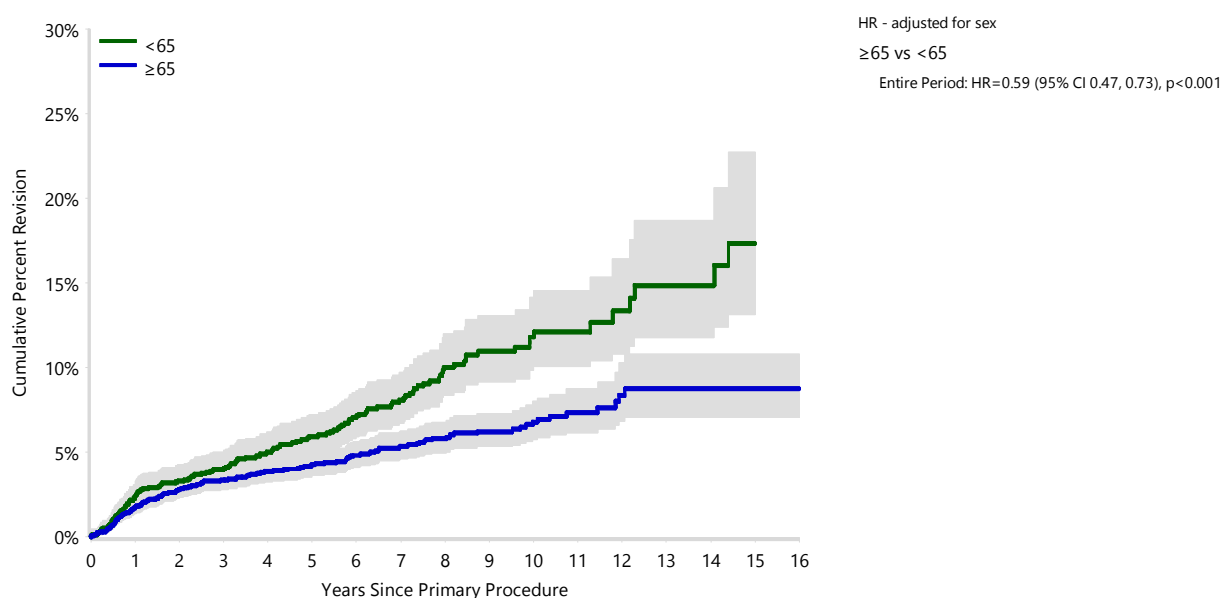
Primary Total Shoulder Replacement

Table ST52 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)

Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<65	142	1818	2.4 (1.8, 3.2)	4.0 (3.2, 5.1)	5.9 (4.8, 7.2)	8.1 (6.7, 9.7)	11.8 (9.8, 14.1)	17.3 (13.1, 22.7)
≥65	180	3631	1.7 (1.4, 2.2)	3.3 (2.8, 4.0)	4.3 (3.6, 5.0)	5.4 (4.6, 6.3)	6.8 (5.8, 8.0)	8.8 (7.1, 10.8)
TOTAL	322	5449						

Note: Restricted to modern prostheses

Figure ST44 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Age (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<65	1818	1659	1368	1025	701	293	52
≥65	3631	3351	2795	2157	1492	604	97

Note: Restricted to modern prostheses

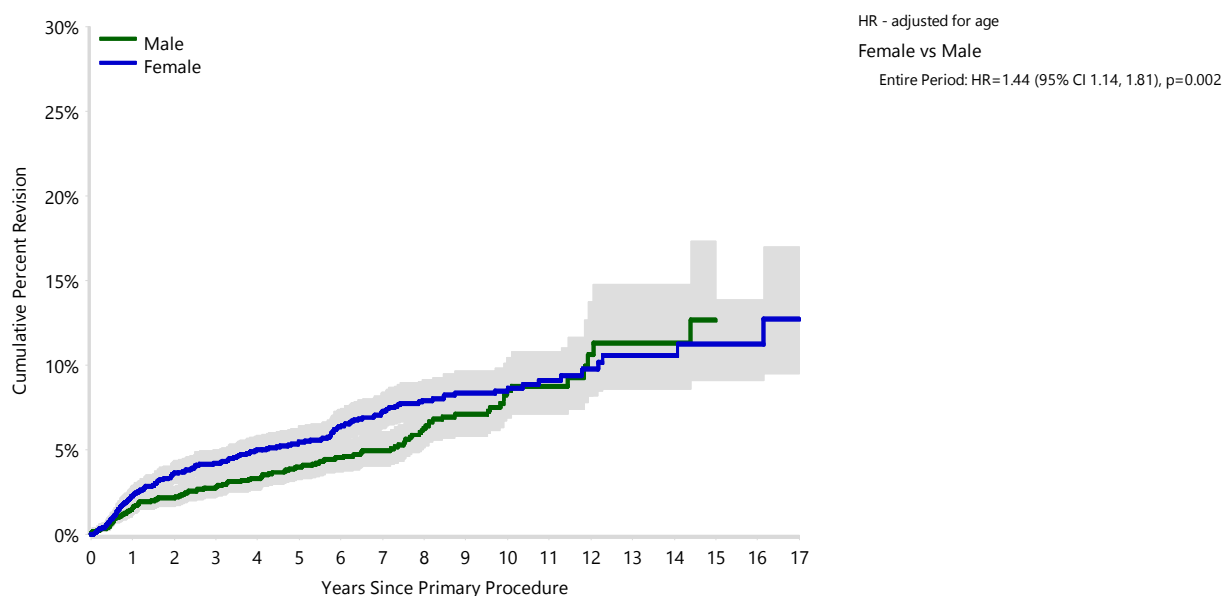
Primary Total Shoulder Replacement

Table ST53 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Sex and Age (Primary Diagnosis OA)

Sex	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male		126	2460	1.6 (1.1, 2.1)	2.8 (2.2, 3.6)	4.0 (3.2, 5.0)	5.0 (4.1, 6.1)	8.5 (6.9, 10.5)	12.7 (9.2, 17.3)
	<65	69	1051	1.7 (1.0, 2.7)	3.6 (2.6, 5.0)	5.3 (4.0, 7.1)	6.7 (5.1, 8.7)	11.6 (8.8, 15.1)	
	≥65	57	1409	1.5 (0.9, 2.3)	2.3 (1.6, 3.2)	3.1 (2.2, 4.2)	3.8 (2.8, 5.1)	6.3 (4.5, 8.7)	
Female		196	2989	2.3 (1.8, 2.9)	4.2 (3.5, 5.0)	5.5 (4.7, 6.4)	7.3 (6.3, 8.4)	8.5 (7.3, 9.8)	11.2 (9.1, 13.9)
	<65	73	767	3.4 (2.3, 5.0)	4.7 (3.4, 6.5)	6.8 (5.1, 8.9)	9.8 (7.6, 12.6)	12.2 (9.5, 15.5)	
	≥65	123	2222	1.9 (1.4, 2.6)	4.0 (3.2, 5.0)	5.0 (4.1, 6.1)	6.4 (5.3, 7.6)	7.2 (6.0, 8.6)	7.8 (6.4, 9.5)
TOTAL		322	5449						

Note: Restricted to modern prostheses

Figure ST45 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Sex (Primary Diagnosis OA)



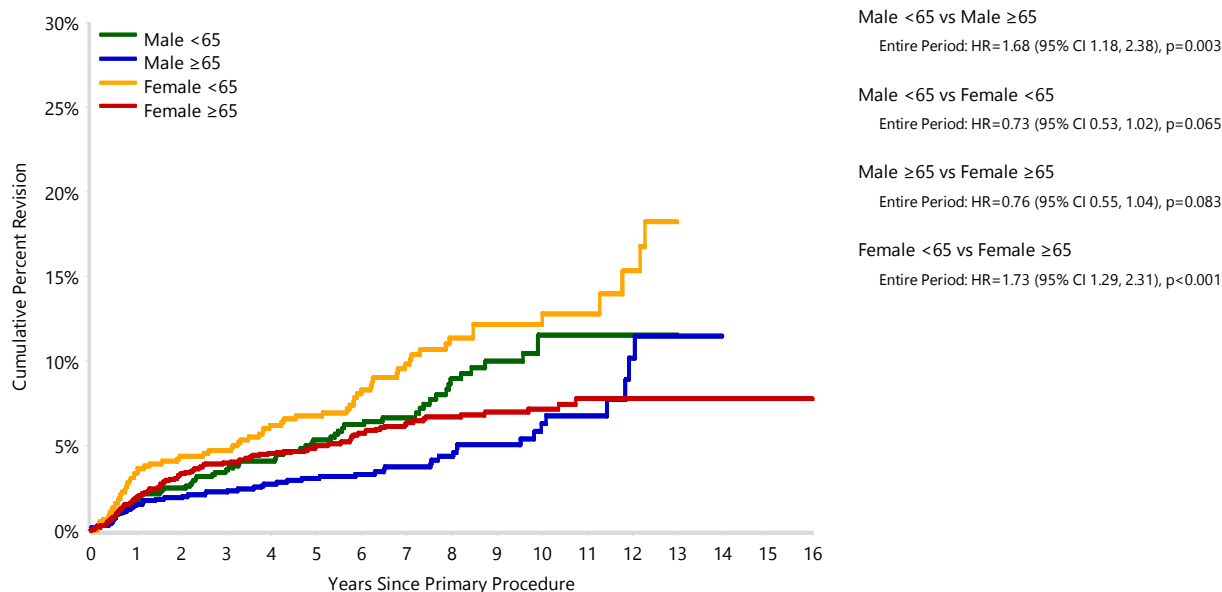
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male	2460	2259	1858	1386	934	357	53
Female	2989	2751	2305	1796	1259	540	96

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST46 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Sex and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Male	<65	1051	966	770	558	376	155	26
	≥65	1409	1293	1088	828	558	202	27
Female	<65	767	693	598	467	325	138	26
	≥65	2222	2058	1707	1329	934	402	70

Note: Restricted to modern prostheses

Table ST54 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by ASA Score (Primary Diagnosis OA)

ASA Score	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
ASA 1	19	309	2.3 (1.1, 4.8)	3.0 (1.6, 5.7)	3.8 (2.1, 6.7)	4.6 (2.7, 7.9)	6.0 (3.6, 9.9)		
ASA 2	148	2601	1.8 (1.4, 2.4)	2.9 (2.3, 3.6)	3.5 (2.8, 4.3)	4.5 (3.7, 5.5)	6.4 (5.4, 7.7)	9.0 (7.5, 10.9)	9.7 (7.9, 11.8)
ASA 3	95	1899	2.1 (1.6, 2.9)	3.2 (2.5, 4.1)	3.7 (2.9, 4.7)	5.1 (4.1, 6.3)	6.1 (5.0, 7.6)	7.1 (5.5, 9.1)	7.1 (5.5, 9.1)
ASA 4	2	52	2.0 (0.3, 13.4)	2.0 (0.3, 13.4)	2.0 (0.3, 13.4)	2.0 (0.3, 13.4)	6.9 (1.6, 27.7)		
ASA 5	0	1							
TOTAL	264	4862							

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Primary Total Shoulder Replacement

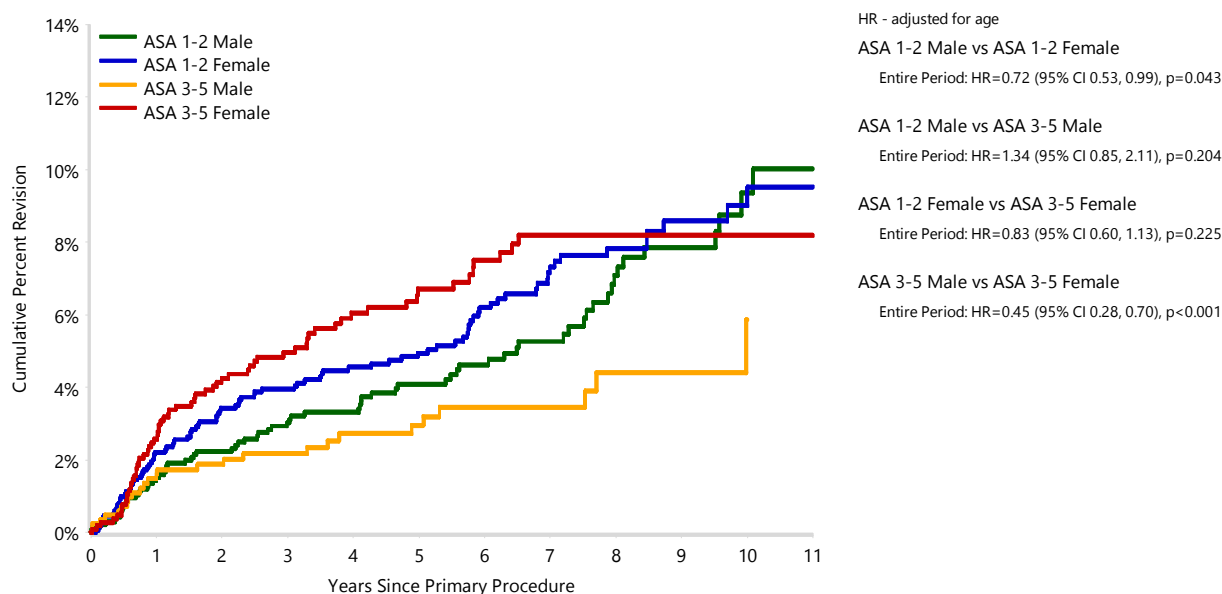
Table ST55 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by ASA Score and Sex (Primary Diagnosis OA)

ASA Score	Sex	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
ASA 1	Male	12	186	1.6 (0.5, 5.0)	2.8 (1.2, 6.6)	3.4 (1.5, 7.5)	4.9 (2.5, 9.6)	5.8 (3.0, 11.1)		
	Female	7	123	3.4 (1.3, 8.7)	3.4 (1.3, 8.7)	4.3 (1.8, 10.0)	4.3 (1.8, 10.0)	6.1 (2.7, 13.7)		
ASA 2	Male	60	1185	1.5 (0.9, 2.4)	2.1 (1.4, 3.2)	3.0 (2.1, 4.2)	4.0 (2.9, 5.4)	5.2 (3.9, 6.9)	9.0 (6.5, 12.2)	9.7 (7.0, 13.5)
	Female	88	1416	2.1 (1.5, 3.0)	3.4 (2.6, 4.6)	3.9 (3.0, 5.1)	5.0 (3.9, 6.4)	7.4 (6.0, 9.2)	9.1 (7.2, 11.5)	9.7 (7.5, 12.3)
ASA 3	Male	26	838	1.6 (0.9, 2.8)	1.9 (1.1, 3.1)	2.2 (1.4, 3.5)	3.0 (1.9, 4.5)	3.5 (2.3, 5.2)	5.9 (3.3, 10.5)	
	Female	69	1061	2.6 (1.8, 3.7)	4.3 (3.2, 5.7)	5.0 (3.8, 6.5)	6.7 (5.2, 8.6)	8.2 (6.4, 10.4)	8.2 (6.4, 10.4)	8.2 (6.4, 10.4)
ASA 4 or 5	Male	1	25	4.2 (0.6, 26.1)	4.2 (0.6, 26.1)	4.2 (0.6, 26.1)	4.2 (0.6, 26.1)	4.2 (0.6, 26.1)		
	Female	1	28	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	7.7 (1.1, 43.4)		
TOTAL		264	4862							

Note: Restricted to modern prostheses

Excludes 587 procedures with unknown ASA score

Figure ST47 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by ASA Score and Sex (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
ASA 1-2	Male	1371	1259	1155	1047	773	492	143	56
	Female	1539	1417	1308	1189	923	607	176	64
ASA 3-5	Male	838	759	686	587	407	257	64	27
	Female	1061	955	856	760	538	341	103	41

Note: Restricted to modern prostheses

Excludes 587 procedures with unknown ASA score



Primary Total Shoulder Replacement

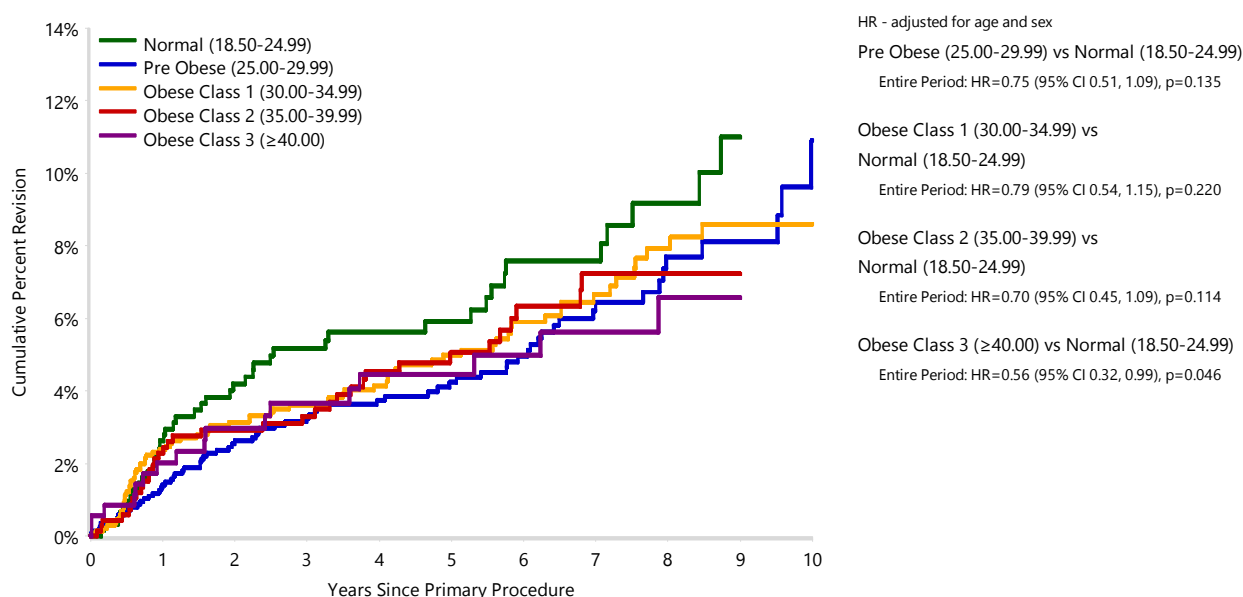
Table ST56 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category (Primary Diagnosis OA)

BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Underweight (<18.5)	0	13	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
Normal (18.5-24.9)	43	642	2.6 (1.6, 4.2)	5.2 (3.6, 7.3)	5.9 (4.2, 8.3)	7.6 (5.5, 10.4)	
Pre Obese (25.0-29.9)	71	1393	1.4 (0.9, 2.2)	3.3 (2.4, 4.4)	4.2 (3.2, 5.6)	6.4 (5.0, 8.3)	10.9 (7.6, 15.5)
Obese Class 1 (30.0-34.9)	74	1350	2.4 (1.7, 3.4)	3.6 (2.7, 4.8)	5.0 (3.9, 6.5)	6.7 (5.2, 8.5)	8.6 (6.7, 11.0)
Obese Class 2 (35.0-39.9)	36	684	2.3 (1.4, 3.8)	3.3 (2.2, 5.0)	5.1 (3.5, 7.2)	7.2 (5.1, 10.2)	
Obese Class 3 (≥40.0)	17	355	2.0 (1.0, 4.2)	3.7 (2.1, 6.4)	4.4 (2.6, 7.4)	5.6 (3.4, 9.2)	
TOTAL	241	4437					

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Figure ST48 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Normal (18.5-24.9)	642	575	448	300	193	32
Pre Obese (25.0-29.9)	1393	1271	1024	734	423	69
Obese Class 1 (30.0-34.9)	1350	1211	968	709	437	79
Obese Class 2 (35.0-39.9)	684	620	504	351	195	32
Obese Class 3 (≥40.0)	355	330	262	194	124	31

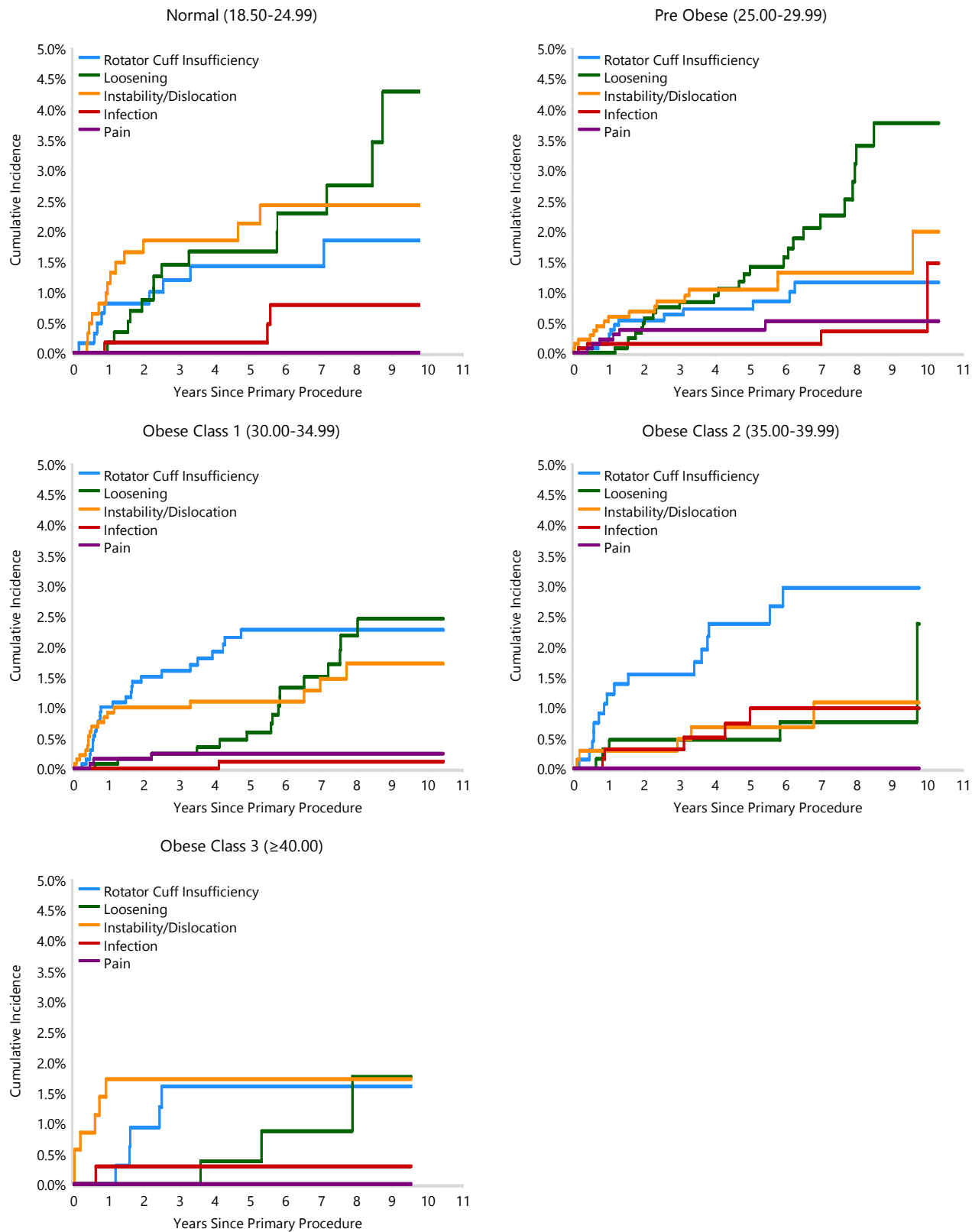
Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years



Primary Total Shoulder Replacement

Figure ST49 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category (Primary Diagnosis OA)



Note: Restricted to modern prostheses
BMI has not been presented for patients aged ≤ 19 years



Primary Total Shoulder Replacement

Table ST57 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category and Sex (Primary Diagnosis OA)

BMI Category	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Not Obese	Male	47	952	1.5 (0.9, 2.6)	3.3 (2.3, 4.7)	4.1 (2.9, 5.8)	5.3 (3.8, 7.3)	12.3 (7.8, 19.0)
	Female	67	1096	2.0 (1.3, 3.1)	4.3 (3.2, 5.8)	5.3 (4.0, 6.9)	7.9 (6.2, 10.2)	9.6 (7.3, 12.6)
Obese	Male	43	1097	1.6 (1.0, 2.6)	2.4 (1.6, 3.5)	3.5 (2.5, 5.0)	4.6 (3.3, 6.4)	6.8 (4.8, 9.4)
	Female	84	1292	2.9 (2.1, 4.0)	4.5 (3.5, 5.8)	6.1 (4.8, 7.7)	8.3 (6.7, 10.4)	9.7 (7.5, 12.5)
TOTAL		241	4437					

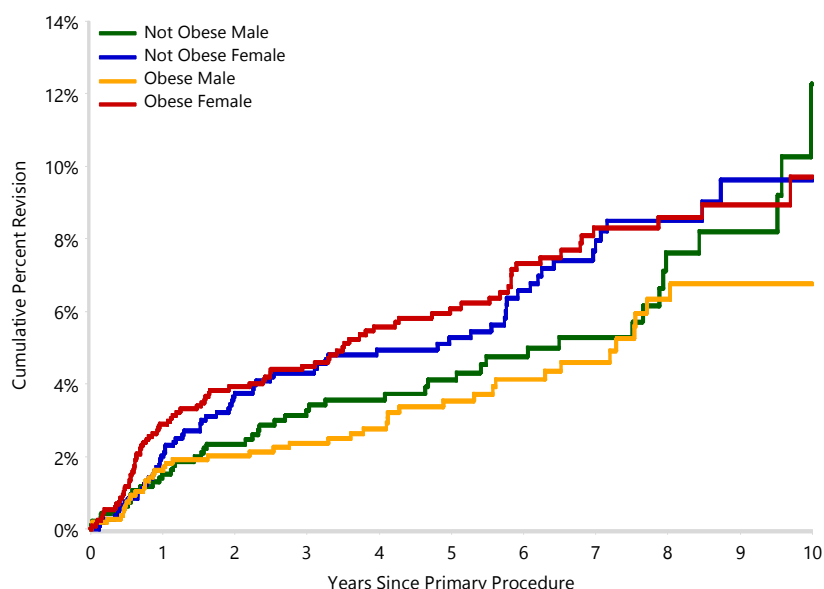
Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Figure ST50 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by BMI Category and Sex (Primary Diagnosis OA)



HR - adjusted for age

Not Obese Male vs Not Obese Female

Entire Period: HR=0.70 (95% CI 0.48, 1.02), p=0.066

Not Obese Male vs Obese Male

Entire Period: HR=1.35 (95% CI 0.89, 2.04), p=0.153

Not Obese Female vs Obese Female

Entire Period: HR=1.02 (95% CI 0.74, 1.40), p=0.912

Obese Male vs Obese Female

Entire Period: HR=0.53 (95% CI 0.36, 0.77), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Not Obese	Male	952	864	682	472	274	44
	Female	1096	995	801	569	343	57
Obese	Male	1097	993	793	557	331	56
	Female	1292	1168	941	697	425	86

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3



Primary Total Shoulder Replacement

Table ST58 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Morphology (Primary Diagnosis OA)

Glenoid Morphology	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
A1	65	1166	2.7 (1.9, 3.8)	3.9 (2.9, 5.2)	4.9 (3.7, 6.5)	8.1 (6.3, 10.6)	9.3 (7.0, 12.3)
A2	38	856	1.6 (0.9, 2.8)	3.5 (2.4, 5.1)	4.8 (3.4, 6.7)	6.8 (4.8, 9.8)	7.7 (5.2, 11.2)
B1	38	633	2.5 (1.5, 4.1)	4.4 (3.0, 6.4)	5.9 (4.1, 8.3)	7.6 (5.4, 10.8)	10.3 (7.0, 15.2)
B2	19	545	1.0 (0.4, 2.4)	2.7 (1.5, 4.7)	4.2 (2.6, 7.0)	5.9 (3.4, 10.2)	
C	2	94	1.1 (0.2, 7.5)	1.1 (0.2, 7.5)	1.1 (0.2, 7.5)	9.3 (1.7, 43.2)	
TOTAL	162	3294					

Note: Restricted to modern prostheses

Excludes 2,155 procedures with unknown glenoid morphology or recorded glenoid morphology of B3

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report



Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS – PROSTHESIS CHARACTERISTICS

Fixation

There is no difference in the rate of revision when cemented and hybrid (glenoid cemented) fixations are compared. There are too few procedures using cementless fixation for a comparative analysis to be undertaken (analysis restricted to >100 procedures) (Table ST59). Stratifying fixation by age group continues to show no difference in the risk of revision (Table ST60 and Figure ST51).

Non-modular metal backed glenoids have a higher rate of revision than other polyethylene glenoids.

Glenoid Types and Bearing Surfaces

There are four types of glenoids, all with a polyethylene bearing surface but differing methods of fixation to bone. Non- modular metal back glenoids have a polyethylene bearing surface with backside integrated metallic coating. Hybrid metal/polyethylene glenoids have a polyethylene bearing surface and one or more metallic fixation pegs. Cemented polyethylene glenoids with a modified central peg are all polyethylene but the central peg is further engineered for additional fixation to bone. All polyethylene glenoids are polyethylene fixed by cemented pegs or keels alone without further fixation features.

Modified central peg glenoids have a lower rate of revision compared to hybrid metal/polyethylene glenoids, cemented all polyethylene glenoids and non-modular metal backed glenoids for the first 6 months only (Table ST61 and Figure ST52).

Procedures with a metal/XLPE bearing surface (humeral head/glenoid) have a lower rate of revision compared to procedures with a metal/non XLPE bearing surface (Table ST62 and Figure ST53).

Metal/XLPE bearing surface has a lower rate of revision than metal/non XLPE.

Humeral Head Size

Humeral heads >50mm have a lower rate of revision compared to both <44mm and 44–50mm (Table ST63 and Figure ST54). When stratified by polyethylene type, both humeral sizes 44-50mm and >50mm, when combined with non XLPE polyethylene glenoids, have higher rates of revision than similar head sizes articulating with XLPE polyethylene glenoids (Table ST64, Figure ST55 and Figure ST56). The cumulative incidence revision diagnosis for the most common reasons for humeral head size revision is shown in Figure ST57.

Humeral head sizes >50mm have a lower rate of revision compared to smaller head sizes.

Table ST59 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Fixation (Primary Diagnosis OA)

Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Cemented	20	440	1.2 (0.5, 2.9)	3.4 (2.0, 5.9)	3.4 (2.0, 5.9)	7.8 (4.7, 12.7)		
Cementless	10	71	5.7 (2.2, 14.5)	9.1 (4.2, 19.1)	11.3 (5.5, 22.5)	11.3 (5.5, 22.5)	22.4 (11.9, 39.9)	
Hybrid (Glenoid Cemented)	292	4938	2.0 (1.6, 2.4)	3.5 (3.0, 4.1)	4.8 (4.2, 5.5)	6.1 (5.4, 7.0)	8.2 (7.2, 9.3)	11.6 (9.6, 13.9)
TOTAL	322	5449						

Note: Restricted to modern prostheses
Figures (with sufficient revisions) are not shown where the results are not statistically significant (p >0.05). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

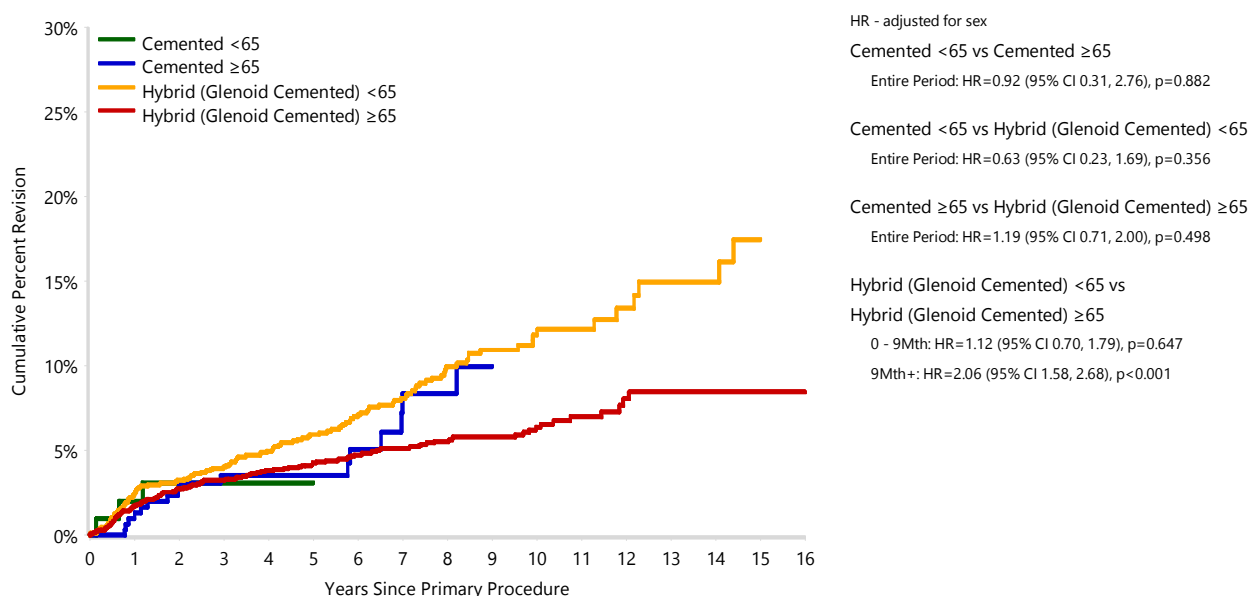
Primary Total Shoulder Replacement

Table ST60 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Fixation and Age (Primary Diagnosis OA)

Fixation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Cemented	<65	4	104	2.0 (0.5, 7.8)	3.1 (1.0, 9.3)	3.1 (1.0, 9.3)			
	≥65	16	336	1.0 (0.3, 3.0)	3.5 (1.9, 6.5)	3.5 (1.9, 6.5)	8.4 (4.8, 14.5)		
Hybrid (Glenoid Cemented)	<65	134	1687	2.5 (1.8, 3.3)	4.0 (3.2, 5.1)	5.9 (4.8, 7.3)	8.1 (6.7, 9.8)	11.8 (9.8, 14.3)	17.5 (13.2, 22.9)
	≥65	158	3251	1.7 (1.3, 2.2)	3.2 (2.7, 3.9)	4.3 (3.6, 5.1)	5.2 (4.4, 6.1)	6.4 (5.4, 7.6)	8.5 (6.7, 10.6)
TOTAL		312	5378						

Note: Restricted to modern prostheses

Figure ST51 Cumulative Percent Revision of Cemented Primary Total Stemmed Anatomic Shoulder Replacement by Fixation and Age (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Cemented	<65	104	92	60	44	24	7	1
	≥65	336	294	219	153	80	29	2
Hybrid (Glenoid Cemented)	<65	1687	1541	1287	971	668	281	51
	≥65	3251	3022	2549	1984	1395	567	95

Note: Restricted to modern prostheses



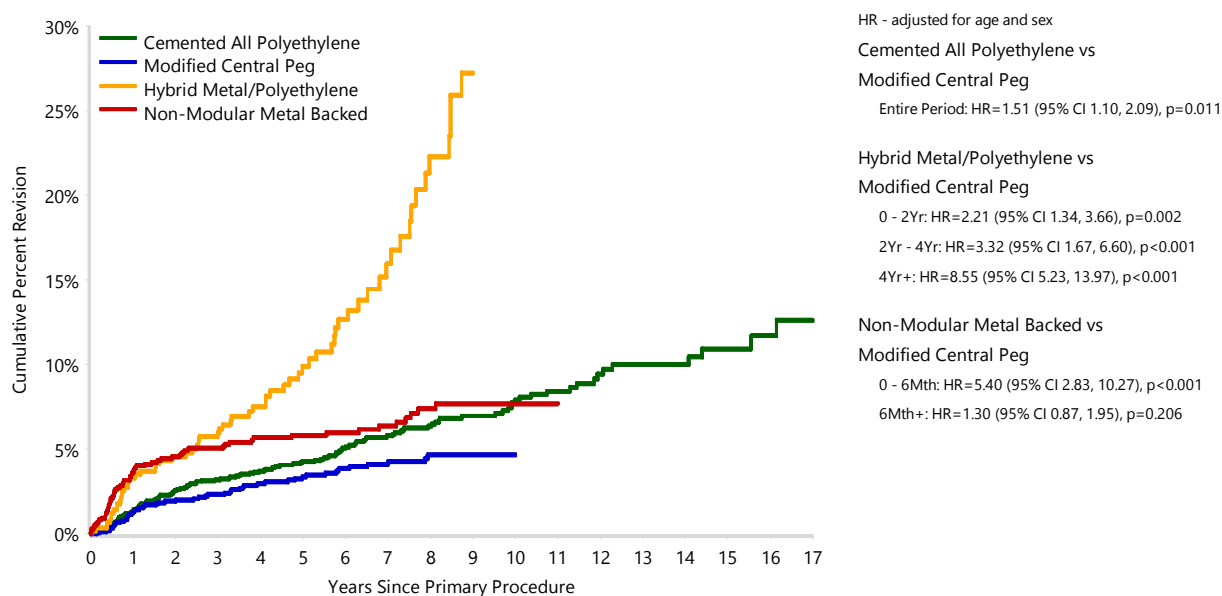
Primary Total Shoulder Replacement

Table ST61 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)

Glenoid Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Cemented All Polyethylene	140	2452	1.4 (1.0, 1.9)	3.2 (2.6, 4.0)	4.3 (3.5, 5.2)	5.8 (4.8, 7.0)	7.9 (6.6, 9.5)	10.9 (8.8, 13.5)
Modified Central Peg	52	1455	1.3 (0.8, 2.0)	2.3 (1.7, 3.3)	3.4 (2.5, 4.6)	4.3 (3.2, 5.6)	4.7 (3.5, 6.1)	
Hybrid Metal/Polyethylene	67	591	3.3 (2.1, 5.2)	6.0 (4.2, 8.4)	9.9 (7.4, 13.3)	15.9 (12.0, 21.0)		
Non-Modular Metal Backed	63	950	3.7 (2.7, 5.1)	5.0 (3.8, 6.7)	5.8 (4.5, 7.6)	6.4 (4.9, 8.2)	7.7 (5.9, 10.0)	
TOTAL	322	5448						

Note: Restricted to modern prostheses
Excludes 1 procedure with unknown glenoid type

Figure ST52 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Type (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15Yrs
Cemented All Polyethylene	2452	2251	1867	1421	1017	564	148
Modified Central Peg	1455	1377	1135	899	631	168	0
Hybrid Metal/Polyethylene	591	481	388	232	108	32	0
Non-Modular Metal Backed	950	901	773	630	437	133	1

Note: Restricted to modern prostheses
Excludes 1 procedure with unknown glenoid type

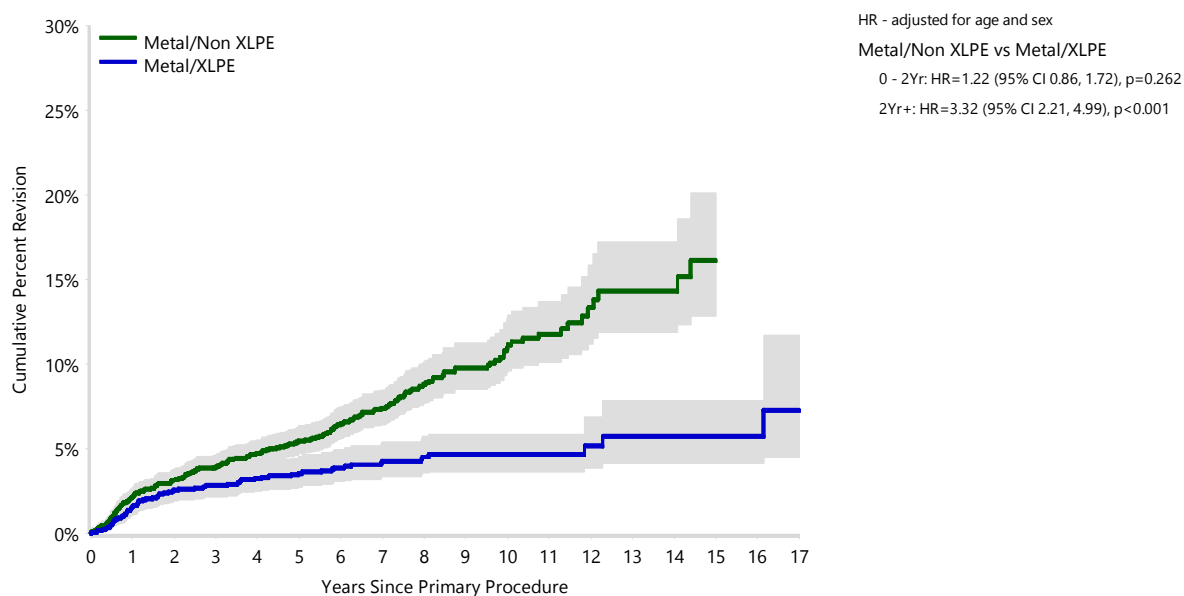
Primary Total Shoulder Replacement

Table ST62 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)

Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Ceramic/XLPE	1	1						
Metal/Non XLPE	247	3580	2.1 (1.7, 2.7)	3.9 (3.3, 4.7)	5.5 (4.7, 6.4)	7.4 (6.4, 8.5)	11.0 (9.5, 12.7)	16.1 (12.9, 20.1)
Metal/XLPE	74	1867	1.6 (1.1, 2.3)	2.8 (2.2, 3.7)	3.6 (2.8, 4.6)	4.3 (3.4, 5.4)	4.7 (3.7, 5.9)	5.7 (4.1, 7.9)
TOTAL	322	5448						

Note: Restricted to modern prostheses
 Reported as humeral head/glenoid
 Excludes 1 procedure with unknown glenoid type

Figure ST53 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Metal/Non XLPE	3580	3255	2691	1967	1272	486	64
Metal/XLPE	1867	1754	1472	1215	921	411	85

Note: Restricted to modern prostheses
 Reported as humeral head/glenoid
 Excludes 1 procedure with unknown glenoid type



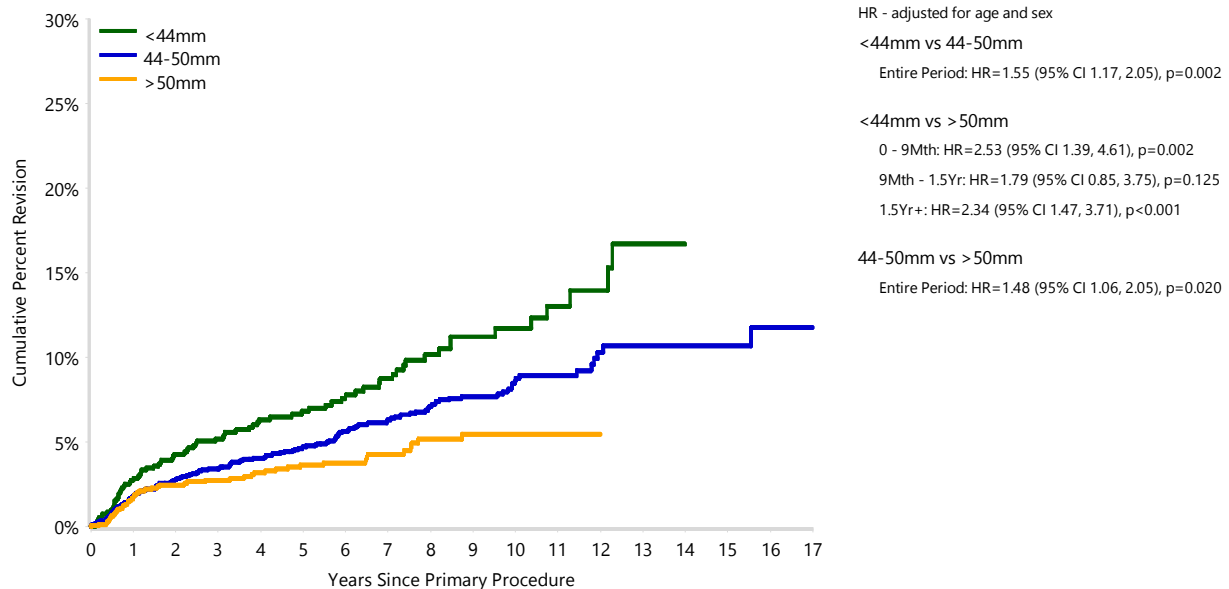
Primary Total Shoulder Replacement

Table ST63 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)

Humeral Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<44mm	81	938	2.8 (1.9, 4.1)	5.2 (3.9, 6.9)	6.8 (5.3, 8.8)	8.7 (6.8, 11.1)	11.7 (9.2, 14.9)	
44-50mm	189	3191	1.8 (1.4, 2.3)	3.4 (2.8, 4.2)	4.7 (4.0, 5.6)	6.3 (5.4, 7.4)	8.6 (7.3, 10.1)	10.7 (8.8, 13.0)
>50mm	52	1317	1.7 (1.1, 2.6)	2.7 (2.0, 3.8)	3.6 (2.7, 4.9)	4.3 (3.2, 5.7)	5.5 (4.1, 7.3)	
TOTAL	322	5446						

Note: Restricted to modern prostheses
Excludes 3 procedures with unknown head size

Figure ST54 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<44mm	938	849	710	539	354	154	26
44-50mm	3191	2946	2465	1887	1326	568	102
>50mm	1317	1214	987	756	513	175	21

Note: Restricted to modern prostheses
Excludes 3 procedures with unknown head size

Primary Total Shoulder Replacement

Table ST64 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size and Bearing Surface (Primary Diagnosis OA)

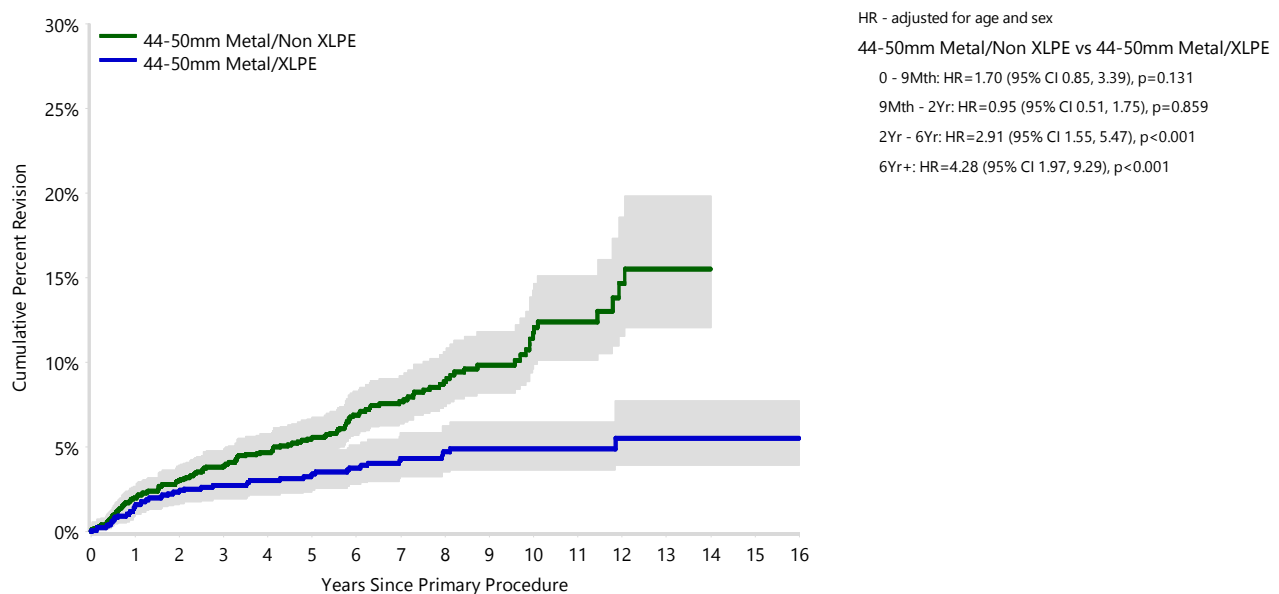
Humeral Head Size	Polyethylene Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
<44mm	Ceramic/XLPE	1	1						
	Metal/Non XLPE	69	816	2.8 (1.8, 4.2)	4.9 (3.6, 6.7)	6.6 (5.0, 8.8)	8.7 (6.6, 11.2)	12.2 (9.4, 15.8)	
	Metal/XLPE	11	121	2.6 (0.8, 7.7)	6.2 (3.0, 12.5)	7.2 (3.7, 14.0)	8.5 (4.5, 15.9)		
44-50mm	Metal/Non XLPE	141	1995	2.0 (1.4, 2.7)	3.9 (3.1, 4.9)	5.6 (4.6, 6.8)	7.7 (6.4, 9.2)	11.7 (9.6, 14.3)	
	Metal/XLPE	48	1196	1.5 (1.0, 2.4)	2.7 (1.9, 3.8)	3.4 (2.5, 4.7)	4.3 (3.2, 5.8)	4.9 (3.7, 6.5)	5.5 (3.9, 7.8)
>50mm	Metal/Non XLPE	37	767	1.9 (1.1, 3.2)	3.0 (2.0, 4.6)	4.1 (2.8, 5.9)	5.2 (3.6, 7.5)	7.5 (5.2, 10.8)	
	Metal/XLPE	15	550	1.5 (0.8, 3.0)	2.3 (1.3, 4.1)	3.1 (1.9, 5.1)	3.1 (1.9, 5.1)	3.1 (1.9, 5.1)	
TOTAL		322	5446						

Note: Restricted to modern prostheses

Excluding 3 procedures with unknown head size or bearing surface

Figures with <44mm head size comparison (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Figure ST55 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size and Bearing Surface (Primary Diagnosis OA)



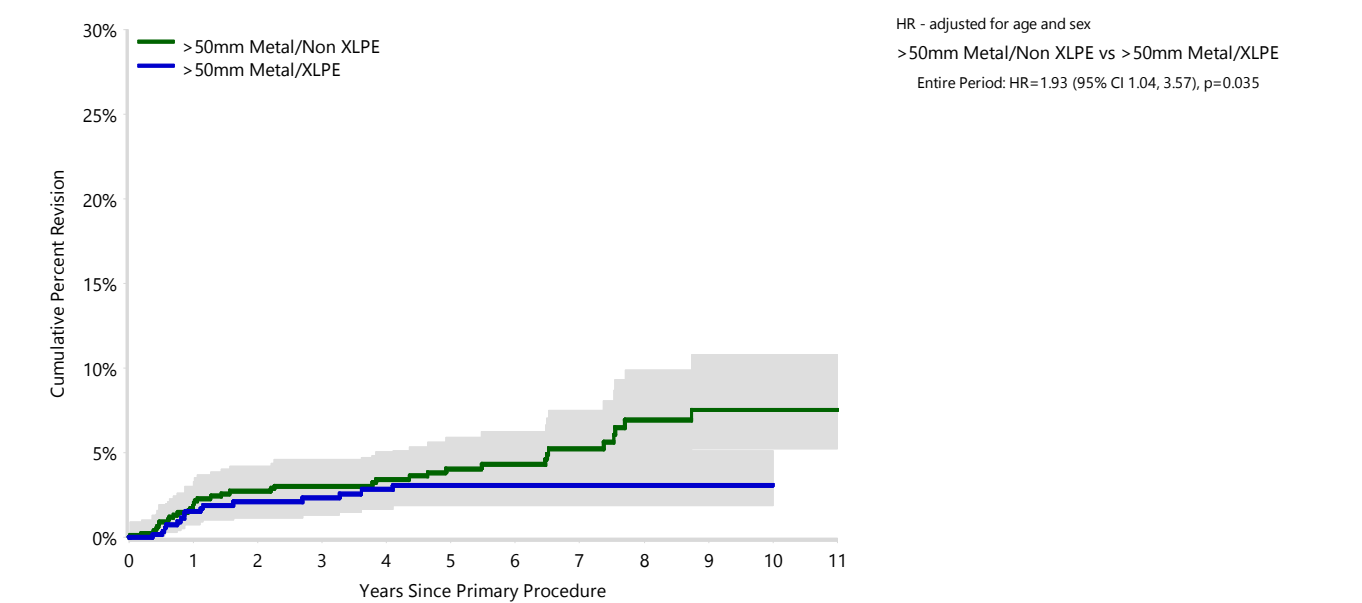
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
44-50mm	Metal/Non XLPE	1995	1814	1500	1088	700	268	38
	Metal/XLPE	1196	1132	965	799	626	300	64

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST56 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size and Bearing Surface (Primary Diagnosis OA)

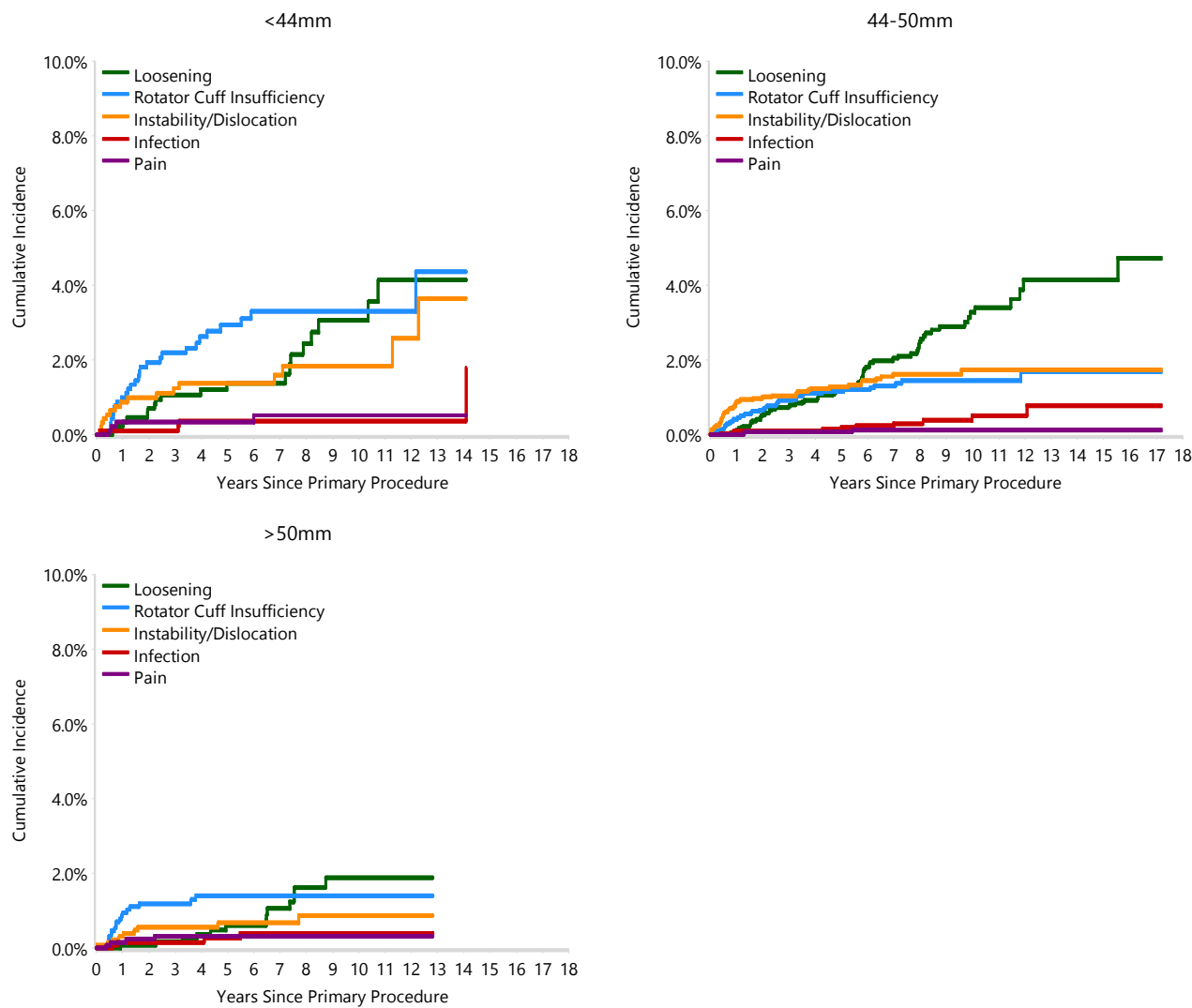


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
>50mm	Metal/Non XLPE	767	703	574	418	269	85	7
	Metal/XLPE	550	511	413	338	244	90	14

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST57 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Head Size (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

IMPLANT SIZING VARIATIONS (ISV)

ISV are modifications to a prosthesis design range beyond simple size change.

Glenoid Augmentation

A glenoid component is categorised as augmented if the backside has been modified for glenoid deformity (e.g. wedged, stepped, angulated, or lateralised). Augmented glenoids have a higher rate of revision than non-augmented prostheses (Table ST65 and Figure ST58). The reasons for revision are shown in Figure ST59.

When stratified by glenoid morphology, both class A and class B glenoids with an augmented glenoid component have a higher rate of revision compared to non-augmented glenoid components used for the same glenoid morphology classes (Table ST66, Figure ST60 and Figure ST61).

Augmented glenoids utilised for class A and B glenoid cases are predominantly revised for loosening (Figure ST62).

When stratified by bearing surface, metal/non-XLPE (humeral/glenoid) augmented glenoids have a higher rate of revision compared to non-augmented glenoids with the same bearing surface (Table ST67 and Figure ST63).

Humeral Stem Length

Humeral stem length is categorised as short if the size is <100mm or conventional if the size is ≥100mm. Humeral stem length is a revision risk for a conventional stem after 1.5 years (Table ST68 and Figure ST64). Total stemmed anatomic primary shoulder replacements with conventional humeral stems are more commonly revised for loosening (Figure ST65).

Conventional humeral stem length combined with a metal/non-XLPE bearing surface (humeral/glenoid) has a higher rate of revision than short humeral stems with the same bearing surface after 9 months, and with metal/XLPE bearing surface with conventional stem lengths. In contrast, short humeral stems combined with XLPE have a higher revision risk than conventional length humeral components with the same bearing surface (Table ST69 and Figure ST66).

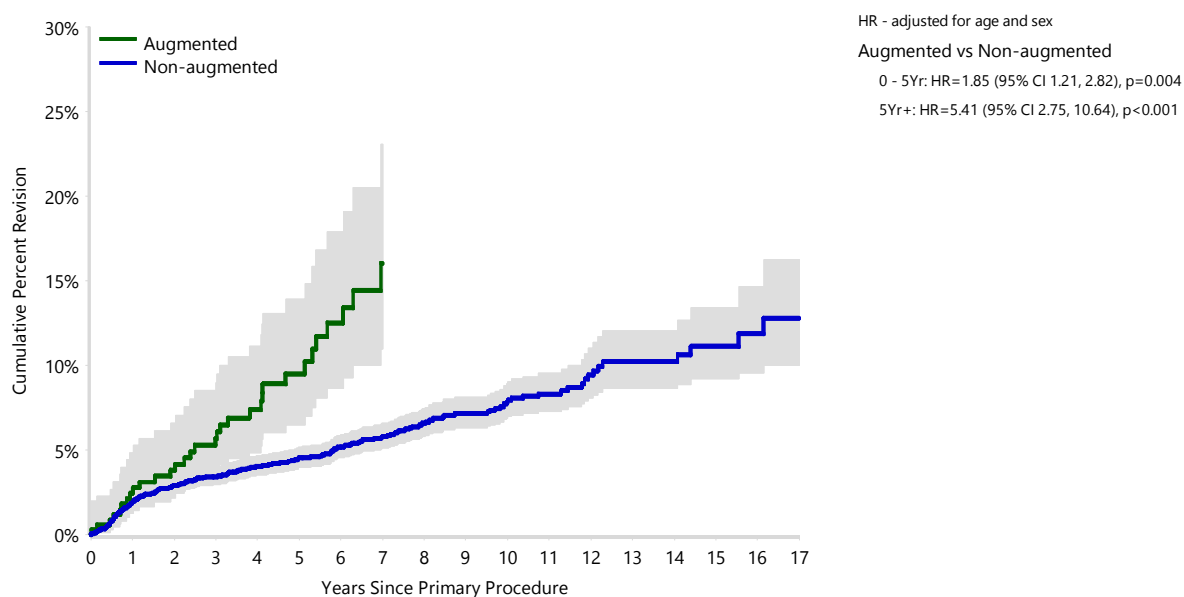
Primary Total Shoulder Replacement

Table ST65 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)

Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Augmented	35	347	2.5 (1.2, 4.9)	5.7 (3.6, 9.0)	9.5 (6.5, 13.9)	16.0 (11.0, 23.1)		
Non-augmented	287	5101	1.9 (1.6, 2.3)	3.4 (3.0, 4.0)	4.5 (4.0, 5.2)	5.8 (5.1, 6.6)	7.9 (6.9, 8.9)	11.1 (9.2, 13.4)
TOTAL	322	5448						

Note: Restricted to modern prostheses
Excludes 1 procedure with unknown glenoid augmentation

Figure ST58 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)



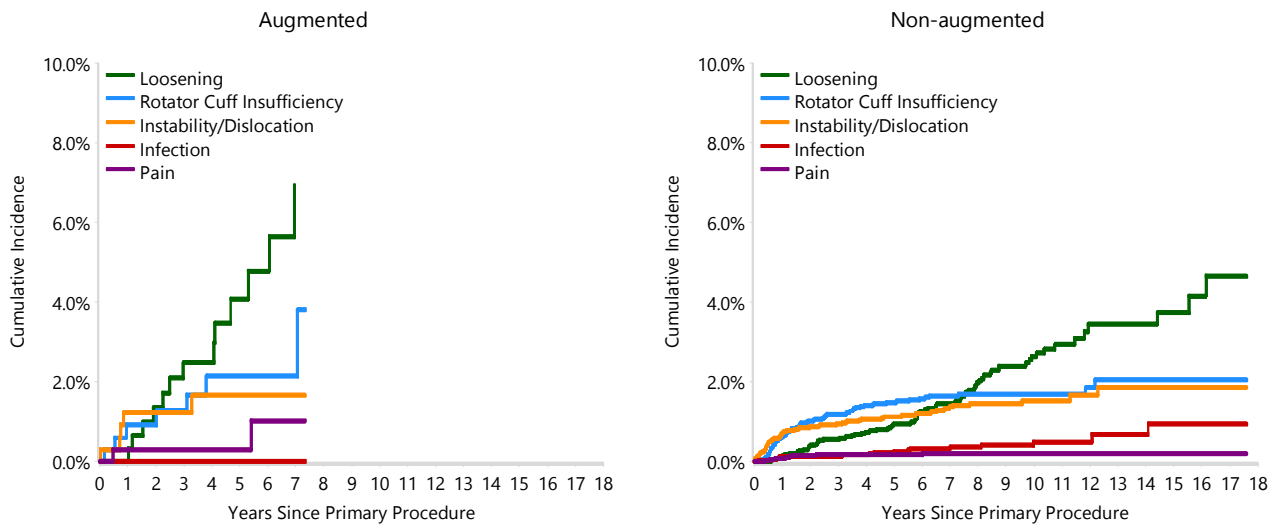
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Augmented	347	301	236	134	50	3	0
Non-augmented	5101	4709	3927	3048	2143	894	149

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST59 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

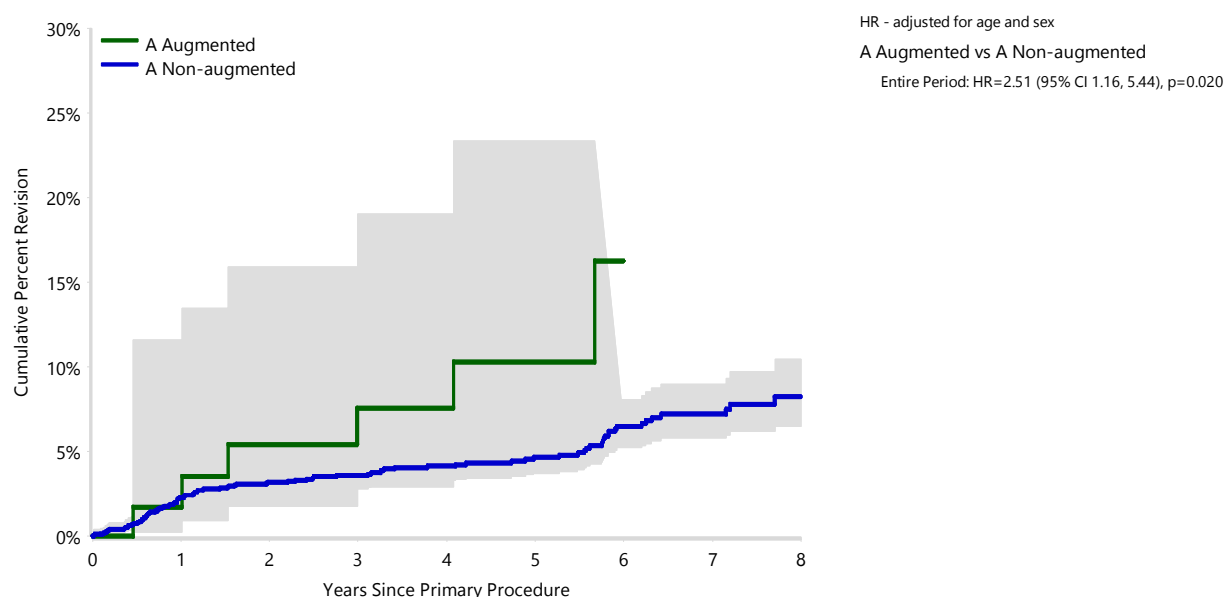
Table ST66 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Morphology and Glenoid Augmentation (Primary Diagnosis OA)

Glenoid Morphology	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
A	Augmented	7	59	1.7 (0.2, 11.6)	7.6 (2.9, 19.0)	10.3 (4.3, 23.4)	16.3 (6.7, 36.5)		
	Non-augmented	96	1963	2.3 (1.7, 3.0)	3.6 (2.8, 4.6)	4.7 (3.7, 5.8)	6.5 (5.2, 8.1)	7.2 (5.8, 9.0)	8.3 (6.5, 10.5)
B	Augmented	18	214	1.6 (0.5, 4.8)	3.5 (1.6, 7.7)	8.0 (4.4, 14.4)	12.0 (7.1, 20.1)		
	Non-augmented	39	964	1.9 (1.2, 3.0)	3.6 (2.6, 5.1)	4.6 (3.3, 6.3)	4.6 (3.3, 6.3)	5.0 (3.5, 7.0)	6.8 (4.3, 10.6)
C	Augmented	0	25	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
	Non-augmented	2	69	1.5 (0.2, 10.3)	1.5 (0.2, 10.3)	1.5 (0.2, 10.3)	1.5 (0.2, 10.3)	11.4 (2.1, 49.4)	
TOTAL		162	3294						

Note: Restricted to modern prostheses

Excludes 2,155 procedures with unknown glenoid augmentation or glenoid morphology

Figure ST60 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement with Glenoid Morphology A by Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
A	Augmented	59	54	43	20	12	3	0
	Non-augmented	1963	1739	1311	821	602	364	149

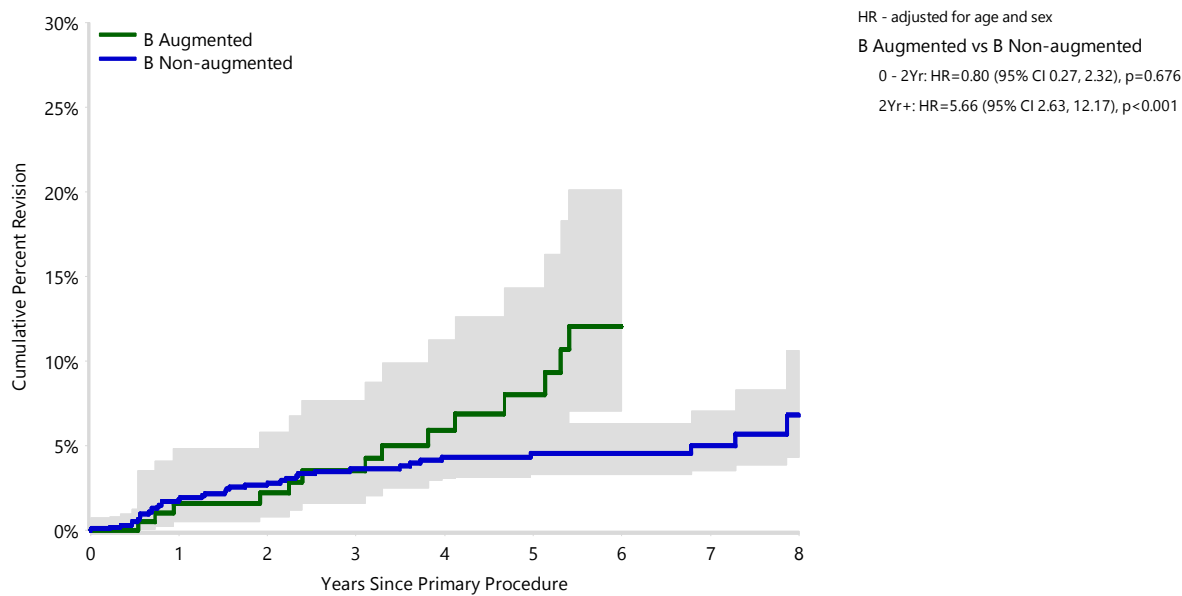
Note: Restricted to modern prostheses

Excludes 2,155 procedures with unknown glenoid augmentation or glenoid morphology



Primary Total Shoulder Replacement

Figure ST61 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement with Glenoid Morphology B by Glenoid Augmentation (Primary Diagnosis OA)

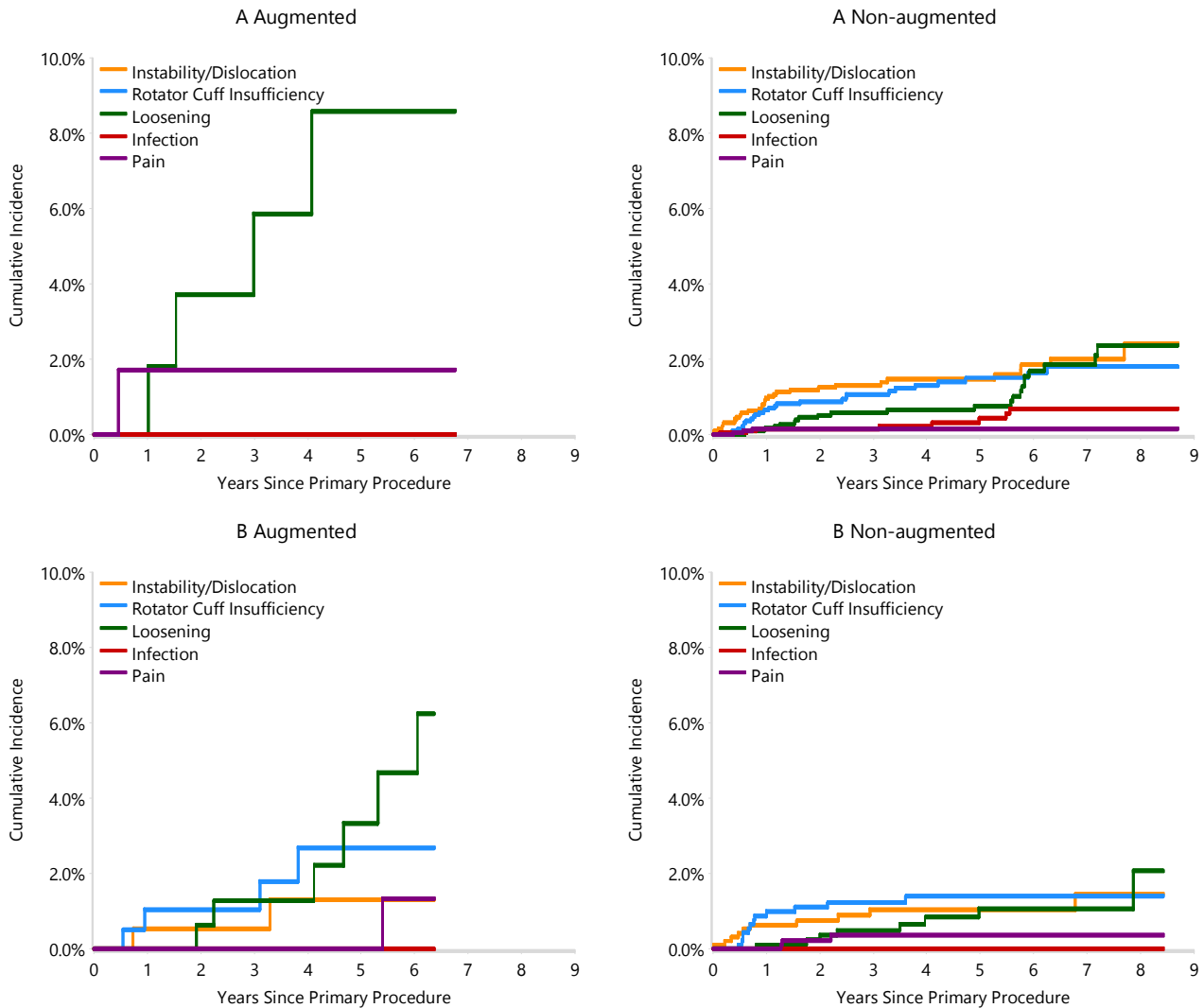


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
B	Augmented	214	178	134	75	56	25	7
	Non-augmented	964	867	638	418	312	184	71

Note: Restricted to modern prostheses
Excludes 2,155 procedures with unknown glenoid augmentation or glenoid morphology

Primary Total Shoulder Replacement

Figure ST62 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Glenoid Morphology and Glenoid Augmentation (Primary Diagnosis OA)



Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST67 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface and Glenoid Augmentation (Primary Diagnosis OA)

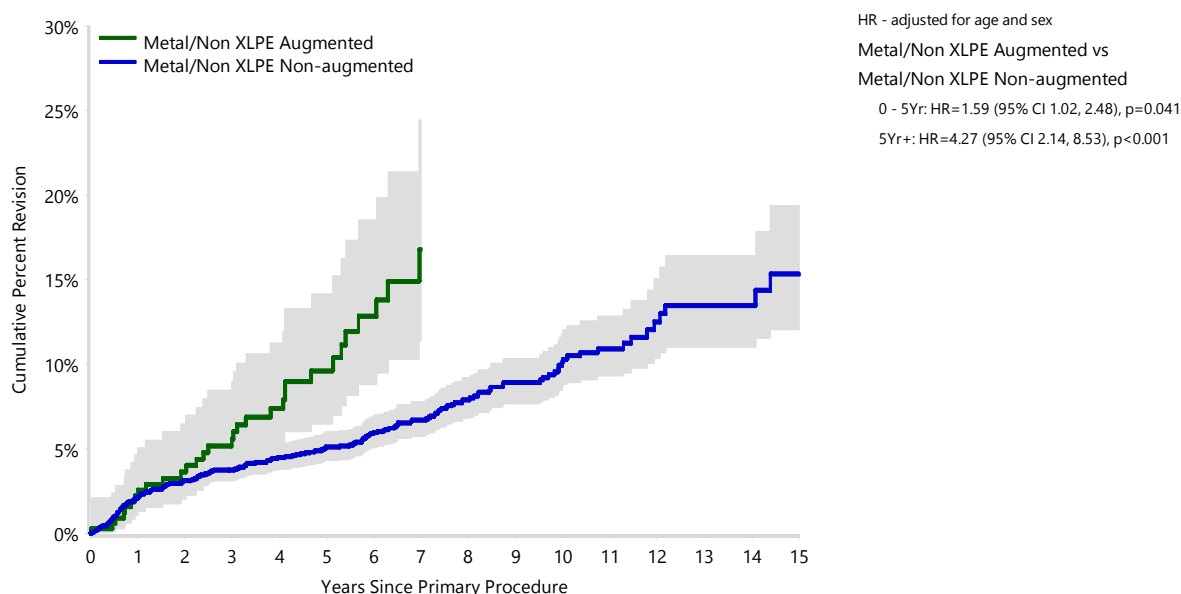
Bearing Surface	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Ceramic/XLPE	Non-augmented	1	1					
Metal/Non XLPE	Augmented	34	335	2.2 (1.1, 4.6)	5.6 (3.5, 9.0)	9.6 (6.5, 14.2)	16.8 (11.3, 24.4)	
	Non-augmented	213	3245	2.1 (1.7, 2.7)	3.8 (3.2, 4.5)	5.1 (4.4, 6.0)	6.7 (5.8, 7.8)	7.9 (6.8, 9.2)
Metal/XLPE	Augmented	1	12	8.3 (1.2, 46.1)	8.3 (1.2, 46.1)	8.3 (1.2, 46.1)	8.3 (1.2, 46.1)	8.3 (1.2, 46.1)
	Non-augmented	73	1855	1.6 (1.1, 2.2)	2.8 (2.1, 3.7)	3.5 (2.7, 4.5)	4.3 (3.3, 5.4)	4.5 (3.5, 5.7)
TOTAL		322	5448					

Note: Restricted to modern prostheses

Excludes 1 procedure with unknown glenoid augmentation or bearing surface

Bearing surface reported as humeral head/glenoid

Figure ST63 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement with Metal/Non XLPE Bearing Surface and Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Metal/Non XLPE	Augmented	335	291	226	125	43	18
	Non-augmented	3245	2964	2465	1842	1229	925

Note: Restricted to modern prostheses

Excludes 1 procedure with unknown glenoid augmentation or bearing surface

Bearing surface reported as humeral head/glenoid

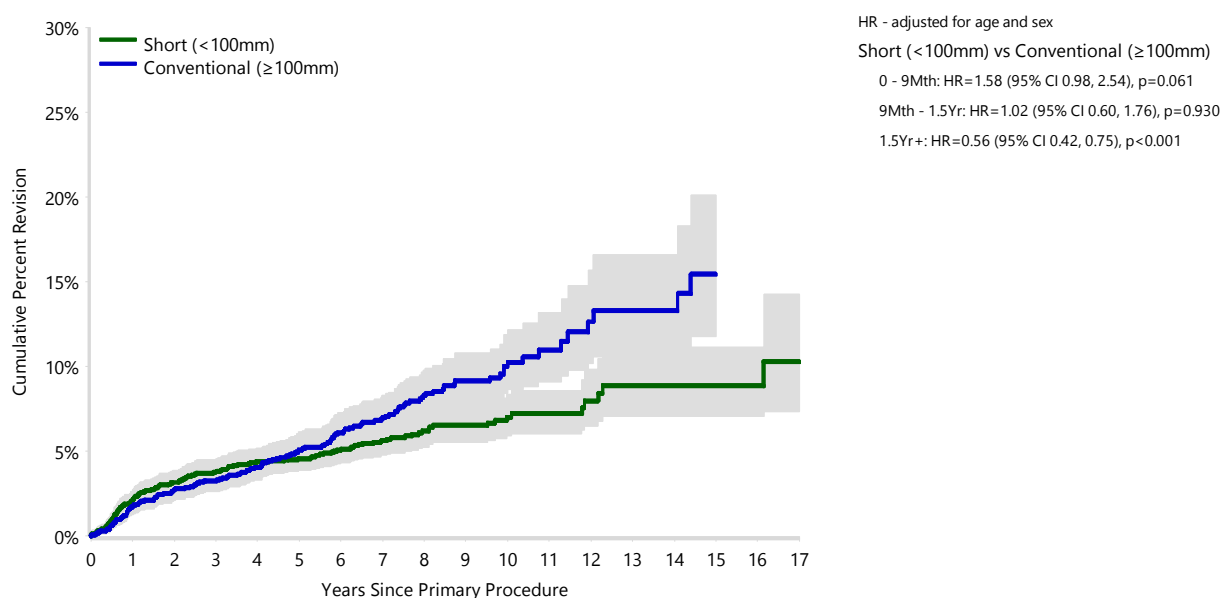
Primary Total Shoulder Replacement

Table ST68 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)

Humeral Stem Length	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Short (<100mm)	160	3140	2.1 (1.7, 2.7)	3.8 (3.2, 4.6)	4.6 (3.9, 5.4)	5.6 (4.8, 6.6)	7.0 (5.9, 8.4)	8.9 (7.0, 11.1)
Conventional (≥100mm)	162	2309	1.7 (1.3, 2.4)	3.3 (2.6, 4.1)	5.1 (4.2, 6.2)	7.0 (5.9, 8.3)	10.0 (8.4, 11.9)	15.4 (11.8, 20.1)
TOTAL	322	5449						

Note: Restricted to modern prostheses

Figure ST64 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)



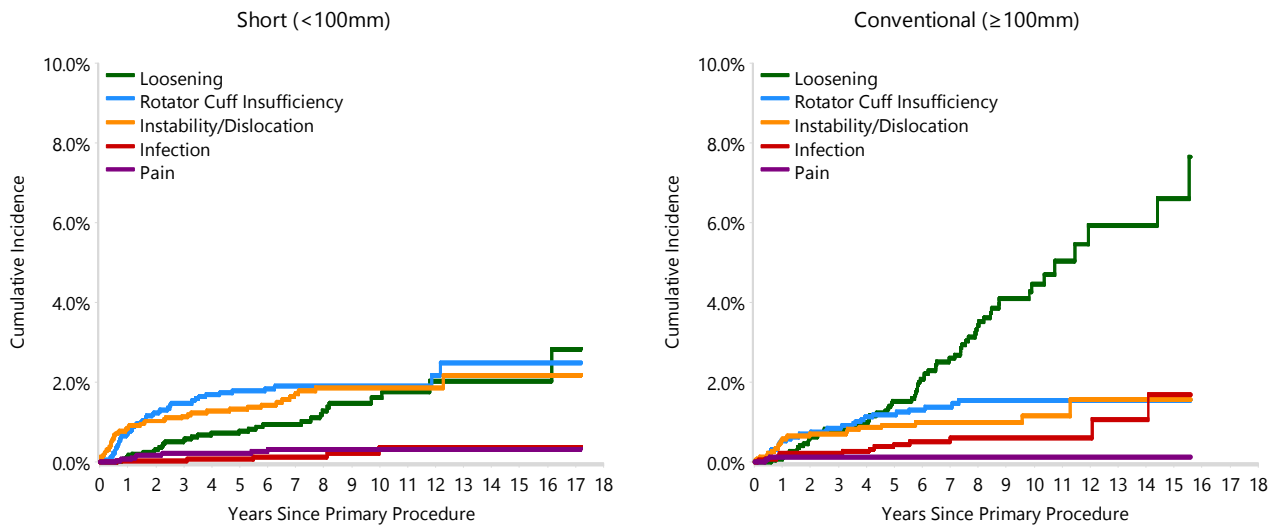
Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Short (<100mm)	3140	2819	2296	1727	1163	513	94
Conventional (≥100mm)	2309	2191	1867	1455	1030	384	55

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST65 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Anatomic Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)



Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Table ST69 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface and Humeral Stem Length (Primary Diagnosis OA)

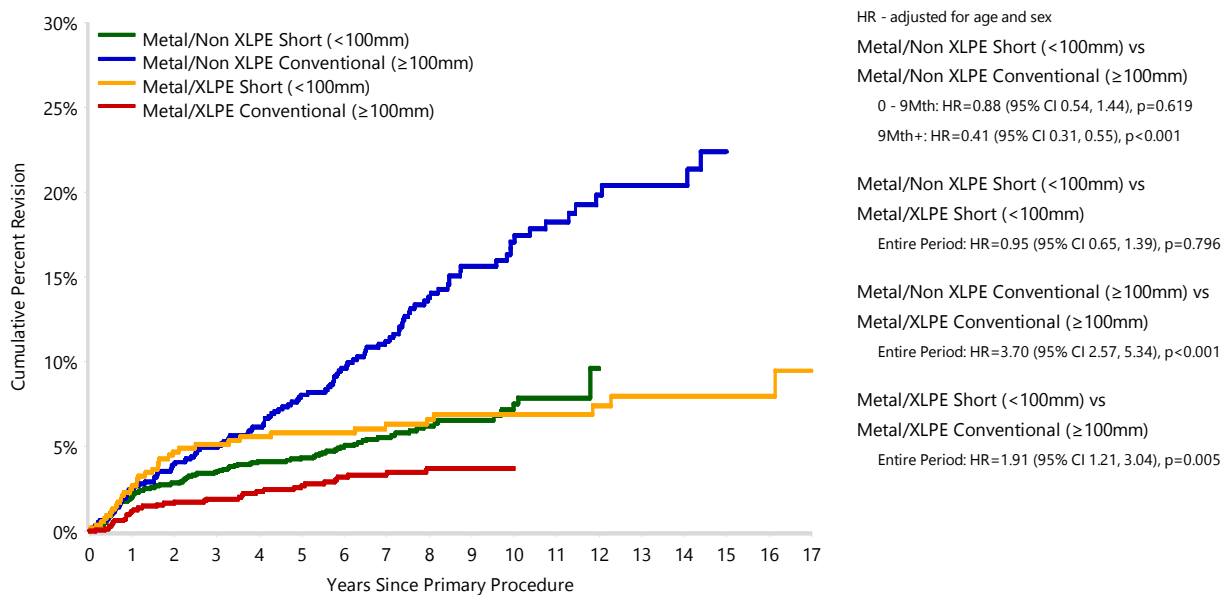
Bearing Surface	Humeral Stem Length	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Ceramic/XLPE	Conventional (≥100mm)	1	1						
Metal/Non XLPE	Short (<100mm)	124	2603	2.0 (1.5, 2.6)	3.5 (2.8, 4.3)	4.3 (3.6, 5.3)	5.5 (4.6, 6.7)	7.5 (6.0, 9.4)	
	Conventional (≥100mm)	123	977	2.5 (1.7, 3.7)	4.9 (3.7, 6.5)	8.0 (6.4, 10.1)	11.2 (9.2, 13.7)	17.1 (14.1, 20.5)	22.4 (18.1, 27.5)
Metal/XLPE	Short (<100mm)	36	537	2.7 (1.6, 4.5)	5.1 (3.5, 7.4)	5.8 (4.1, 8.2)	6.3 (4.5, 8.9)	6.9 (4.9, 9.6)	8.0 (5.7, 11.1)
	Conventional (≥100mm)	38	1330	1.2 (0.7, 1.9)	1.9 (1.3, 2.8)	2.7 (1.9, 3.8)	3.5 (2.5, 4.8)	3.7 (2.7, 5.1)	
TOTAL		322	5448						

Note: Restricted to modern prostheses

Excludes 1 procedure with unknown humeral stem length or bearing surface

Bearing surface reported as humeral head/glenoid

Figure ST66 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Bearing Surface and Humeral Stem Length (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Metal/Non XLPE	Short (<100mm)	2603	2323	1857	1333	826	265	9
	Conventional (≥100mm)	977	932	834	634	446	221	55
Metal/XLPE	Short (<100mm)	537	496	439	394	337	248	85
	Conventional (≥100mm)	1330	1258	1033	821	584	163	0

Note: Restricted to modern prostheses

Bearing surface reported as humeral head/glenoid



Primary Total Shoulder Replacement

SURGEON ASSISTIVE TOOLS (SAT)

An image derived instrument (IDI) is defined as custom made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient. Traditional instrumentation is defined as no SAT has been recorded in the implantation of the prosthesis. There are 982 total stemmed anatomic shoulder replacements for osteoarthritis utilising an IDI since their first use in 2014.

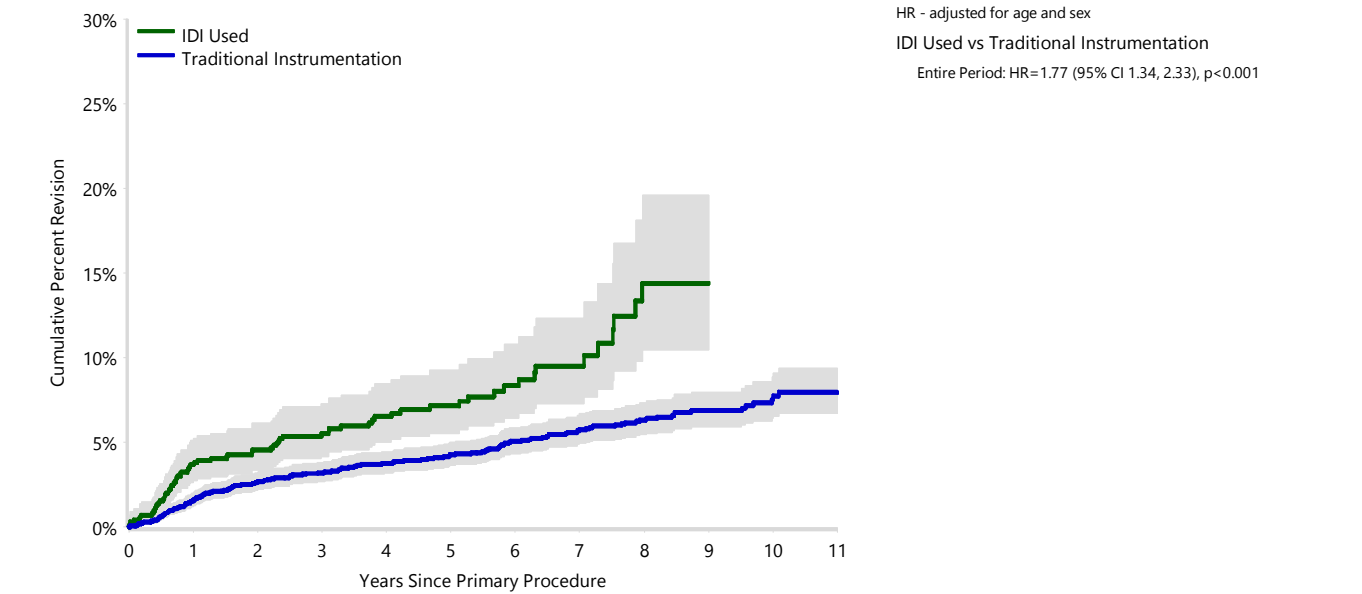
In 2025, IDI are used in 37% of total stemmed anatomic shoulder replacement procedures. There is an increase in the revision rate associated with IDI usage (Table ST70 and Figure ST67). IDI usage and glenoid morphology are listed in Table ST71. IDI usage with glenoid morphology class B is associated with an increased risk of revision (Figure ST68).

Table ST70 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Since 2014 by IDI Usage (Primary Diagnosis OA)

IDI Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
IDI Used	70	982	3.7 (2.6, 5.1)	5.5 (4.2, 7.3)	7.2 (5.5, 9.2)	9.5 (7.3, 12.4)		
Traditional instrumentation	196	3895	1.6 (1.2, 2.0)	3.2 (2.7, 3.8)	4.3 (3.6, 5.0)	5.8 (5.0, 6.7)	7.5 (6.4, 8.9)	8.0 (6.7, 9.4)
TOTAL	266	4877						

Note: Restricted to modern prostheses

Figure ST67 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Since 2014 by IDI Usage (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs
IDI Used	981	830	624	360	151	22	5
Traditional Instrumentation	3895	3621	3001	2313	1561	458	170

Note: Restricted to modern prosthesesTable ST71 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement Since 2014 by IDI Usage and Glenoid Morphology (Primary Diagnosis OA)



Primary Total Shoulder Replacement

IDI Use	Glenoid Morphology	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
IDI Used	A1	14	221	3.9 (2.0, 7.6)	5.0 (2.7, 9.2)	6.0 (3.3, 10.7)	9.6 (5.1, 17.6)		
	A2	15	232	3.2 (1.5, 6.6)	5.0 (2.7, 9.1)	7.6 (4.3, 13.0)	9.2 (5.2, 15.9)		
	B1	18	154	4.2 (1.9, 9.1)	6.7 (3.5, 12.5)	10.9 (6.4, 18.3)			
	B2	9	207	2.2 (0.8, 5.7)	4.4 (2.1, 9.0)	5.7 (2.8, 11.6)	5.7 (2.8, 11.6)		
	C	0	35	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
Traditional Instrumentation	A1	51	944	2.4 (1.6, 3.6)	3.6 (2.6, 5.1)	4.7 (3.4, 6.4)	6.9 (5.1, 9.3)	7.5 (5.6, 10.1)	8.8 (6.4, 12.1)
	A2	23	624	1.0 (0.5, 2.3)	3.0 (1.8, 4.8)	3.8 (2.4, 6.0)	4.8 (3.0, 7.5)	5.4 (3.4, 8.5)	6.3 (3.9, 10.2)
	B1	20	479	1.9 (1.0, 3.7)	3.6 (2.2, 5.9)	4.3 (2.7, 6.8)	4.8 (3.0, 7.5)	5.5 (3.4, 8.8)	
	B2	10	338	0.3 (0.0, 2.3)	1.8 (0.7, 4.2)	3.4 (1.7, 6.9)	4.1 (2.1, 8.0)	5.8 (2.8, 11.7)	
	C	2	59	1.8 (0.3, 12.0)	1.8 (0.3, 12.0)	1.8 (0.3, 12.0)	1.8 (0.3, 12.0)	14.1 (2.6, 58.0)	
TOTAL		162	3293						

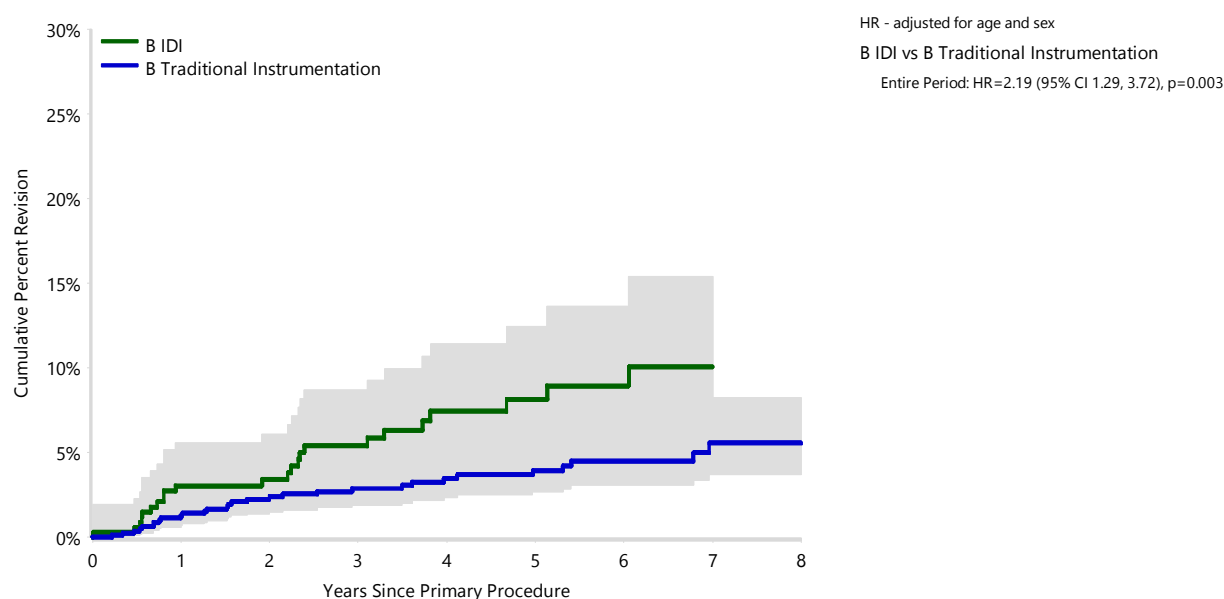
Note: Restricted to modern prostheses

Excludes 1,584 procedures with unknown/B3 glenoid morphology

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Figure ST68 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement with B Glenoid Morphology Since 2014 by IDI Usage (Primary Diagnosis OA)



Number at Risk		0 Yrs	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
IDI	B	361	298	213	119	82	43	13
Traditional Instrumentation		817	747	559	374	286	166	65

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

OPERATIVE TECHNIQUE

Rotator Cuff Repair

When the rotator cuff is repaired as part of a primary total stemmed anatomic replacement procedure, there is no difference in the rate of revision compared to when it is not repaired (Table ST72).

Table ST72 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis OA)

Rotator Cuff Repair	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs
Yes	8	314	2.2 (1.0, 4.9)	2.7 (1.3, 5.6)	3.6 (1.7, 7.4)	
No	21	748	2.3 (1.3, 3.8)	3.1 (2.0, 4.9)	3.8 (2.4, 5.9)	4.3 (2.7, 6.9)
TOTAL	29	1062				

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

PROSTHESIS COMBINATIONS BY PRIMARY DIAGNOSIS

The outcome of the most used (>50 procedures) prosthesis combinations is listed in Table ST73. The most commonly used cementless prosthesis combinations are listed in Table ST74.

The most commonly used prosthesis combinations with cemented and hybrid (glenoid cemented) fixation are listed in Table ST75 and Table ST76, respectively.

Table ST73 Cumulative Percent Revision of Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Affinis	Affinis	22	208	0.0 (0.0, 0.0)	2.1 (0.8, 5.6)	5.0 (2.6, 9.4)	6.2 (3.5, 10.9)	8.8 (5.4, 14.2)	14.2 (9.3, 21.2)
Ascend Flex	Perform	57	1526	1.0 (0.6, 1.6)	2.3 (1.6, 3.3)	3.3 (2.4, 4.5)	4.9 (3.7, 6.5)	7.6 (5.4, 10.8)	
Comprehensive	Alliance	2	115	2.3 (0.6, 9.2)					
	Comprehensive	63	937	3.7 (2.7, 5.2)	5.1 (3.9, 6.7)	5.9 (4.5, 7.6)	6.4 (5.0, 8.3)	7.8 (6.0, 10.0)	
Equinox	Equinox	100	747	3.0 (2.0, 4.5)	6.1 (4.6, 8.1)	9.4 (7.4, 12.0)	14.1 (11.3, 17.4)	24.6 (19.5, 30.8)	
Global Unite	Global	39	1327	1.2 (0.7, 1.9)	2.0 (1.3, 2.9)	2.7 (1.9, 3.8)	3.5 (2.5, 4.8)	3.7 (2.7, 5.1)	
SMR	SMR	37	562	2.4 (1.4, 4.1)	4.9 (3.4, 7.1)	5.5 (3.9, 7.9)	6.3 (4.5, 8.8)	6.9 (4.9, 9.5)	7.8 (5.6, 10.8)
Other (5)		2	27	10.2 (2.6, 35.2)	10.2 (2.6, 35.2)	10.2 (2.6, 35.2)			
TOTAL		322	5449						

Note: Restricted to modern prostheses

Only prostheses with > 50 procedures have been listed



Primary Total Shoulder Replacement

Table ST74 Cumulative Percent Revision of Cementless Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs
Affinis	Affinis	0	12	0.0 (0.0, 0.0)						
Equinox	Equinox	10	56	7.1 (2.7, 17.9)	10.7 (5.0, 22.3)	13.0 (6.4, 25.5)	13.0 (6.4, 25.5)	20.4 (10.6, 37.1)	24.4 (13.2, 42.4)	24.4 (13.2, 42.4)
Other (2)		0	3	0.0 (0.0, 0.0)						
TOTAL		10	71							

Note: Restricted to modern prostheses

Only prostheses with > 10 procedures have been listed

Table ST75 Cumulative Percent Revision of Cemented Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Ascend Flex	Perform	9	240	0.9 (0.2, 3.5)	2.2 (0.8, 5.9)	2.2 (0.8, 5.9)	6.9 (3.0, 15.2)		
Comprehensive	Comprehensive	0	10	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)
Equinox	Equinox	2	30	3.3 (0.5, 21.4)	6.9 (1.8, 25.0)	6.9 (1.8, 25.0)	6.9 (1.8, 25.0)	6.9 (1.8, 25.0)	6.9 (1.8, 25.0)
Global Unite	Global	5	130	1.6 (0.4, 6.1)	3.1 (1.2, 8.1)	3.1 (1.2, 8.1)	3.1 (1.2, 8.1)		
SMR	SMR	3	21	0.0 (0.0, 0.0)	10.0 (2.6, 34.4)	10.0 (2.6, 34.4)	10.0 (2.6, 34.4)	16.4 (5.5, 43.2)	16.4 (5.5, 43.2)
Other (2)		1	9	0.0 (0.0, 0.0)	14.3 (2.1, 66.6)	14.3 (2.1, 66.6)	14.3 (2.1, 66.6)	14.3 (2.1, 66.6)	14.3 (2.1, 66.6)
TOTAL		20	440						

Note: Restricted to modern prostheses

Only prostheses with over 10 procedures have been listed

Table ST76 Cumulative Percent Revision of Hybrid (Glenoid Cemented) Primary Total Stemmed Anatomic Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Affinis	Affinis	21	190	0.0 (0.0, 0.0)	1.7 (0.5, 5.1)	4.6 (2.3, 9.1)	5.9 (3.2, 10.6)	8.5 (5.1, 13.9)	14.0 (9.1, 21.1)
Ascend Flex	Perform	48	1286	1.0 (0.6, 1.7)	2.3 (1.6, 3.4)	3.4 (2.5, 4.7)	4.5 (3.3, 6.1)	7.0 (4.8, 10.3)	
Comprehensive	Alliance	2	112	2.4 (0.6, 9.4)					
	Comprehensive	63	926	3.8 (2.7, 5.2)	5.2 (3.9, 6.8)	5.9 (4.6, 7.7)	6.5 (5.0, 8.4)	7.9 (6.1, 10.2)	
Equinox	Equinox	88	661	2.6 (1.6, 4.2)	5.7 (4.1, 7.8)	9.2 (7.1, 11.9)	14.5 (11.5, 18.2)	25.4 (19.6, 32.5)	
Global Unite	Global	34	1195	1.1 (0.7, 1.9)	1.9 (1.2, 2.8)	2.7 (1.8, 3.9)	3.4 (2.4, 4.7)	3.6 (2.5, 5.0)	
SMR	SMR	34	541	2.5 (1.4, 4.2)	4.7 (3.2, 6.9)	5.4 (3.7, 7.7)	5.9 (4.1, 8.4)	6.5 (4.6, 9.1)	7.4 (5.2, 10.5)
Other (5)		2	27	10.2 (2.6, 35.2)	10.2 (2.6, 35.2)	10.2 (2.6, 35.2)			
TOTAL		292	4938						

Note: Restricted to modern prostheses

Only prostheses with > 50 procedures have been listed

Primary Total Shoulder Replacement

Primary Total Stemmed Reverse Shoulder Replacement

DEMOGRAPHICS

There are 76,716 primary total stemmed reverse shoulder replacement procedures. This is an increase of 10,109 procedures compared to the previous report.

For further information on the closure of the database please see the **Glossary** of this report.

The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) is created by the Australian Bureau of Statistics as a summary measure of the socioeconomic status for each geographical area.²⁰ An IRSAD rating of 1 indicates the most socioeconomically disadvantaged region, while a rating of 10 indicates the most advantaged. Each Australian region has differing rates of social advantage and disadvantage.

Percentages of primary total stemmed reverse shoulder replacements from regions rated IRSAD 1-2 and 9-10 by state and territory are shown in Figure ST69 and Figure ST70.

Percentages of primary total stemmed reverse shoulder replacements from regions rated IRSAD 1-2 and 9-10 by hospital locality are shown in Figure ST71 and Figure ST72.

Osteoarthritis is the most common diagnosis for primary total stemmed reverse shoulder replacement followed by rotator cuff arthropathy and fracture (Figure ST73).

Primary total stemmed reverse shoulder replacement is more commonly undertaken in females who are older on average than males (Table ST77). The percentage of male patients has increased by 6.4% compared to 2016.

The proportional use in patients aged ≥ 75 years has increased and is the predominant age group.

The majority of procedures use cementless fixation followed by hybrid (humerus cemented) fixation. There has been increase in cementless fixation since 2014 (Figure ST74).

The polyethylene type used in total stemmed reverse shoulder replacement in 2025 is now almost equal in proportion between XLPE (54.9%) and non XLPE (45.1%) (Figure ST75).

The most commonly used humeral stems are listed in Table ST78. The most used glenoid prostheses are listed in Table ST79.

The most common primary diagnoses are osteoarthritis, rotator cuff arthropathy, and fracture.

Figure ST69 Percentage of Primary Total Stemmed Reverse Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by State (All Diagnoses)

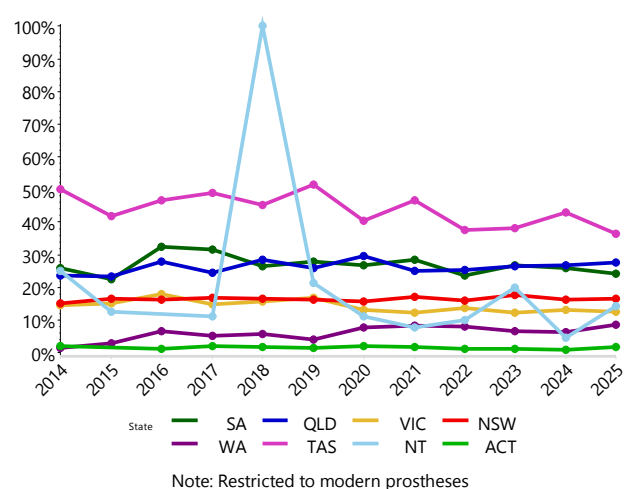
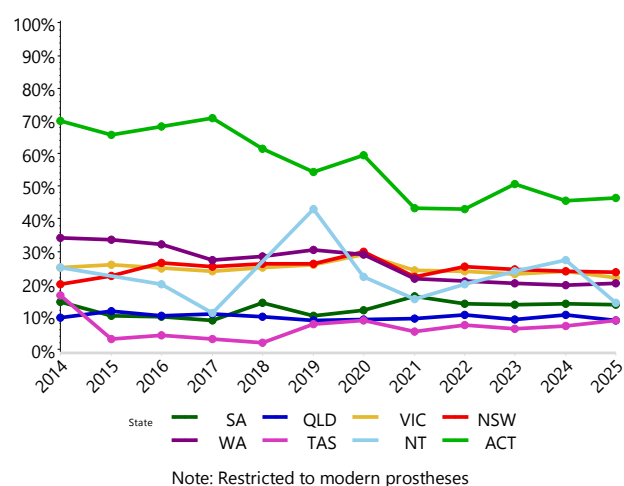


Figure ST70 Percentage of Primary Total Stemmed Reverse Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by State (All Diagnoses)



²⁰ <https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/latest-release>

Primary Total Shoulder Replacement

Figure ST71 Percentage of Primary Total Stemmed Reverse Shoulder Replacement Procedures from Regions Rated IRSAD 1 and 2 by Hospital Locality (All Diagnoses)

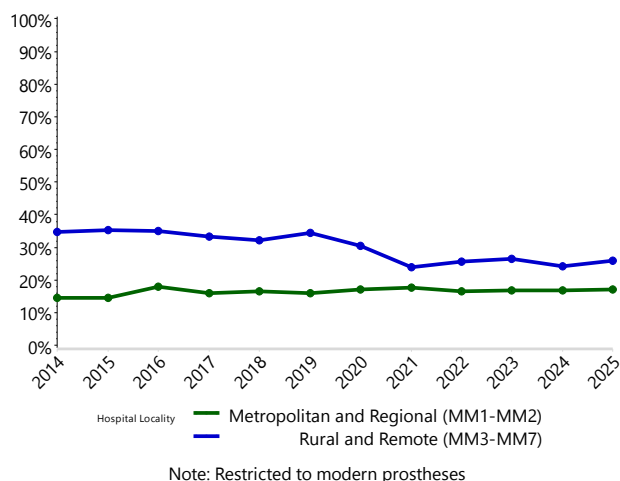


Figure ST72 Percentage of Primary Total Stemmed Reverse Shoulder Replacement Procedures from Regions Rated IRSAD 9 and 10 by Hospital Locality (All Diagnoses)

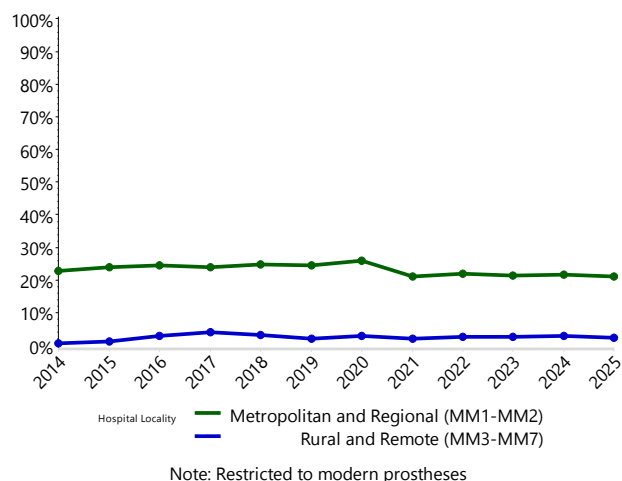


Figure ST73 Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis

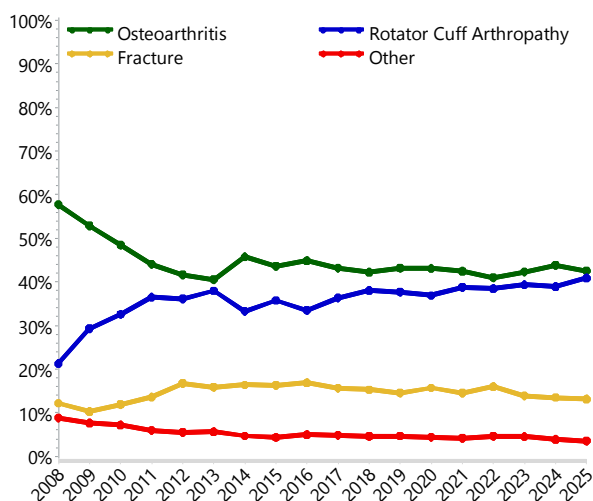


Table ST77 Age and Sex of Primary Total Stemmed Reverse Shoulder Replacement

Sex	Number	Percent	Minimum	Maximum	Median	Mean	Std Dev
Male	29891	39.0%	13	100	72	71.8	8.3
Female	46825	61.0%	12	102	75	74.4	7.9
TOTAL	76716	100.0%	12	102	74	73.4	8.2



Primary Total Shoulder Replacement

Figure ST74 Total Stemmed Reverse Shoulder Replacement by Fixation

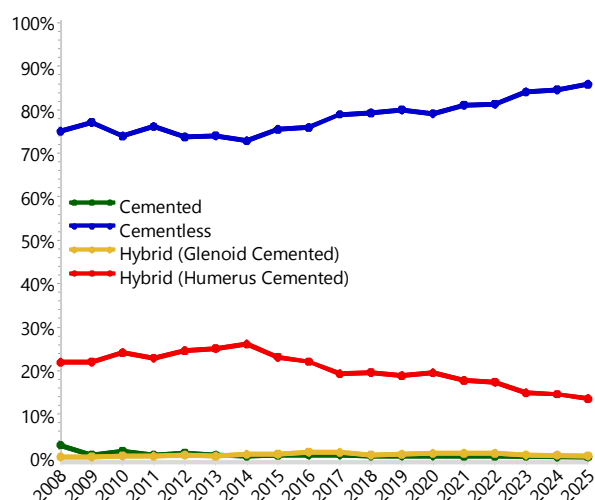


Figure ST75 Primary Total Stemmed Reverse Shoulder Replacement by Polyethylene Type

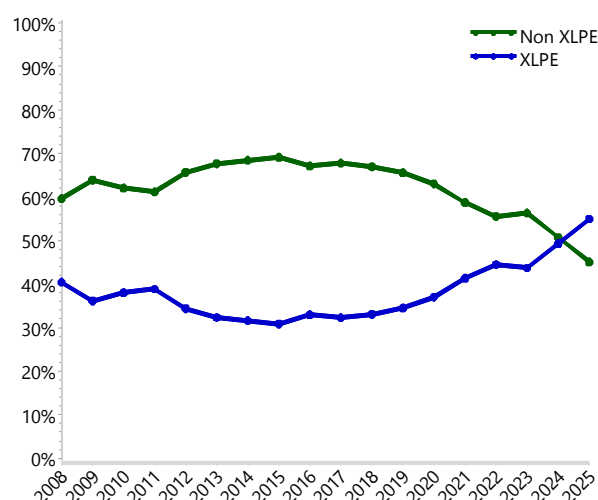


Table ST78 10 Most Used Humeral Stem Prostheses in Primary Total Stemmed Reverse Shoulder Replacement

2008		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
263	SMR	1291	Comprehensive	1739	Comprehensive	2156	Comprehensive	2654	Comprehensive
252	Delta Xtend	1119	SMR	1363	Ascend Flex	1579	Ascend Flex	1779	Ascend Flex
76	Aequalis	1060	Equinox	1353	Equinox	1293	Equinox	1044	SMR
42	Trabecular Metal	895	Ascend Flex	1091	SMR	1099	SMR	951	AltiVate Reverse
21	Delta CTA	692	Delta Xtend	777	Delta Xtend	842	AltiVate Reverse	932	Equinox
2	Custom Made (Lima)	549	AltiVate Reverse	718	AltiVate Reverse	821	Delta Xtend	638	Delta Xtend
1	Generic Humeral Stem	387	Aequalis	364	Aequalis	341	Aequalis	591	MSS
1	Promos	193	Global Unite	250	Global Unite	336	Global Unite	469	Global Unite
		149	Trabecular Metal	212	Trabecular Metal	302	MSS	329	Aequalis
		141	Affinis	114	Affinis	192	Trabecular Metal	172	Trabecular Metal
10 Most Used									
658	(8) 100.0%	6476	(10) 96.7%	7981	(10) 96.7%	8961	(10) 97.9%	9559	(10) 97.4%
Remainder									
0	(0) 0%	224	(7) 3.3%	269	(8) 3.3%	193	(9) 2.1%	260	(9) 2.6%
TOTAL									
658	(8) 100.0%	6700	(17) 100.0%	8250	(18) 100.0%	9154	(19) 100.0%	9819	(19) 100.0%



Primary Total Shoulder Replacement

Table ST79 10 Most Used Glenoid Prostheses in Primary Total Stemmed Reverse Shoulder Replacement

2008		2022		2023		2024		2025	
N	Model	N	Model	N	Model	N	Model	N	Model
264	SMR L1	1338	Comprehensive Reverse	1847	Comprehensive Reverse	2245	Comprehensive Reverse	2730	Comprehensive Reverse
252	Delta Xtend	1059	Equinox	1353	Equinox	1292	Equinox	1540	Perform Reversed
76	Aequalis	1034	SMR L1	1025	Delta Xtend	1158	Perform Reversed	1106	Delta Xtend
42	Trabecular Metal	912	Aequalis	947	SMR L1	1155	Delta Xtend	1048	RSP
21	Delta CTA	886	Delta Xtend	938	Aequalis	934	RSP	932	Equinox
1	Generic Metaglene	691	RSP	830	RSP	921	SMR L1	821	SMR L1
1	Promos	392	Perform Reversed	823	Perform Reversed	799	Aequalis	645	Aequalis
1	SMR	140	Affinis	118	SMR	302	MSS	590	MSS
		95	Trabecular Metal	114	Affinis	158	SMR	196	SMR
		42	MSS	100	MSS	83	Trabecular Metal	76	Trabecular Metal
10 Most Used									
658	(8) 100.0%	6589	(10) 98.3%	8095	(10) 98.1%	9047	(10) 98.8%	9684	(10) 98.6%
Remainder									
0	(0) 0%	111	(7) 1.7%	155	(11) 1.9%	107	(11) 1.2%	135	(11) 1.4%
TOTAL									
658	(8) 100.0%	6700	(17) 100.0%	8250	(21) 100.0%	9154	(21) 100.0%	9819	(21) 100.0%

OUTCOME FOR ALL DIAGNOSES

Primary Diagnosis

In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2025 (described as modern prostheses) are included in the analyses, unless clearly specified.

Procedures undertaken for instability, rheumatoid arthritis, tumour, fracture and rotator cuff arthropathy have a higher risk of revision compared to those undertaken for osteoarthritis (Table ST80 and Figure ST76).

Reason for Revision

The main reasons for revision are instability/dislocation, infection, loosening, and fracture (Table ST81). Since 2016, the proportion of revisions for instability/dislocation has increased by 16.8%, but infection and loosening have decreased by 3.8% and 5.7%, respectively.

Instability/dislocation was the most common reason for revision early, but in males this was more frequent along with infection (Figure ST77 and Figure ST78).

Type of Revision

The most common types of revision involve replacement of the humeral component, replacement of the cup/head, cup only, and replacement of the humeral/glenoid (Table ST82). The majority of total stemmed reverse revisions are to a total stemmed reverse (87.8%) with 12.2% to anatomic shoulder replacement categories.

Compared to 2016, humeral component revision increased by 14.2% and humerus/glenoid by 11.7%. In contrast, cup/head only revisions decreased by 2.7% and isolated glenoid components also decreased by 5.2%.



Primary Total Shoulder Replacement

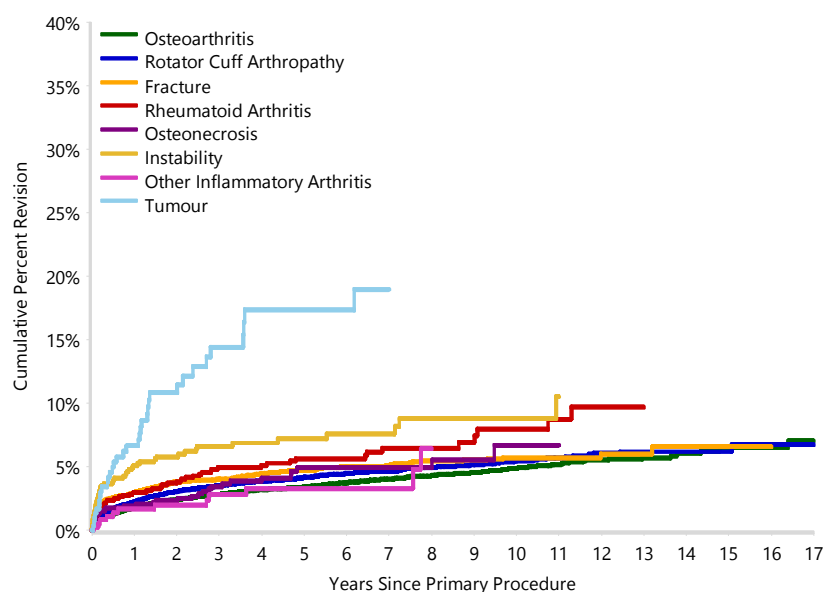
Table ST80 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
Rotator Cuff Arthropathy	1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
Fracture	465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
Rheumatoid Arthritis	61	1125	2.9 (2.1, 4.1)	5.0 (3.8, 6.5)	5.7 (4.3, 7.4)	6.5 (4.9, 8.5)	8.0 (5.9, 10.8)	
Osteonecrosis	33	804	1.9 (1.1, 3.1)	3.4 (2.3, 5.1)	4.9 (3.4, 7.1)	4.9 (3.4, 7.1)	6.7 (4.2, 10.6)	
Instability	49	716	5.1 (3.7, 7.0)	6.6 (4.9, 8.9)	7.2 (5.4, 9.6)	7.6 (5.7, 10.1)	8.8 (6.4, 11.9)	
Other Inflammatory Arthritis	12	377	1.7 (0.7, 3.7)	2.8 (1.4, 5.3)	3.3 (1.8, 6.2)	3.3 (1.8, 6.2)		
Tumour	39	302	6.6 (4.2, 10.4)	14.4 (10.2, 20.2)	17.4 (12.4, 24.0)	19.0 (13.4, 26.5)		
Other (1)	2	19	0.0 (0.0, 0.0)	16.7 (4.4, 51.8)	16.7 (4.4, 51.8)	16.7 (4.4, 51.8)		
TOTAL	2739	74719						

Note: Restricted to modern prostheses

Only primary diagnoses with >300 procedures have been listed

Figure ST76 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis



HR - adjusted for age and sex

Rotator Cuff Arthropathy vs Osteoarthritis

Entire Period: HR=1.14 (95% CI 1.05, 1.25), p=0.002

Fracture vs Osteoarthritis

0 - 3Mth: HR=2.72 (95% CI 2.33, 3.18), p<0.001

3Mth+: HR=1.16 (95% CI 1.00, 1.35), p=0.046

Rheumatoid Arthritis vs Osteoarthritis

Entire Period: HR=1.69 (95% CI 1.30, 2.19), p<0.001

Osteonecrosis vs Osteoarthritis

Entire Period: HR=1.35 (95% CI 0.95, 1.90), p=0.094

Instability vs Osteoarthritis

0 - 3Mth: HR=3.53 (95% CI 2.36, 5.28), p<0.001

3Mth+: HR=1.51 (95% CI 1.00, 2.26), p=0.047

Other Inflammatory Arthritis vs Osteoarthritis

Entire Period: HR=1.05 (95% CI 0.59, 1.85), p=0.876

Tumour vs Osteoarthritis

Entire Period: HR=3.07 (95% CI 2.20, 4.29), p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	32227	27270	19007	12892	7782	2901	345
Rotator Cuff Arthropathy	28238	23447	15976	10401	6135	2122	175
Fracture	10911	9054	6191	3965	2321	808	64
Rheumatoid Arthritis	1125	958	690	482	314	138	27
Osteonecrosis	804	688	471	327	201	68	11
Instability	716	578	397	261	166	67	11
Other Inflammatory Arthritis	377	332	219	131	71	24	4
Tumour	302	199	103	68	41	10	2

Note: Restricted to modern prostheses

Only primary diagnoses with >300 procedures have been listed

Primary Total Shoulder Replacement

Table ST81 Primary Total Stemmed Reverse Shoulder Replacement by Reason for Revision (All Diagnoses)

Reason for Revision	Number	Percent
Instability/Dislocation	842	30.7
Infection	712	26.0
Loosening	439	16.0
Fracture	296	10.8
Dissociation	100	3.7
Pain	61	2.2
Lysis	34	1.2
Arthrofibrosis	30	1.1
Malposition	26	0.9
Incorrect Sizing	23	0.8
Implant Breakage Glenoid	19	0.7
Metal Related Pathology	16	0.6
Heterotopic Bone	14	0.5
Wear Humeral Cup	10	0.4
Implant Breakage Humeral	10	0.4
Rotator Cuff Insufficiency	9	0.3
Tumour	6	0.2
Implant Breakage Glenoid Insert	6	0.2
Wear Glenoid Insert	3	0.1
Glenoid Erosion	2	0.1
Prosthesis Dislocation	1	0.0
Other	80	2.9
TOTAL	2739	100.0

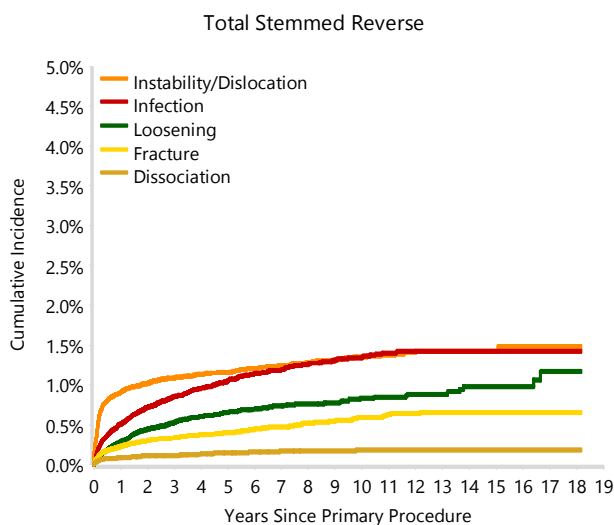
Note: Restricted to modern prostheses

Table ST82 Primary Total Stemmed Reverse Shoulder Replacement by Type of Revision (All Diagnoses)

Type of Revision	Number	Percent
Humeral Component	758	27.7
Cup/Head	510	18.6
Cup Only	404	14.7
Humeral/Glenoid	297	10.8
Cement Spacer	251	9.2
Humeral Head Only	219	8.0
Glenoid Component	191	7.0
Removal of Prostheses	45	1.6
Minor Components	19	0.7
Glenosphere Only	16	0.6
Cement Only	12	0.4
Reoperation	11	0.4
Reinsertion of Components	4	0.1
Head/Insert	2	0.1
TOTAL	2739	100.0

Note: Restricted to modern prostheses

Figure ST77 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement (All Diagnoses)

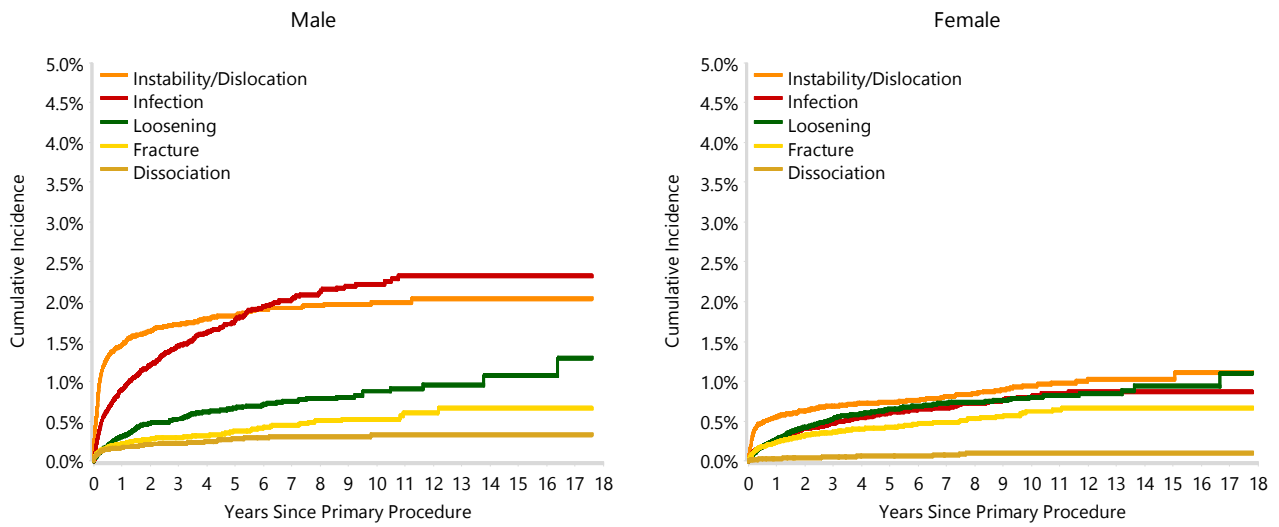


Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST78 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Sex



Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

PROSTHESIS TYPES

The outcomes of humeral stem and glenoid prosthesis combinations (>50 procedures) used in primary total stemmed reverse shoulder replacement are listed in Table ST83. The most commonly used cementless prosthesis

combinations are listed in Table ST84. The most commonly used prosthesis combinations with hybrid (humerus cemented) fixation are listed in Table ST85.

Table ST83 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	237	4710	2.1 (1.7, 2.6)	3.4 (2.9, 4.0)	4.3 (3.8, 5.0)	5.2 (4.6, 6.0)	6.8 (5.9, 7.8)	7.7 (6.5, 9.1)
	Perform Reversed	13	624	1.7 (0.9, 3.2)	2.6 (1.4, 4.7)	2.6 (1.4, 4.7)			
Aequalis Flex Revive	Perform Reversed	4	137	2.2 (0.7, 6.8)					
Affinis	Affinis	87	2064	1.8 (1.3, 2.4)	3.5 (2.8, 4.4)	4.2 (3.4, 5.2)	4.6 (3.7, 5.8)		
AltiVate	RSP	4	214	2.1 (0.8, 5.6)	2.1 (0.8, 5.6)				
AltiVate Reverse	RSP	113	3927	2.2 (1.7, 2.7)	3.5 (2.9, 4.2)	3.9 (3.2, 4.8)			
Ascend Flex	Aequalis	192	4591	2.3 (1.9, 2.8)	4.0 (3.4, 4.7)	4.9 (4.2, 5.7)	5.7 (4.9, 6.7)	7.2 (5.6, 9.3)	
	Perform Reversed	72	3609	1.9 (1.5, 2.4)	2.8 (2.1, 3.6)	3.0 (2.3, 4.0)			
Comprehensive	Comprehensive Reverse	216	11456	1.3 (1.1, 1.5)	2.0 (1.8, 2.3)	2.5 (2.2, 2.9)	2.8 (2.4, 3.3)	3.2 (2.4, 4.2)	
	Custom Made (Comprehensive)	7	105	6.0 (2.7, 12.8)	6.0 (2.7, 12.8)	7.6 (3.6, 15.6)			
	Trabecular Metal	2	97	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	2.7 (0.7, 10.2)	2.7 (0.7, 10.2)		
Delta Xtend	Delta Xtend	527	13004	2.1 (1.9, 2.4)	3.2 (2.9, 3.5)	3.7 (3.4, 4.1)	4.2 (3.8, 4.6)	4.9 (4.5, 5.4)	6.6 (5.6, 7.8)
Equinox	Equinox	336	8272	2.3 (2.0, 2.6)	3.5 (3.1, 4.0)	4.7 (4.2, 5.3)	6.1 (5.3, 6.9)	9.5 (7.2, 12.5)	
Global Unite	Delta Xtend	70	2295	1.8 (1.3, 2.5)	3.3 (2.5, 4.2)	3.9 (3.1, 5.0)	4.3 (3.3, 5.5)	4.9 (3.5, 6.9)	
MSS	MSS	21	1126	1.9 (1.2, 3.2)	2.7 (1.7, 4.3)	3.5 (2.0, 6.2)			
Mets	Custom Made (Mets)	27	136	12.6 (7.9, 19.8)	19.5 (13.1, 28.4)	19.5 (13.1, 28.4)			
RSP	RSP	90	1891	2.8 (2.1, 3.6)	4.3 (3.5, 5.3)	4.9 (4.0, 6.0)	5.0 (4.1, 6.1)		
SMR	Custom Made (Lima)	8	102	6.3 (2.9, 13.5)	7.6 (3.7, 15.3)				
	SMR	10	506	1.6 (0.8, 3.3)					
	SMR Axioma	14	215	3.3 (1.6, 6.7)	6.9 (4.2, 11.4)	6.9 (4.2, 11.4)			
	SMR L1	541	12719	2.8 (2.6, 3.1)	3.9 (3.5, 4.2)	4.2 (3.9, 4.6)	4.6 (4.2, 5.0)	5.1 (4.7, 5.6)	5.8 (5.2, 6.6)
Trabecular Metal	Comprehensive Reverse	25	655	3.2 (2.1, 4.9)	4.4 (2.9, 6.5)	4.4 (2.9, 6.5)	4.4 (2.9, 6.5)		
	Trabecular Metal	112	2057	2.6 (2.0, 3.4)	4.5 (3.7, 5.5)	5.2 (4.3, 6.3)	5.6 (4.6, 6.8)	6.3 (5.2, 7.7)	7.5 (5.6, 10.0)
Univers Revers	Univers Revers	0	56						
Other (22)		11	151	6.5 (3.3, 12.6)	9.6 (5.4, 16.8)				
TOTAL		2739	74719						

Note: Restricted to modern prostheses

Only prostheses with > 50 procedures have been listed



Primary Total Shoulder Replacement

Table ST84 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15Yrs
Aequalis	Aequalis	153	2600	2.1 (1.6, 2.8)	3.8 (3.1, 4.6)	4.8 (4.0, 5.7)	5.8 (4.9, 6.8)	7.6 (6.4, 9.0)	8.4 (7.0, 10.1)
	Perform Reversed	5	278	1.6 (0.6, 4.1)	1.6 (0.6, 4.1)	1.6 (0.6, 4.1)			
Aequalis Flex Revive	Perform Reversed	2	113	1.8 (0.5, 7.0)					
Affinis	Affinis	44	1026	1.7 (1.0, 2.7)	3.7 (2.7, 5.0)	4.3 (3.2, 5.8)	4.9 (3.6, 6.6)		
AltiVate	RSP	4	203	2.2 (0.8, 5.9)	2.2 (0.8, 5.9)				
AltiVate Reverse	RSP	91	3308	2.1 (1.6, 2.6)	3.5 (2.8, 4.3)	3.7 (3.0, 4.6)			
Ascend Flex	Aequalis	172	3973	2.4 (1.9, 2.9)	4.2 (3.5, 4.9)	5.0 (4.3, 5.9)	5.9 (4.9, 7.0)	7.5 (5.8, 9.9)	
	Perform Reversed	65	3146	2.0 (1.5, 2.6)	2.7 (2.1, 3.6)	3.0 (2.2, 4.0)			
Comprehensive	Comprehensive Reverse	171	9823	1.2 (1.0, 1.4)	1.9 (1.6, 2.3)	2.3 (2.0, 2.7)	2.7 (2.2, 3.2)	2.7 (2.2, 3.2)	
	Custom Made (Comprehensive)	5	95	4.3 (1.6, 10.9)	4.3 (1.6, 10.9)	6.0 (2.5, 14.2)	6.0 (2.5, 14.2)		
	Trabecular Metal	2	80	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.2 (0.8, 12.1)			
Delta Xtend	Delta Xtend	378	9554	1.9 (1.7, 2.2)	3.0 (2.7, 3.4)	3.7 (3.3, 4.1)	4.2 (3.8, 4.7)	5.0 (4.5, 5.6)	7.4 (5.9, 9.3)
Equinox	Equinox	283	7090	2.1 (1.8, 2.5)	3.4 (2.9, 3.8)	4.6 (4.0, 5.2)	6.0 (5.2, 6.9)	9.9 (7.3, 13.4)	
Global Unite	Delta Xtend	45	1541	1.7 (1.1, 2.5)	3.1 (2.2, 4.2)	3.9 (2.8, 5.3)	4.1 (3.0, 5.6)	4.8 (3.3, 7.2)	
MSS	MSS	20	1075	1.9 (1.1, 3.2)	2.7 (1.7, 4.3)	3.6 (2.0, 6.3)			
RSP	RSP	63	1499	2.5 (1.8, 3.4)	3.8 (2.9, 4.9)	4.3 (3.4, 5.5)	4.3 (3.4, 5.5)		
SMR	Custom Made (Lima)	7	97	5.5 (2.3, 12.8)	6.9 (3.1, 14.7)	9.5 (4.4, 19.9)			
	SMR	10	500	1.6 (0.8, 3.4)					
	SMR Axioma	12	209	2.9 (1.3, 6.3)	6.1 (3.5, 10.5)	6.1 (3.5, 10.5)			
	SMR L1	499	12107	2.7 (2.4, 3.0)	3.7 (3.4, 4.1)	4.1 (3.7, 4.5)	4.4 (4.0, 4.8)	5.0 (4.5, 5.5)	5.8 (5.0, 6.6)
Trabecular Metal	Comprehensive Reverse	17	458	2.7 (1.6, 4.8)	4.4 (2.7, 7.1)	4.4 (2.7, 7.1)	4.4 (2.7, 7.1)		
	Trabecular Metal	94	1662	2.7 (2.1, 3.7)	4.8 (3.8, 5.9)	5.4 (4.4, 6.7)	5.8 (4.7, 7.1)	6.5 (5.3, 8.0)	6.8 (5.5, 8.4)
Univers Revers	Univers Revers	0	54						
Other (18)		11	117	8.4 (4.3, 16.2)	12.3 (7.0, 21.2)				
TOTAL		2153	60608						

Note: Restricted to modern prostheses

Only prostheses with > 50 procedures have been listed



Primary Total Shoulder Replacement

Table ST85 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	83	2056	2.1 (1.6, 2.8)	3.0 (2.3, 3.9)	3.8 (3.0, 4.7)	4.5 (3.6, 5.6)	5.5 (4.3, 6.9)	
	Perform Reversed	8	343	1.7 (0.7, 4.2)	4.1 (1.9, 9.1)				
Affinis	Affinis	41	979	2.0 (1.3, 3.1)	3.3 (2.3, 4.7)	4.1 (3.0, 5.6)	4.5 (3.3, 6.1)		
AltiVate Reverse	RSP	20	569	2.6 (1.6, 4.4)	3.6 (2.3, 5.7)	4.9 (3.0, 8.1)			
Ascend Flex	Aequalis	17	576	1.8 (1.0, 3.3)	3.0 (1.8, 4.9)	3.5 (2.1, 5.8)	4.3 (2.5, 7.5)		
	Perform Reversed	6	436	0.9 (0.3, 2.9)	3.0 (1.2, 7.3)				
Comprehensive	Comprehensive Reverse	39	1532	2.1 (1.4, 2.9)	2.7 (1.9, 3.7)	3.2 (2.3, 4.5)	3.2 (2.3, 4.5)		
Delta Xtend	Delta Xtend	144	3339	2.7 (2.2, 3.4)	3.5 (3.0, 4.2)	3.9 (3.3, 4.7)	4.3 (3.6, 5.0)	4.8 (4.0, 5.7)	5.4 (4.5, 6.5)
Equinox	Equinox	47	1122	2.8 (2.0, 4.0)	4.5 (3.4, 6.1)	4.8 (3.6, 6.5)	6.4 (4.2, 9.5)		
Global Unite	Delta Xtend	24	701	2.1 (1.3, 3.6)	3.8 (2.5, 5.7)	4.1 (2.7, 6.2)	4.8 (3.1, 7.4)		
Mets	Custom Made (Mets)	26	130	13.2 (8.3, 20.6)	20.4 (13.7, 29.7)				
RSP	RSP	26	362	3.9 (2.3, 6.5)	6.6 (4.5, 9.8)	7.4 (5.0, 10.7)	7.8 (5.4, 11.3)		
SMR	SMR L1	26	456	4.3 (2.8, 6.7)	6.0 (4.1, 8.8)	6.0 (4.1, 8.8)	6.6 (4.5, 9.6)	6.6 (4.5, 9.6)	
Trabecular Metal	Comprehensive Reverse	8	187	4.4 (2.2, 8.5)	4.4 (2.2, 8.5)				
	Trabecular Metal	16	361	2.0 (0.9, 4.1)	3.6 (2.0, 6.2)	4.4 (2.6, 7.4)	5.0 (3.0, 8.3)	6.1 (3.5, 10.4)	
Other (20)		7	148	4.4 (2.0, 9.6)					
TOTAL		538	13297						

Note: Restricted to modern prostheses

Only prostheses with > 50 procedures have been listed



Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS, ROTATOR CUFF ARTHROPATHY AND FRACTURE– PATIENT CHARACTERISTICS

There are 32,227 primary total stemmed reverse shoulder replacement procedures with a primary diagnosis of osteoarthritis, 28,238 for rotator cuff arthropathy, and 10,911 for fracture. The three predominate primary diagnoses are presented concurrently for the purpose of comparison.

The cumulative percent revision of primary total stemmed reverse shoulder replacement for osteoarthritis at 15 years is 6.5%, 6.2% for rotator cuff arthropathy, and 6.6% for fracture (Table ST86 and Figure ST79).

Compared to the pre-2016 period, total stemmed reverse replacements for 2016-2025 have a lower rate of revision for osteoarthritis and for rotator cuff arthropathy, but not for fracture (Table ST87, Figure ST80, and Figure ST81).

The most common reasons for revision are instability/dislocation (10.3% for osteoarthritis, 11.8% for rotator cuff arthropathy and 8.1% for fracture), infection (11.5%, 10.2%, and 4.4%) and loosening (7.5%, 6.3%, and 2.5%, respectively) (Table ST88 and Figure ST82).

The most common types of revision are humeral component only (10.5% for osteoarthritis, 10.2% for rotator cuff arthropathy and 6.5% for fracture), replacement of both cup (liner) and glenosphere (7.8%, 7.8% and 3.3%), and cup only revisions (5.7%, 5.9%, and 3.7%, respectively) (Table ST89).

When only the humeral component is revised, this may be associated with exchange of the epiphysis and/or humeral stem and additional minor components such as the liner. Most revisions are to a total stemmed reverse replacement (85.5% for osteoarthritis, 87.9% for rotator cuff arthropathy and 94% for fracture).

Age and Sex

Primary total stemmed reverse shoulder replacement, when used for the management of the three predominant primary diagnoses, is most common in patients aged ≥ 65 years.

Patients aged ≥ 65 years have a lower rate of revision compared to patients aged < 65 years for all three most common primary diagnoses (Table ST90, Figure ST83, Figure ST84 and Figure ST85).

Males have a higher rate of revision than females for osteoarthritis, rotator cuff arthropathy and fracture (Table ST91, Figure ST86, Figure ST87 and Figure ST88). Males are predominantly revised for instability/dislocation and infection compared to loosening in females (Figure ST89).

Males have a higher rate of revision compared to females.

ASA and BMI

Patients with ASA scores 3-5 have higher rates of revision compared to patients with ASA scores 1-2 for all primary diagnoses (Table ST92, Figure ST90, Figure ST91 and Figure ST92).

When the primary diagnosis is osteoarthritis, there is no significant difference in the rate of revision between obese and patients who are not obese.

Obese patients undergoing a total stemmed reverse for rotator cuff arthropathy have an increased rate of revision for the first 3 months, and after this time there is no difference compared to patients who are not obese (Table ST93, Figure ST93 and Figure ST94).

Obese patients undergoing total stemmed reverse shoulder replacement for fracture have a higher rate of revision than patients who are not obese (Table ST93 and Figure ST94).

Glenoid Morphology

The outcome of the different morphology categories is presented in Table ST94. The category of glenoid morphology is not a risk factor for revision for any of the three primary diagnoses for total stemmed reverse shoulder replacement

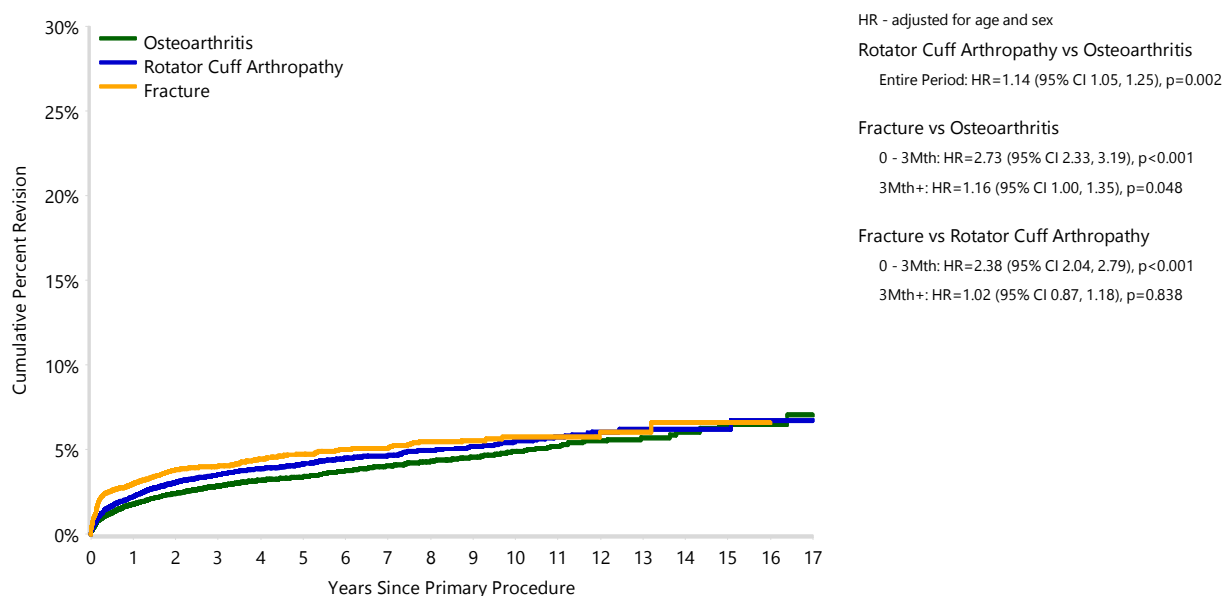
Primary Total Shoulder Replacement

Table ST86 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15Yrs
Osteoarthritis	1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
Rotator Cuff Arthropathy	1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
Fracture	465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
TOTAL	2543	71376						

Note: Restricted to modern prostheses

Figure ST79 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	32227	27270	19007	12892	7782	2901	345
Rotator Cuff Arthropathy	28238	23447	15976	10401	6135	2122	175
Fracture	10911	9054	6191	3965	2321	808	64

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

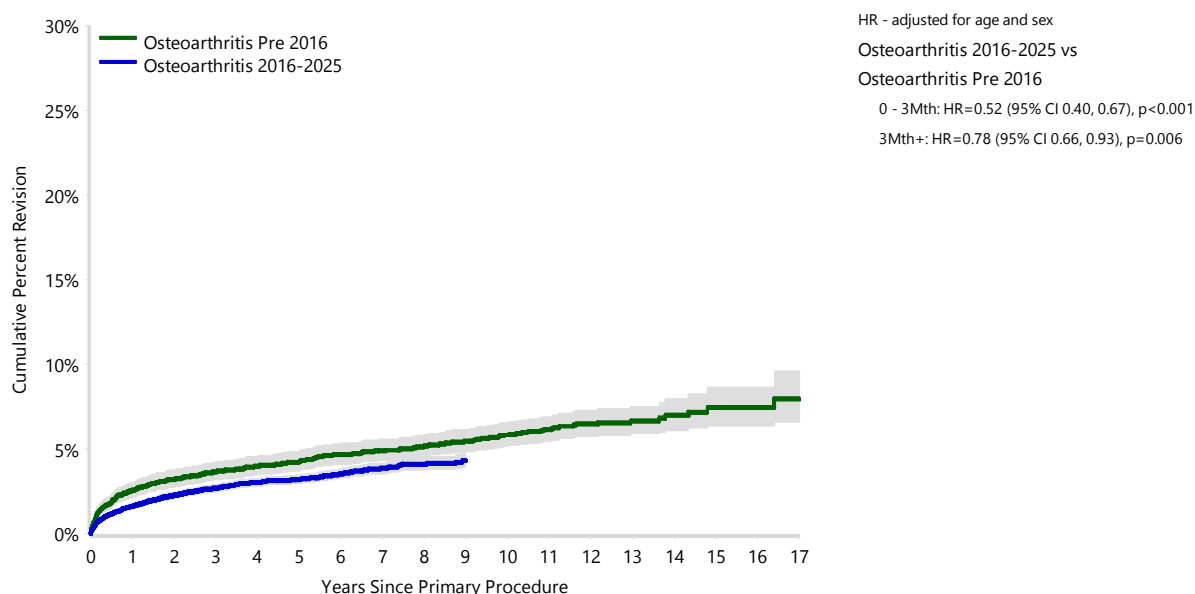
Table ST87 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Procedure Year

Primary Diagnosis	Procedure Year	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Pre 2016	284	4925	2.6 (2.2, 3.1)	3.7 (3.2, 4.2)	4.2 (3.7, 4.9)	4.9 (4.3, 5.6)	5.8 (5.2, 6.6)	7.4 (6.4, 8.6)
	2016-2025	748	27302	1.6 (1.5, 1.8)	2.7 (2.5, 2.9)	3.2 (3.0, 3.5)	3.8 (3.5, 4.2)		
Rotator Cuff Arthropathy		1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Pre 2016	223	3706	2.8 (2.3, 3.4)	4.1 (3.5, 4.8)	5.0 (4.3, 5.8)	5.4 (4.7, 6.2)	6.2 (5.4, 7.1)	6.9 (6.0, 7.9)
	2016-2025	823	24532	2.1 (2.0, 2.3)	3.4 (3.2, 3.7)	4.0 (3.7, 4.3)	4.5 (4.2, 4.9)		
Fracture		465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Pre 2016	70	1594	2.5 (1.8, 3.4)	3.3 (2.5, 4.3)	3.6 (2.8, 4.7)	4.0 (3.1, 5.1)	4.8 (3.8, 6.1)	5.7 (4.2, 7.6)
	2016-2025	395	9317	3.1 (2.7, 3.5)	4.2 (3.7, 4.6)	5.0 (4.5, 5.5)	5.4 (4.8, 6.0)		
TOTAL		2543	71376						

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Figure ST80 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Procedure Year (Primary Diagnosis OA)

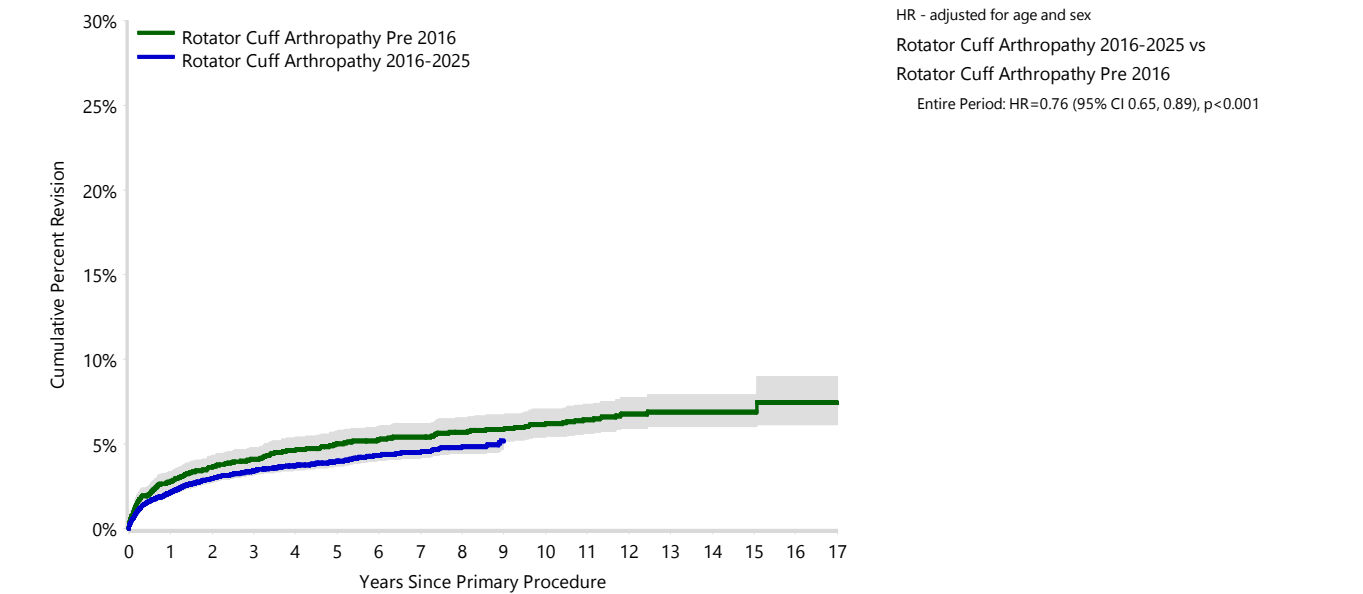


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Pre 2016	4925	4729	4452	4100	3624	2901	345
	2016-2025	27302	22541	14555	8792	4158	0	0

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST81 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Procedure Year (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Pre 2016	3706	3550	3310	3015	2701	2122	175
	2016-2025	24532	19897	12666	7386	3434	0	0

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST88 Primary Total Stemmed Reverse Shoulder Replacement by Reason for Revision and Primary Diagnosis

Reason for Revision	Osteoarthritis		Rotator Cuff Arthropathy		Fracture	
	N	Percent	N	Percent	N	Percent
Instability/Dislocation	261	10.3	299	11.8	207	8.1
Infection	293	11.5	259	10.2	111	4.4
Loosening	190	7.5	159	6.3	63	2.5
Fracture	107	4.2	123	4.8	47	1.8
Dissociation	33	1.3	49	1.9	9	0.4
Pain	25	1.0	30	1.2	5	0.2
Lysis	15	0.6	14	0.6	2	0.1
Arthrofibrosis	14	0.6	6	0.2	9	0.4
Malposition	11	0.4	12	0.5	2	0.1
Incorrect Sizing	5	0.2	17	0.7	1	0.0
Implant Breakage Glenoid	9	0.4	8	0.3	2	0.1
Metal Related Pathology	5	0.2	10	0.4	.	.
Heterotopic Bone	7	0.3	4	0.2	3	0.1
Wear Humeral Cup	6	0.2	4	0.2	.	.
Rotator Cuff Insufficiency	5	0.2	4	0.2	.	.
Implant Breakage Humeral	4	0.2	5	0.2	.	.
Implant Breakage Glenoid Insert	2	0.1	2	0.1	1	0.0
Glenoid Erosion	1	0.0	1	0.0	.	.
Wear Glenoid Insert	2	0.1	.	.	.	.
Tumour	.	.	.	.	1	0.0
Prosthesis Dislocation	1	0.0	.	.	.	.
Other	36	1.4	40	1.6	2	0.1
TOTAL	1032	40.6	1046	41.1	465	18.3

Note: Restricted to modern prostheses

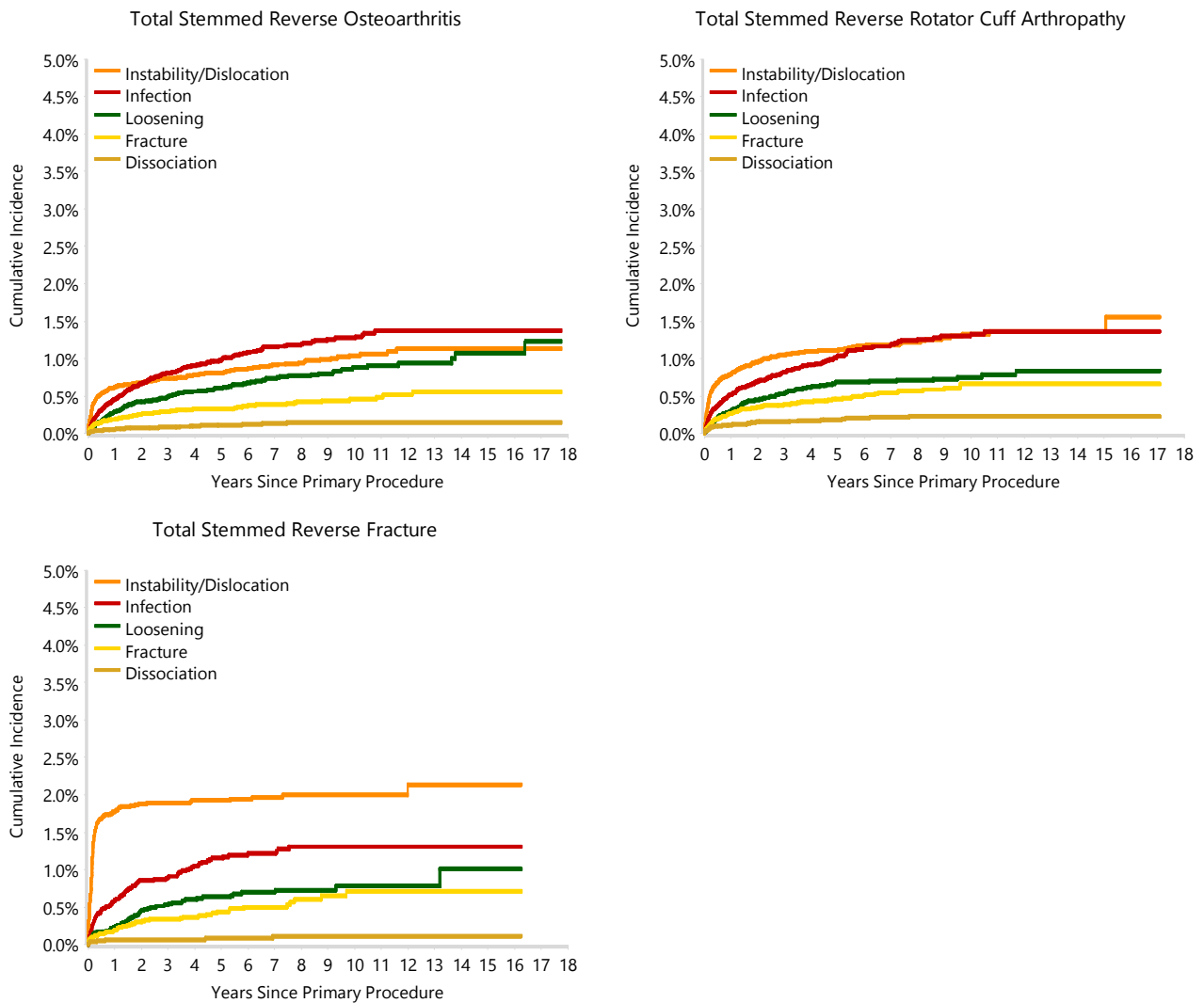
Table ST89 Primary Total Stemmed Reverse Shoulder Replacement by Type of Revision and Primary Diagnosis

Type of Revision	Osteoarthritis		Rotator Cuff Arthropathy		Fracture	
	N	Percent	N	Percent	N	Percent
Humeral Component	266	10.5	259	10.2	165	6.5
Cup/Head	198	7.8	199	7.8	83	3.3
Cup Only	134	5.3	151	5.9	95	3.7
Humeral/Glenoid	116	4.6	123	4.8	39	1.5
Cement Spacer	116	4.6	80	3.1	39	1.5
Humeral Head Only	101	4.0	86	3.4	12	0.5
Glenoid Component	72	2.8	99	3.9	12	0.5
Removal of Prostheses	13	0.5	18	0.7	8	0.3
Minor Components	5	0.2	5	0.2	7	0.3
Glenosphere Only	3	0.1	11	0.4	1	0.0
Cement Only	6	0.2	5	0.2	1	0.0
Reoperation	2	0.1	6	0.2	2	0.1
Reinsertion of Components	.	.	3	0.1	.	.
Head/Insert	.	.	1	0.0	1	0.0
TOTAL	1032	40.6	1046	41.1	465	18.3

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST82 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis



Note: Restricted to modern prostheses



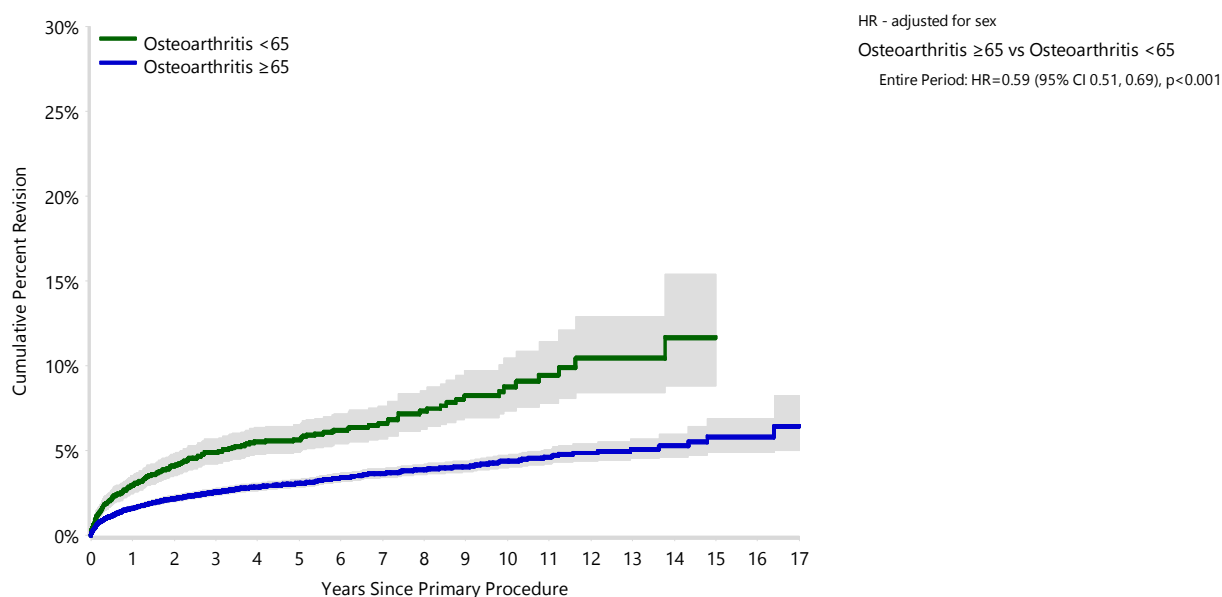
Primary Total Shoulder Replacement

Table ST90 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Age

Primary Diagnosis	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15Yrs
Osteoarthritis		1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	<65	216	4012	3.0 (2.5, 3.5)	4.9 (4.2, 5.7)	5.6 (4.9, 6.5)	6.6 (5.7, 7.6)	8.8 (7.3, 10.4)	11.7 (8.8, 15.4)
	≥65	816	28215	1.6 (1.5, 1.8)	2.6 (2.4, 2.8)	3.1 (2.9, 3.3)	3.7 (3.4, 4.0)	4.4 (4.0, 4.8)	5.8 (4.9, 6.9)
Rotator Cuff Arthropathy		1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	<65	192	3538	3.1 (2.5, 3.7)	5.6 (4.8, 6.5)	6.3 (5.4, 7.3)	6.8 (5.9, 7.9)	8.7 (7.1, 10.8)	
	≥65	854	24700	2.1 (1.9, 2.3)	3.2 (3.0, 3.5)	3.9 (3.6, 4.1)	4.3 (4.0, 4.7)	5.1 (4.7, 5.5)	5.6 (5.0, 6.3)
Fracture		465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	<65	122	1655	4.8 (3.9, 6.0)	6.8 (5.6, 8.2)	8.0 (6.7, 9.7)	9.0 (7.5, 10.9)	11.1 (8.7, 14.3)	
	≥65	343	9256	2.7 (2.3, 3.0)	3.5 (3.2, 3.9)	4.1 (3.7, 4.6)	4.4 (3.9, 4.9)	4.8 (4.3, 5.4)	5.1 (4.3, 6.1)
TOTAL		2543	71376						

Note: Restricted to modern prostheses

Figure ST83 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis OA)

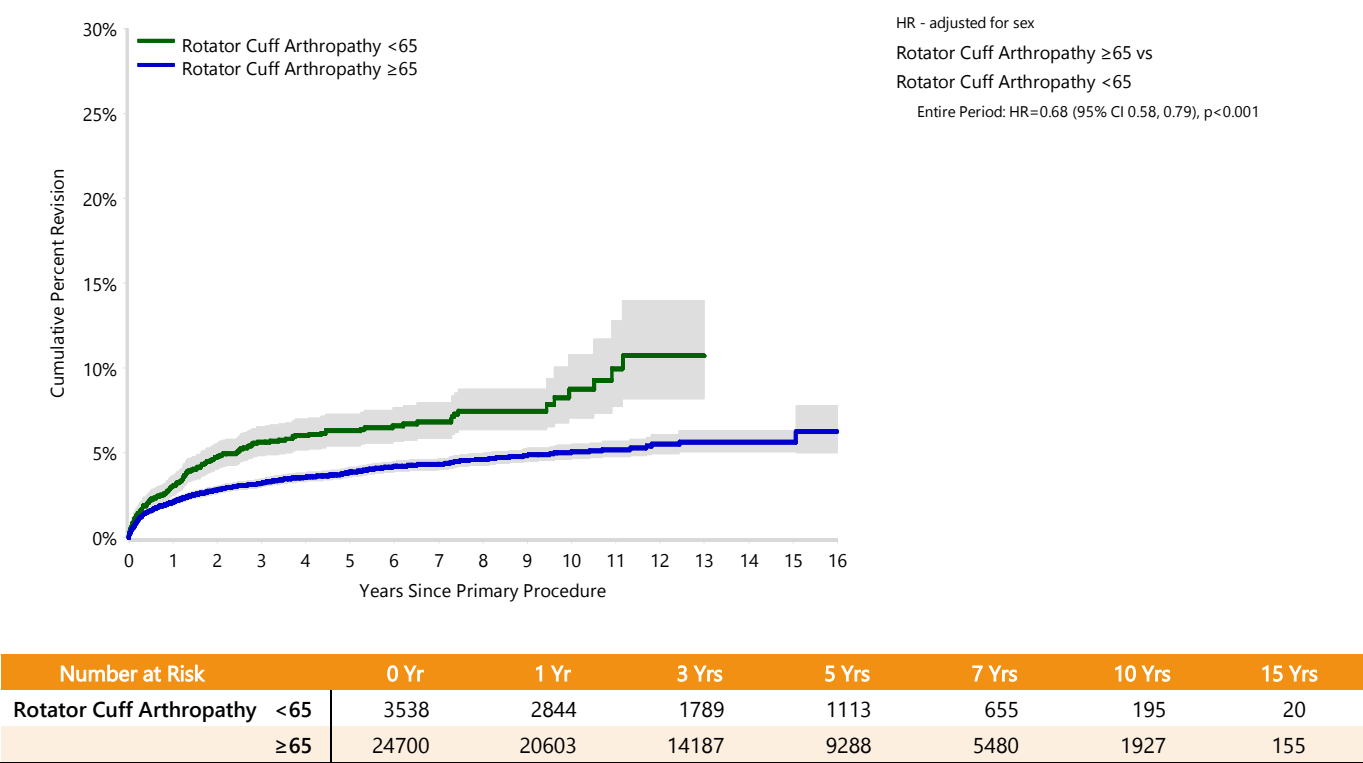


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	<65	4012	3330	2254	1440	868	318	48
	≥65	28215	23940	16753	11452	6914	2583	297

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST84 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Rotator Cuff Arthropathy)

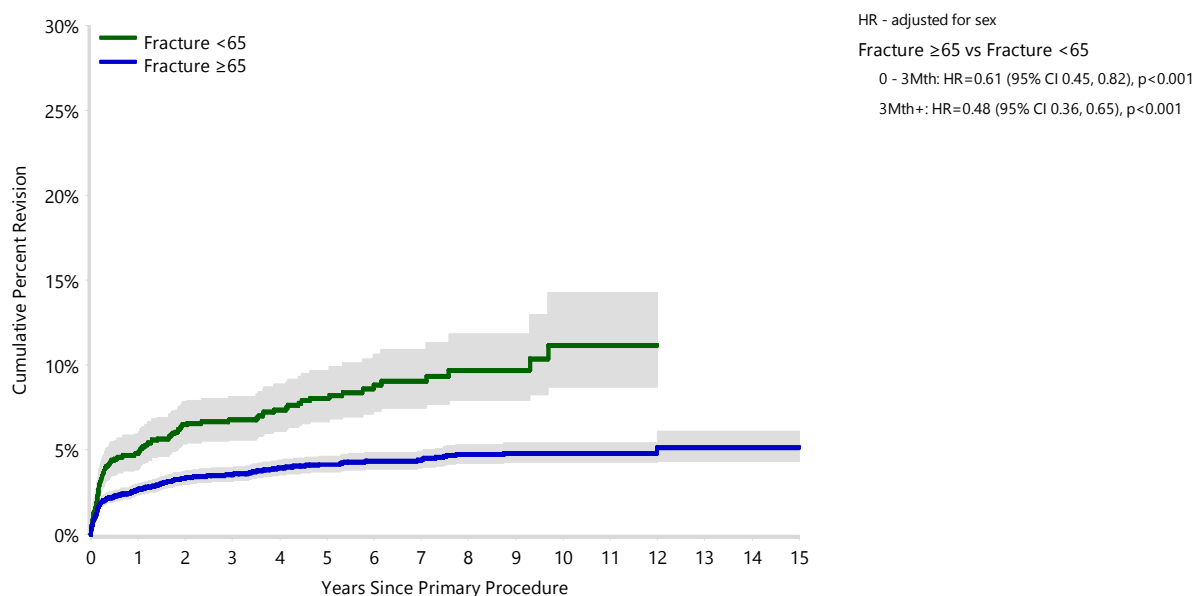


Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST85 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	<65	1655	1339	896	554	318	99	18
	≥ 65	9256	7715	5295	3411	2003	709	46

Note: Restricted to modern prostheses

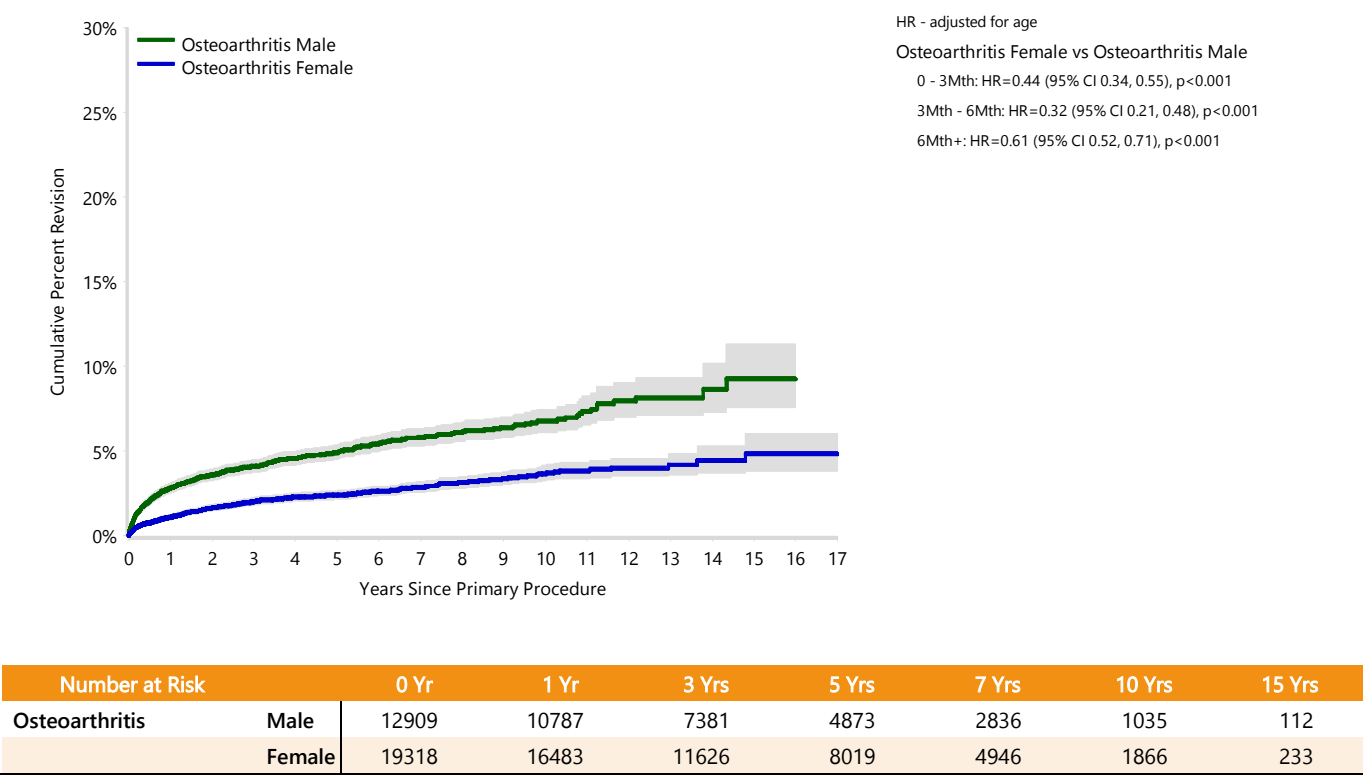
Table ST91 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Sex

Primary Diagnosis	Sex	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Male	593	12909	2.8 (2.5, 3.1)	4.1 (3.7, 4.5)	4.9 (4.5, 5.3)	5.8 (5.3, 6.3)	6.8 (6.1, 7.5)	9.2 (7.5, 11.3)
	Female	439	19318	1.1 (0.9, 1.2)	2.0 (1.8, 2.2)	2.4 (2.2, 2.6)	2.9 (2.6, 3.2)	3.7 (3.3, 4.1)	4.8 (3.8, 6.0)
Rotator Cuff Arthropathy		1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Male	656	13508	3.0 (2.7, 3.3)	4.6 (4.3, 5.0)	5.6 (5.1, 6.0)	6.4 (5.9, 6.9)	7.3 (6.6, 8.1)	7.6 (6.8, 8.5)
	Female	390	14730	1.5 (1.3, 1.8)	2.5 (2.2, 2.8)	2.9 (2.6, 3.2)	3.1 (2.8, 3.5)	3.9 (3.5, 4.5)	4.9 (4.1, 5.8)
Fracture		465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Male	150	1907	6.6 (5.6, 7.8)	7.8 (6.7, 9.2)	8.8 (7.5, 10.4)	8.8 (7.5, 10.4)	9.5 (7.9, 11.3)	
	Female	315	9004	2.2 (1.9, 2.6)	3.2 (2.8, 3.6)	3.9 (3.4, 4.3)	4.3 (3.8, 4.8)	4.9 (4.3, 5.7)	5.9 (4.5, 7.8)
TOTAL		2543	71376						

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST86 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Sex (Primary Diagnosis OA)

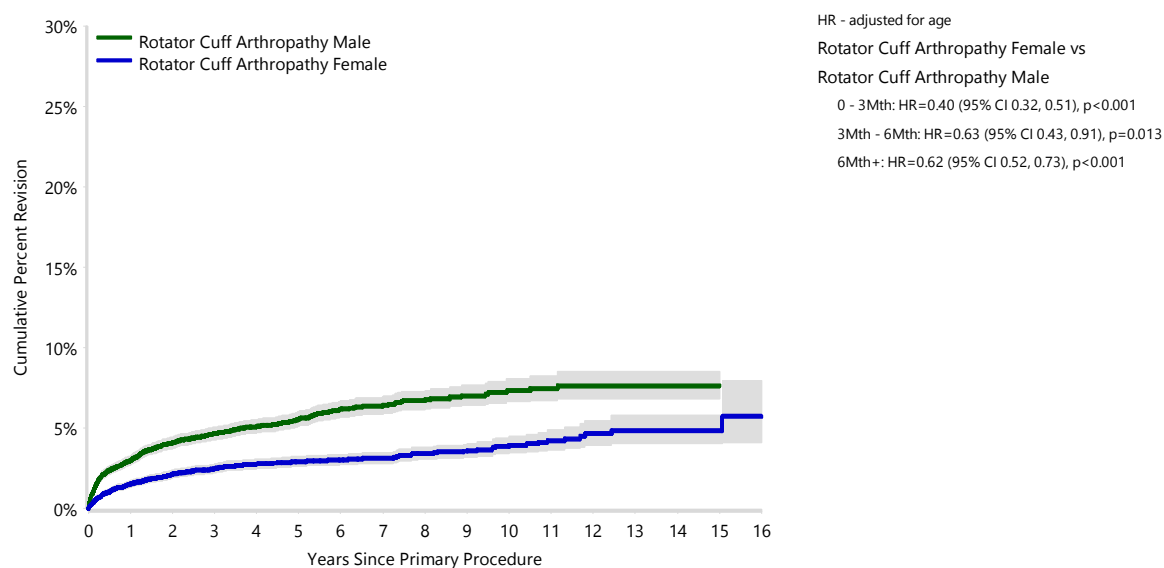


Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

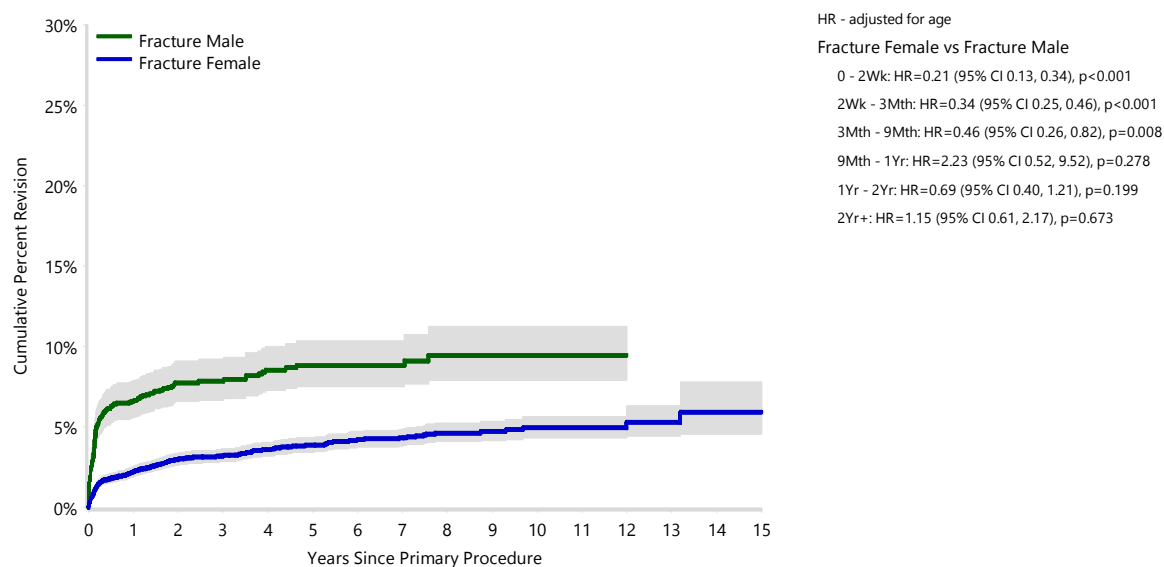
Figure ST87 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Sex (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Male	13508	10963	7267	4536	2569	820	62
	Female	14730	12484	8709	5865	3566	1302	113

Note: Restricted to modern prostheses

Figure ST88 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Sex (Primary Diagnosis Fracture)



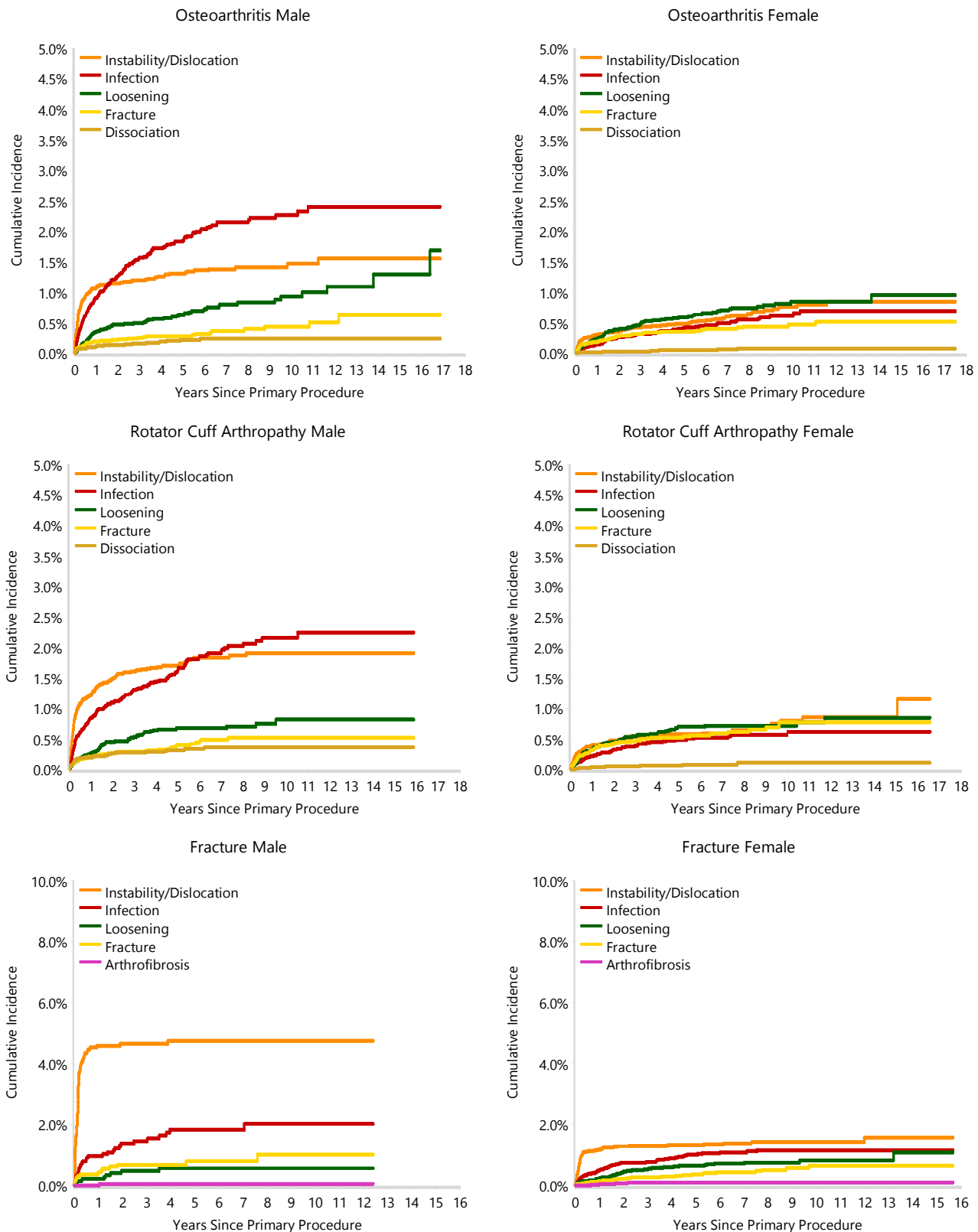
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	Male	1907	1464	914	563	320	113	12
	Female	9004	7590	5277	3402	2001	695	52

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST89 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Sex



Note: Restricted to modern prostheses



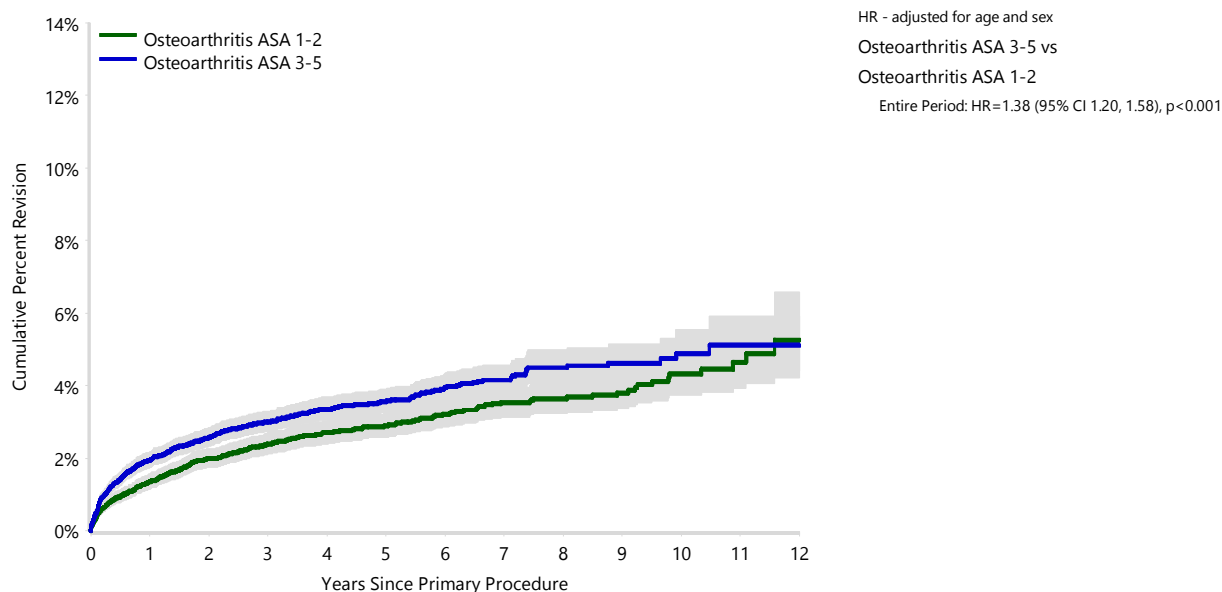
Primary Total Shoulder Replacement

Table ST92 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and ASA Score

Primary Diagnosis	ASA Score	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Osteoarthritis		860	29516	1.7 (1.5, 1.8)	2.7 (2.5, 2.9)	3.3 (3.0, 3.5)	3.9 (3.6, 4.2)	4.3 (3.9, 4.6)	4.7 (4.2, 5.1)
	ASA 1-2	345	13015	1.3 (1.2, 1.6)	2.4 (2.1, 2.7)	2.9 (2.6, 3.2)	3.5 (3.1, 4.0)	3.8 (3.4, 4.3)	4.3 (3.7, 5.0)
	ASA 3-5	515	16501	1.9 (1.7, 2.2)	3.0 (2.7, 3.3)	3.6 (3.3, 3.9)	4.2 (3.8, 4.6)	4.6 (4.2, 5.1)	4.9 (4.3, 5.5)
Rotator Cuff Arthropathy		934	26446	2.2 (2.0, 2.4)	3.5 (3.3, 3.7)	4.1 (3.8, 4.4)	4.6 (4.3, 4.9)	5.0 (4.7, 5.5)	5.4 (4.9, 5.9)
	ASA 1-2	387	11539	2.0 (1.7, 2.3)	3.1 (2.8, 3.5)	3.8 (3.4, 4.2)	4.2 (3.8, 4.7)	4.7 (4.2, 5.3)	5.1 (4.4, 5.8)
	ASA 3-5	547	14907	2.4 (2.1, 2.6)	3.8 (3.4, 4.1)	4.3 (4.0, 4.7)	4.8 (4.4, 5.3)	5.3 (4.7, 5.9)	5.7 (4.9, 6.5)
Fracture		418	10056	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.8 (4.3, 5.2)	5.1 (4.6, 5.6)	5.4 (4.9, 6.1)	5.6 (5.0, 6.3)
	ASA 1-2	138	3753	2.4 (2.0, 3.0)	3.5 (2.9, 4.1)	4.1 (3.5, 4.9)	4.4 (3.7, 5.3)	4.7 (3.9, 5.6)	4.7 (3.9, 5.6)
	ASA 3-5	280	6303	3.3 (2.9, 3.8)	4.3 (3.8, 4.9)	5.1 (4.5, 5.8)	5.5 (4.9, 6.3)	6.0 (5.1, 6.9)	6.3 (5.3, 7.4)
TOTAL		2212	66018						

Note: Restricted to modern prostheses

Figure ST90 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by ASA Score (Primary Diagnosis OA)

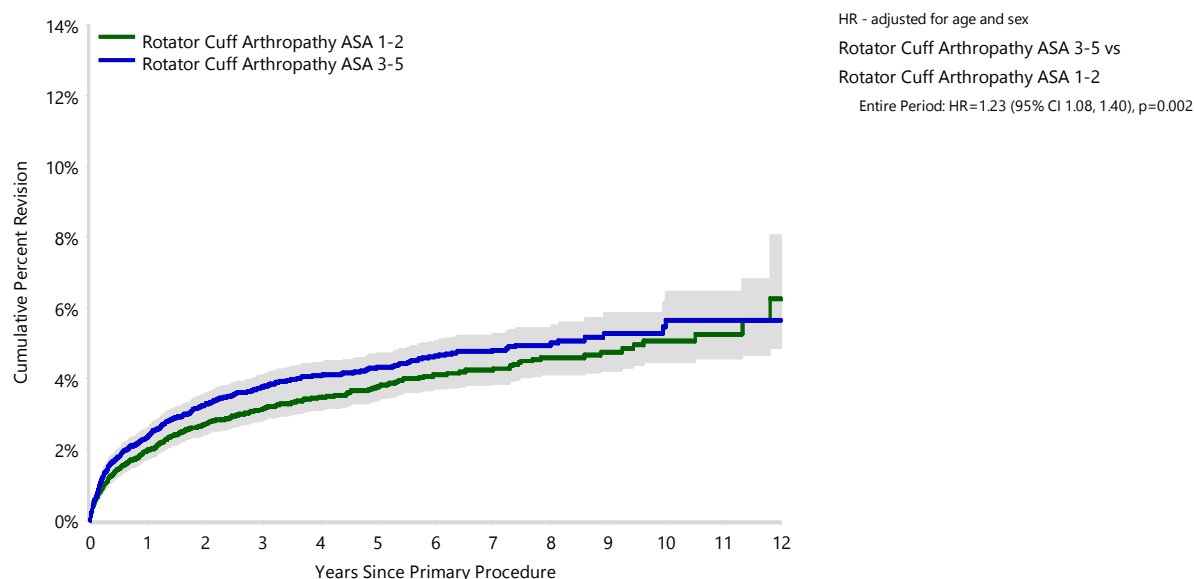


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Osteoarthritis	ASA 1-2	13015	10986	7674	5213	3080	1425	836
	ASA 3-5	16501	13710	8930	5490	2801	1129	627

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

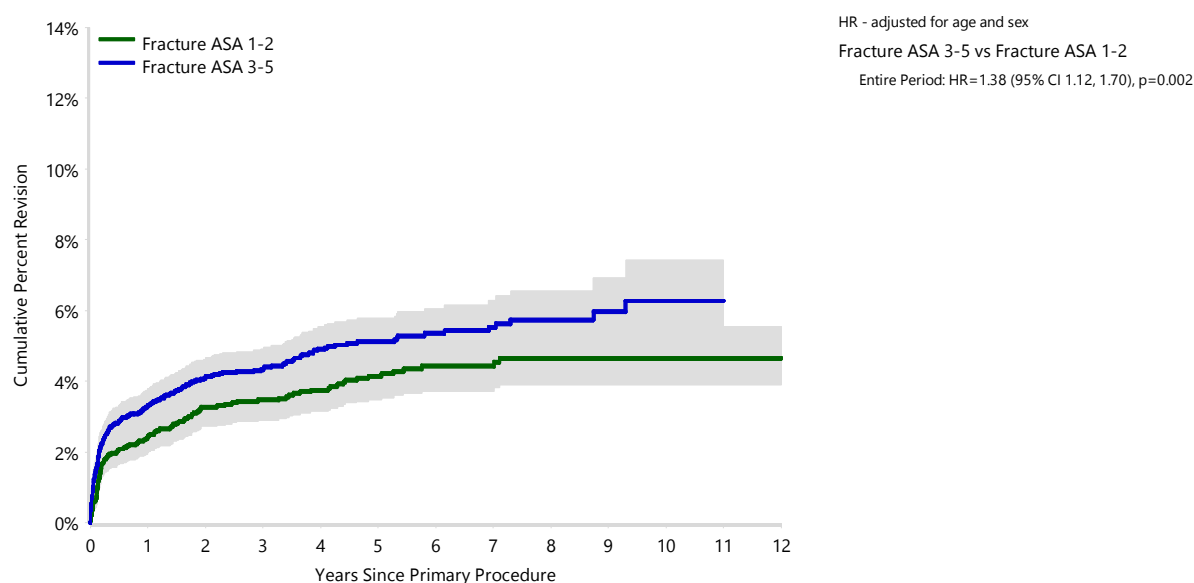
Figure ST91 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and ASA Score (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Rotator Cuff Arthropathy	ASA 1-2	11539	9606	6616	4390	2583	1104	677
	ASA 3-5	14907	12125	7760	4566	2293	863	493

Note: Restricted to modern prostheses

Figure ST92 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and ASA Score (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Fracture	ASA 1-2	3753	3201	2260	1508	862	383	239
	ASA 3-5	6303	5069	3232	1848	948	367	202

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST93 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and BMI Category

Primary Diagnosis	BMI Category	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Osteoarthritis		757	27175	1.7 (1.5, 1.8)	2.7 (2.5, 3.0)	3.3 (3.0, 3.5)	3.8 (3.6, 4.2)	4.3 (3.9, 4.7)	4.3 (3.9, 4.7)
	Not Obese	359	13455	1.5 (1.3, 1.7)	2.6 (2.3, 2.9)	3.1 (2.8, 3.4)	3.8 (3.4, 4.3)	4.4 (3.8, 5.1)	4.4 (3.8, 5.1)
	Obese	398	13720	1.8 (1.6, 2.1)	2.9 (2.6, 3.2)	3.4 (3.1, 3.8)	3.9 (3.5, 4.3)	4.2 (3.7, 4.8)	4.2 (3.7, 4.8)
Rotator Cuff Arthropathy		828	24610	2.1 (2.0, 2.3)	3.4 (3.2, 3.7)	4.0 (3.7, 4.3)	4.5 (4.2, 4.8)	5.0 (4.6, 5.5)	5.4 (4.7, 6.1)
	Not Obese	392	13191	1.9 (1.6, 2.1)	3.1 (2.8, 3.4)	3.5 (3.1, 3.9)	4.0 (3.6, 4.5)	4.6 (4.0, 5.3)	4.8 (4.1, 5.6)
	Obese	436	11419	2.5 (2.2, 2.8)	3.8 (3.4, 4.2)	4.6 (4.1, 5.0)	5.0 (4.5, 5.6)	5.5 (4.9, 6.2)	6.0 (5.0, 7.3)
Fracture		334	8017	3.0 (2.7, 3.4)	4.1 (3.7, 4.6)	4.9 (4.4, 5.5)	5.2 (4.7, 5.9)	5.4 (4.8, 6.1)	5.8 (4.9, 6.8)
	Not Obese	148	4419	2.4 (2.0, 2.9)	3.2 (2.7, 3.8)	3.9 (3.3, 4.6)	4.3 (3.6, 5.2)	4.5 (3.7, 5.4)	5.3 (3.8, 7.3)
	Obese	186	3598	3.8 (3.2, 4.5)	5.2 (4.4, 6.0)	6.2 (5.3, 7.1)	6.4 (5.5, 7.4)	6.5 (5.6, 7.6)	6.5 (5.6, 7.6)
TOTAL		1919	59802						

Note: Restricted to modern prostheses

BMI has not been presented for patients aged ≤19 years

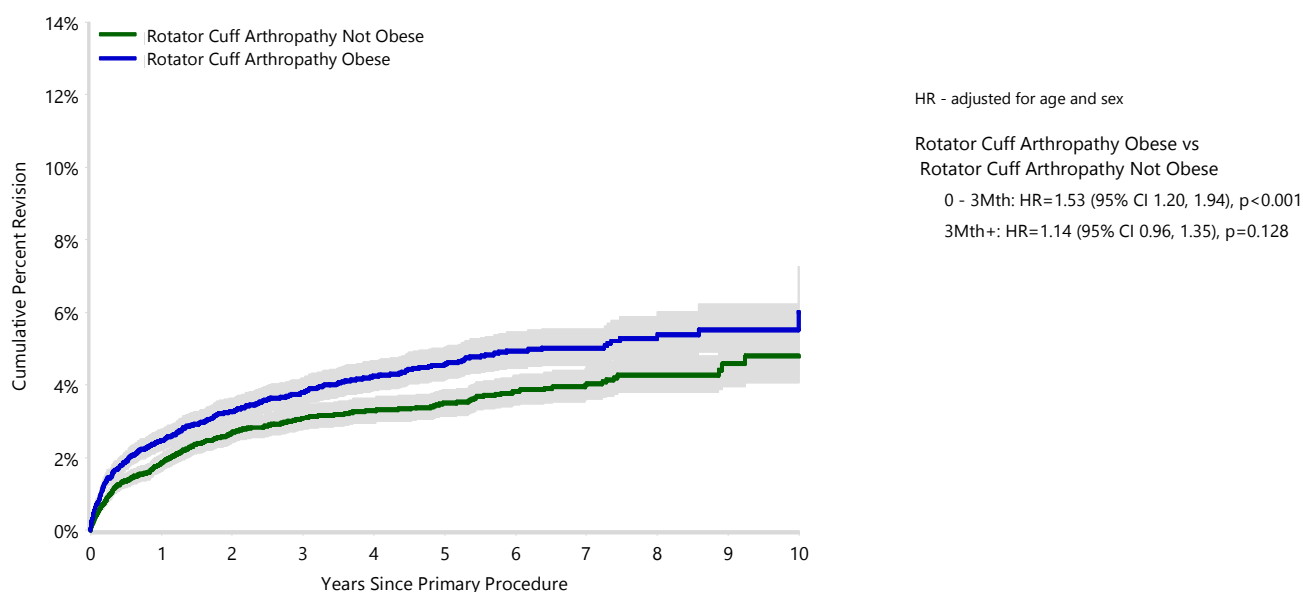
Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Figure ST93 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by BMI Category (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Rotator Cuff Arthropathy	Not Obese	13191	10729	6853	4056	1999	560	213
	Obese	11419	9285	5986	3540	1699	499	195

Note: Restricted to modern prostheses

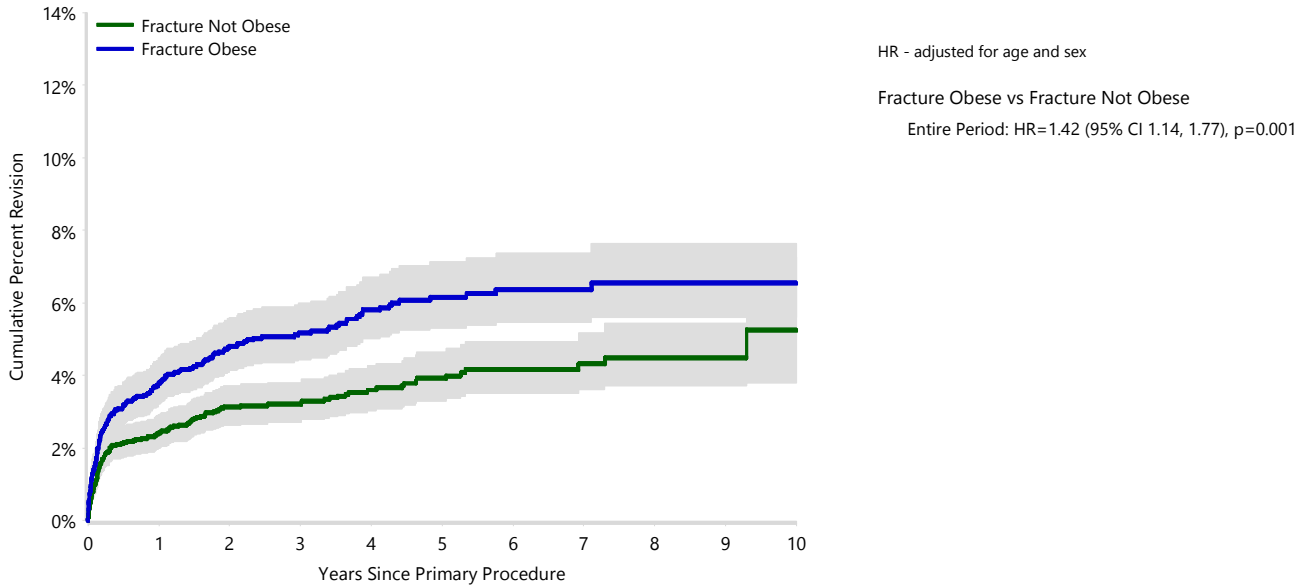
BMI has not been presented for patients aged ≤19 years

Not Obese group includes underweight, normal and pre-obese

Obese group includes obese class 1, 2 and 3

Primary Total Shoulder Replacement

Figure ST94 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by BMI Category (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	10 Yrs
Fracture	Not Obese	4419	3584	2258	1271	601	164	62
	Obese	3598	2908	1881	1103	549	177	71

Note: Restricted to modern prostheses
 BMI has not been presented for patients aged ≤ 19 years
 Not Obese group includes underweight, normal and pre-obese
 Obese group includes obese class 1, 2 and 3



Primary Total Shoulder Replacement

Table ST94 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Glenoid Morphology

Primary Diagnosis	Glenoid Morphology	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Osteoarthritis								
	A1	148	5670	1.5 (1.2, 1.9)	2.7 (2.3, 3.3)	3.2 (2.7, 3.8)	3.8 (3.1, 4.6)	4.0 (3.2, 4.9)
	A2	148	5600	1.6 (1.3, 2.0)	2.9 (2.5, 3.5)	3.2 (2.7, 3.8)	3.9 (3.2, 4.7)	4.2 (3.3, 5.2)
	B1	89	3905	1.7 (1.3, 2.1)	2.4 (2.0, 3.0)	2.8 (2.3, 3.5)	3.1 (2.4, 3.9)	3.1 (2.4, 3.9)
	B2	118	4673	1.4 (1.1, 1.8)	2.5 (2.1, 3.1)	3.5 (2.9, 4.3)	4.5 (3.5, 5.6)	5.1 (3.9, 6.7)
	C	44	1501	1.8 (1.2, 2.6)	2.7 (1.9, 3.8)	4.1 (3.0, 5.7)	4.5 (3.2, 6.3)	5.3 (3.5, 7.9)
Rotator Cuff Arthropathy								
	A1	329	10014	2.1 (1.8, 2.4)	3.3 (3.0, 3.7)	4.1 (3.6, 4.5)	4.6 (4.1, 5.2)	5.0 (4.3, 5.9)
	A2	170	5028	2.4 (2.0, 2.9)	3.8 (3.3, 4.4)	4.1 (3.5, 4.8)	4.5 (3.8, 5.3)	4.5 (3.8, 5.3)
	B1	78	3016	1.8 (1.3, 2.3)	2.8 (2.2, 3.5)	3.1 (2.4, 4.0)	3.7 (2.8, 4.8)	4.9 (3.3, 7.1)
	B2	69	2248	2.0 (1.4, 2.7)	3.3 (2.5, 4.2)	4.1 (3.1, 5.2)	4.8 (3.6, 6.3)	4.8 (3.6, 6.3)
	C	25	816	2.0 (1.2, 3.3)	3.3 (2.2, 5.0)	4.5 (2.9, 6.8)	4.5 (2.9, 6.8)	
Fracture								
	A1	222	5656	2.9 (2.5, 3.4)	4.0 (3.4, 4.5)	4.6 (4.0, 5.3)	5.0 (4.3, 5.8)	5.6 (4.7, 6.8)
	A2	23	668	2.2 (1.3, 3.6)	3.3 (2.1, 5.2)	4.7 (3.0, 7.3)	5.4 (3.4, 8.6)	
	B1	10	334	2.5 (1.2, 4.9)	3.1 (1.6, 5.9)	4.0 (2.0, 7.7)		
	B2	10	181	3.5 (1.6, 7.6)	5.1 (2.5, 10.0)	7.8 (4.1, 14.8)		
	C	2	71	2.9 (0.7, 11.3)	2.9 (0.7, 11.3)	2.9 (0.7, 11.3)		
TOTAL		1485	49381					

Note: Restricted to modern prostheses

Excludes 21,825 procedures with an unknown glenoid morphology, and 170 procedures with a recorded glenoid morphology of B3

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Primary Total Shoulder Replacement

OUTCOME FOR OSTEOARTHRITIS, ROTATOR CUFF ARTHROPATHY AND FRACTURE – PROSTHESIS CHARACTERISTICS

Fixation

Hybrid fixation (humerus cemented) has an increase in the rate of revision compared to cementless fixation for the first two weeks only for osteoarthritis. Different glenoid fixation is not associated with a revision rate change. Cementing the glenoid component increases the rate of revision compared to cementless fixation for the primary diagnoses rotator cuff arthropathy (Table ST95, Figure ST95 and Figure ST96).

When stratified by age, patients <65 years have an increased risk of revision using cementless fixation for osteoarthritis (Table ST96, Figure ST97, Figure ST98), rotator cuff arthropathy (Figure ST99, Figure ST100) and fracture (Figure ST101) compared to patients aged ≥65 years. Patients aged <65 years with a primary diagnosis of fracture have an increased risk of revision using hybrid (humerus cemented) fixation compared to patients aged ≥65 years (Figure ST102).

Polyethylene Type and Bearing Surface

Non XLPE glenospheres with metal humeral cups increase the risk of revision in procedures for osteoarthritis but not rotator cuff arthropathy or fracture. Non XLPE humeral cups have an increased rate of revision compared to XLPE humeral cups for osteoarthritis, rotator cuff arthropathy and fracture (Table ST97, Figure ST103, Figure ST104 and Figure ST105).

Glenosphere Size, Glenosphere Materials and Bearing Surface

For osteoarthritis and rotator cuff arthropathy, glenosphere sizes >40mm have a lower rate of revision compared to sizes <38mm over the entire period. In contrast, for fracture, humeral head sizes <38mm have a lower rate of revision than sizes >40mm (Table ST98, Figure ST106, Figure ST107 and Figure ST108).

For the primary diagnosis of osteoarthritis, >40mm glenospheres have a lower rate of revision compared to <38mm glenospheres for both XLPE/metal and non XLPE/metal. Glenosphere sizes >40mm also have a lower rate of revision compared to 38-40mm sizes for non XLPE/metal

but only for the first 3 months (Table ST99, Figure ST109, Figure ST110).

For rotator cuff arthropathy procedures using non XLPE/metal bearing surfaces, >40mm sizes have a lower rate of revision compared to <38mm sizes and also for 38-40mm sizes but only for the first 1.5 years. There is no difference for glenosphere sizes using XLPE/metal bearings (Table ST99 and Figure ST111).

Glenosphere sizes <38mm have a higher rate of revision compared to sizes >40mm.

For total stemmed reverse shoulder replacement procedures with a primary diagnosis of fracture using non XLPE/metal, there is an increased rate of revision for 38-40mm compared with <38mm glenospheres. There are no other significant differences in the rate of revision when bearing surface and glenosphere size are compared (Table ST99 and Figure ST112).

For the primary diagnosis osteoarthritis, total stemmed reverse shoulder replacement with cobalt chrome glenospheres sizes 38-40mm have an increased rate of revision compared to XLPE from 1.5 years and after 2.5 years for glenospheres >40mm (Table ST100, Figure ST113 and Figure ST114).

Similarly, cobalt chrome glenospheres of both 38-40mm and >40mm sizes utilised for rotator cuff arthropathy have an increased revision risk from 1.5 years compared to XLPE materials (Table ST100, Figure ST115 and Figure ST116).

In contrast, when stratified by glenosphere material, glenosphere size does not affect the rate of revision for fracture (Table ST100, Figure ST117 and Figure ST118).



Primary Total Shoulder Replacement

Table ST95 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Fixation

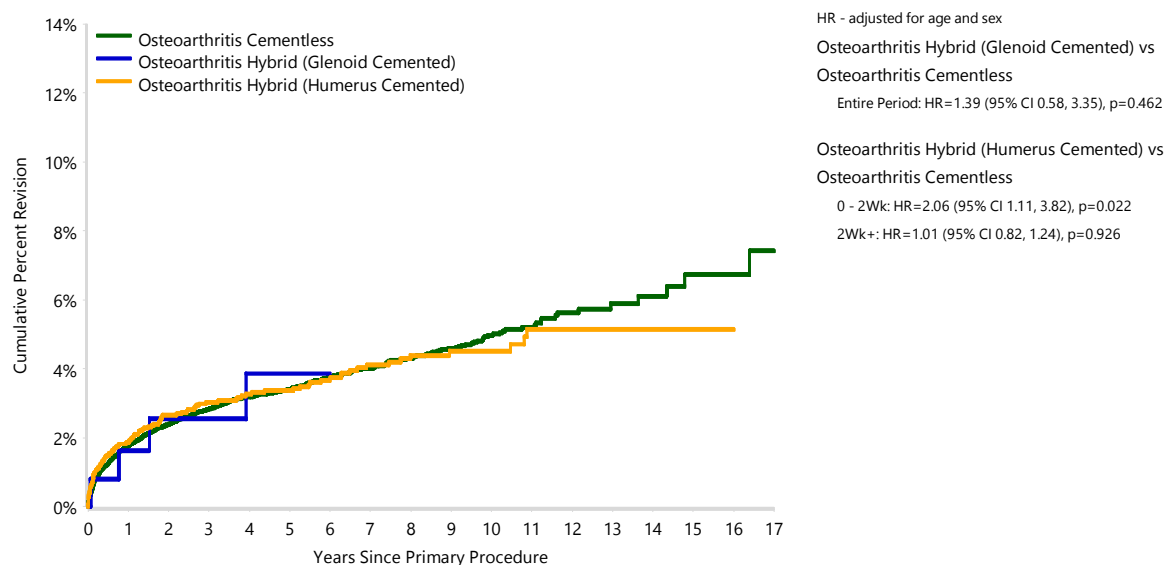
Primary Diagnosis	Fixation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Cemented	4	119	0.8 (0.1, 5.8)	1.8 (0.5, 7.0)	3.0 (1.0, 9.2)	3.0 (1.0, 9.2)		
	Cementless	910	28856	1.8 (1.6, 1.9)	2.8 (2.6, 3.1)	3.4 (3.2, 3.6)	4.0 (3.7, 4.3)	5.0 (4.6, 5.4)	6.7 (5.6, 8.0)
	Hybrid (Glenoid Cemented)	5	126	1.6 (0.4, 6.4)	2.5 (0.8, 7.7)	3.9 (1.4, 10.2)			
	Hybrid (Humerus Cemented)	113	3126	1.9 (1.4, 2.4)	3.0 (2.5, 3.7)	3.4 (2.8, 4.1)	4.1 (3.4, 5.0)	4.5 (3.7, 5.5)	5.1 (4.1, 6.4)
Rotator Cuff Arthropathy		1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Cemented	4	36	5.6 (1.4, 20.4)	5.6 (1.4, 20.4)	9.5 (3.1, 27.1)	9.5 (3.1, 27.1)		
	Cementless	957	25921	2.2 (2.0, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.5)	4.7 (4.4, 5.0)	5.6 (5.1, 6.0)	6.4 (5.7, 7.1)
	Hybrid (Glenoid Cemented)	9	140	5.8 (2.9, 11.2)	6.6 (3.5, 12.3)	6.6 (3.5, 12.3)			
	Hybrid (Humerus Cemented)	76	2141	2.2 (1.7, 2.9)	3.4 (2.7, 4.3)	3.7 (2.9, 4.7)	4.0 (3.2, 5.1)	4.6 (3.5, 6.0)	
Fracture		465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Cemented	6	125	3.3 (1.2, 8.4)	3.3 (1.2, 8.4)	6.4 (2.8, 14.4)			
	Cementless	161	3322	3.5 (2.9, 4.2)	4.6 (3.9, 5.4)	5.3 (4.5, 6.2)	5.7 (4.8, 6.7)	6.0 (5.1, 7.2)	
	Hybrid (Glenoid Cemented)	13	206	5.4 (3.0, 9.6)	6.0 (3.5, 10.4)	7.0 (4.1, 11.9)			
	Hybrid (Humerus Cemented)	285	7258	2.7 (2.3, 3.1)	3.7 (3.3, 4.2)	4.3 (3.8, 4.9)	4.7 (4.2, 5.4)	5.6 (4.8, 6.5)	
TOTAL		2543	71376						

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Primary Total Shoulder Replacement

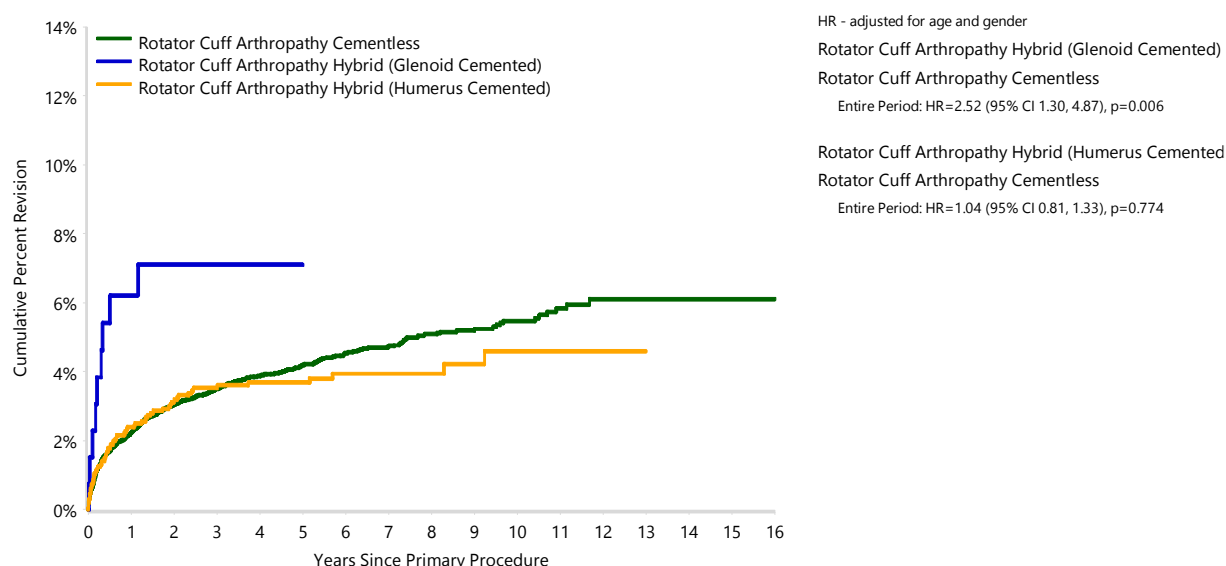
Figure ST95 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Fixation (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Cementless	28856	24231	16597	11049	6501	2305	254
	Hybrid (Glenoid Cemented)	126	113	85	55	29	8	0
	Hybrid (Humerus Cemented)	3126	2816	2233	1712	1193	556	79

Note: Restricted to modern prostheses.

Figure ST96 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Fixation (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Cementless	25921	21414	14421	9315	5504	1860	150
	Hybrid (Glenoid Cemented)	140	120	96	70	30	5	1
	Hybrid (Humerus Cemented)	2141	1881	1434	997	592	253	22

Note: Restricted to modern prostheses.



Primary Total Shoulder Replacement

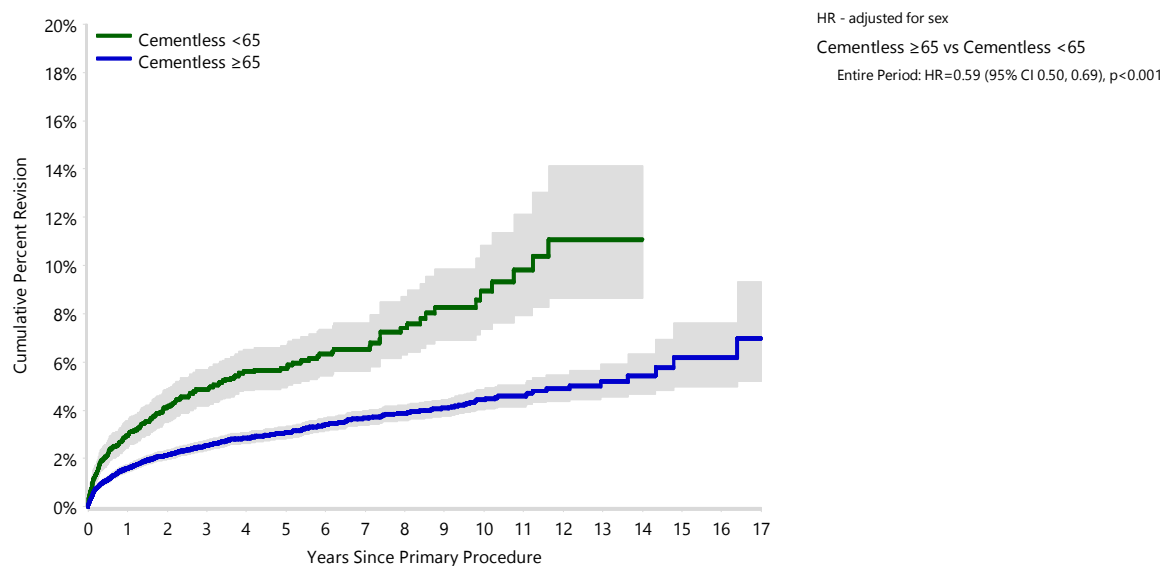
Table ST96 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis, Fixation and Age

Primary Diagnosis	Fixation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis										
	Cementless	<65	194	3646	3.0 (2.4, 3.6)	4.9 (4.2, 5.7)	5.7 (4.9, 6.7)	6.5 (5.6, 7.6)	8.9 (7.4, 10.8)	
		≥65	716	25210	1.6 (1.4, 1.8)	2.5 (2.3, 2.8)	3.1 (2.8, 3.3)	3.7 (3.4, 4.0)	4.4 (4.0, 4.9)	6.2 (5.0, 7.6)
	Hybrid (Humerus Cemented)	<65	19	331	2.5 (1.3, 4.9)	5.0 (3.0, 8.1)	5.0 (3.0, 8.1)	6.9 (4.3, 11.0)	8.0 (4.9, 12.9)	
		≥65	94	2795	1.8 (1.3, 2.3)	2.8 (2.2, 3.5)	3.2 (2.6, 3.9)	3.8 (3.0, 4.7)	4.1 (3.3, 5.1)	4.8 (3.7, 6.1)
Rotator Cuff Arthropathy										
	Cementless	<65	179	3351	3.0 (2.5, 3.7)	5.5 (4.7, 6.4)	6.2 (5.3, 7.2)	6.8 (5.8, 7.9)	8.8 (7.0, 11.0)	
		≥65	778	22570	2.1 (1.9, 2.3)	3.2 (3.0, 3.5)	3.9 (3.6, 4.2)	4.4 (4.1, 4.7)	5.1 (4.7, 5.6)	5.8 (5.1, 6.5)
	Hybrid (Humerus Cemented)	<65	11	179	3.5 (1.6, 7.7)	7.1 (4.0, 12.6)	7.1 (4.0, 12.6)	7.1 (4.0, 12.6)		
		≥65	65	1962	2.1 (1.5, 2.8)	3.1 (2.4, 4.0)	3.4 (2.6, 4.4)	3.8 (2.9, 4.8)	4.4 (3.3, 5.8)	
Fracture										
	Cementless	<65	41	581	4.2 (2.8, 6.2)	6.6 (4.8, 9.2)	7.7 (5.6, 10.5)	8.2 (5.9, 11.2)	10.0 (6.9, 14.4)	
		≥65	120	2741	3.3 (2.7, 4.1)	4.2 (3.5, 5.1)	4.8 (4.0, 5.8)	5.2 (4.3, 6.2)	5.2 (4.3, 6.2)	
	Hybrid (Humerus Cemented)	<65	76	1026	4.9 (3.7, 6.4)	6.6 (5.2, 8.4)	8.1 (6.4, 10.3)	9.5 (7.4, 12.1)	11.9 (8.3, 16.9)	
		≥65	209	6232	2.3 (2.0, 2.7)	3.2 (2.8, 3.7)	3.7 (3.2, 4.3)	4.0 (3.4, 4.6)	4.6 (3.9, 5.4)	
TOTAL			2502	70624						

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

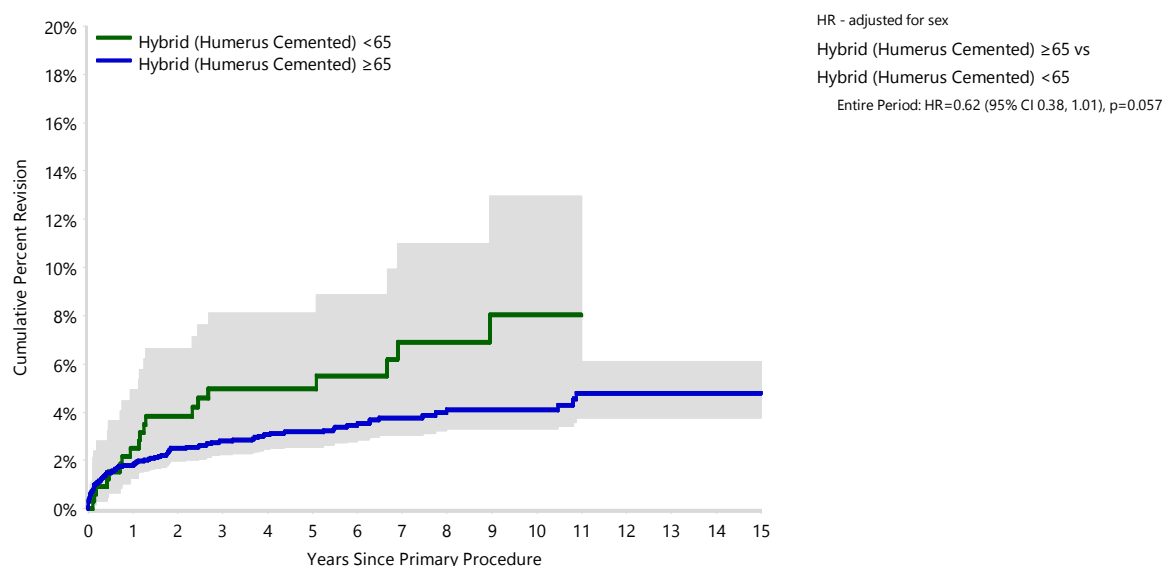
Figure ST97 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis OA)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis Cementless	<65		3646	2996	1994	1247	727	255	32
	≥ 65		25210	21235	14603	9802	5774	2050	222

Note: Restricted to modern prostheses

Figure ST98 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis OA)



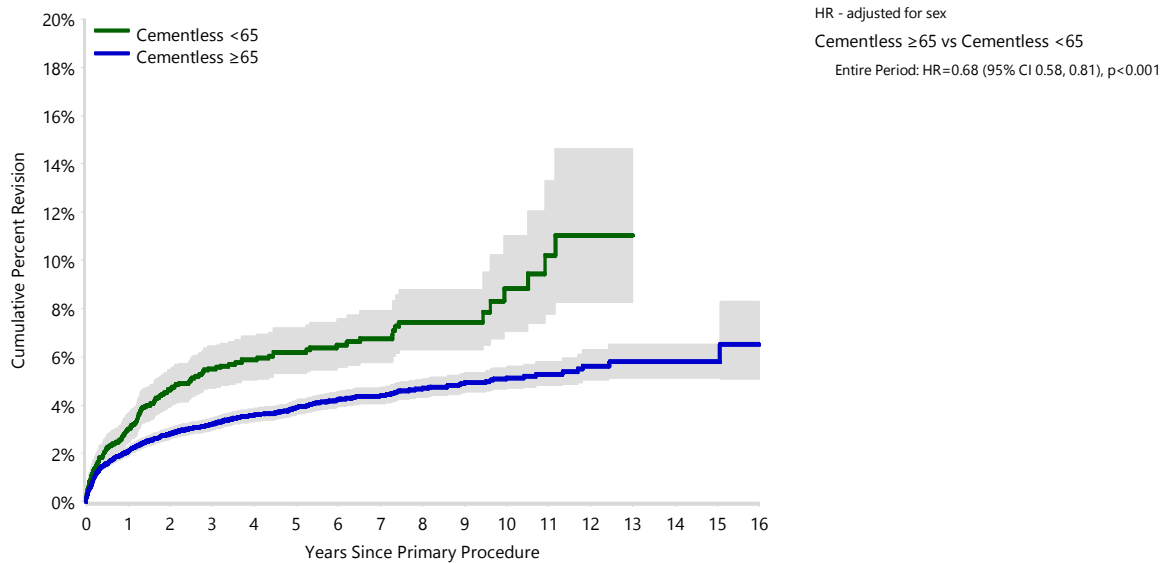
Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis Hybrid (Humerus Cemented)	<65		331	302	237	177	131	60	15
	≥ 65		2795	2514	1996	1535	1062	496	64

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

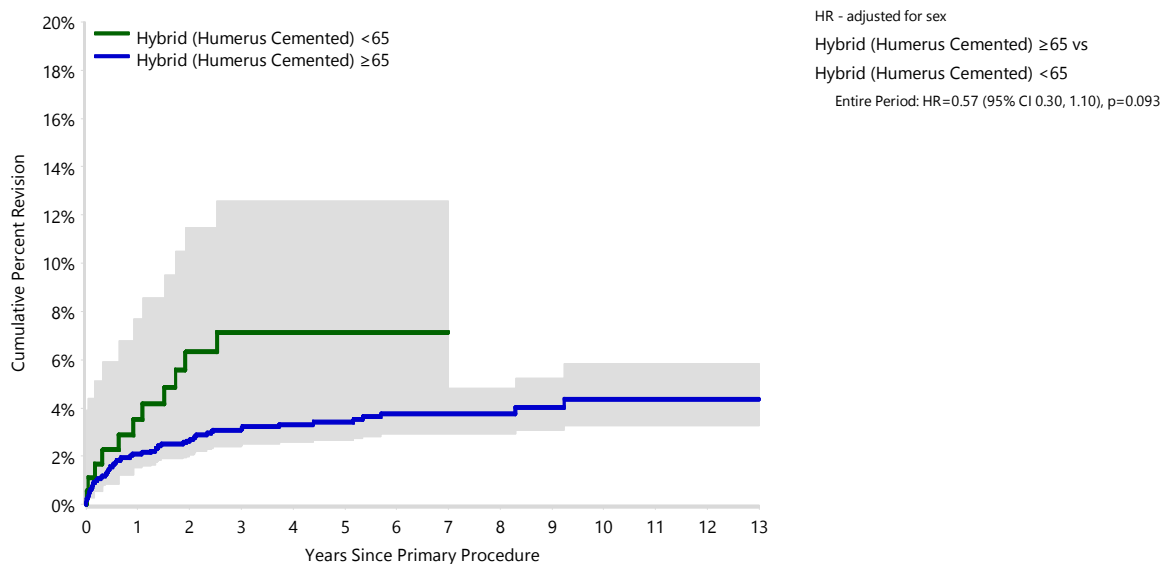
Figure ST99 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Cementless	< 65	3351	2688	1676	1032	604	179	17
		≥ 65	22570	18726	12745	8283	4900	1681	133

Note: Restricted to modern prostheses

Figure ST100 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Rotator Cuff Arthropathy)

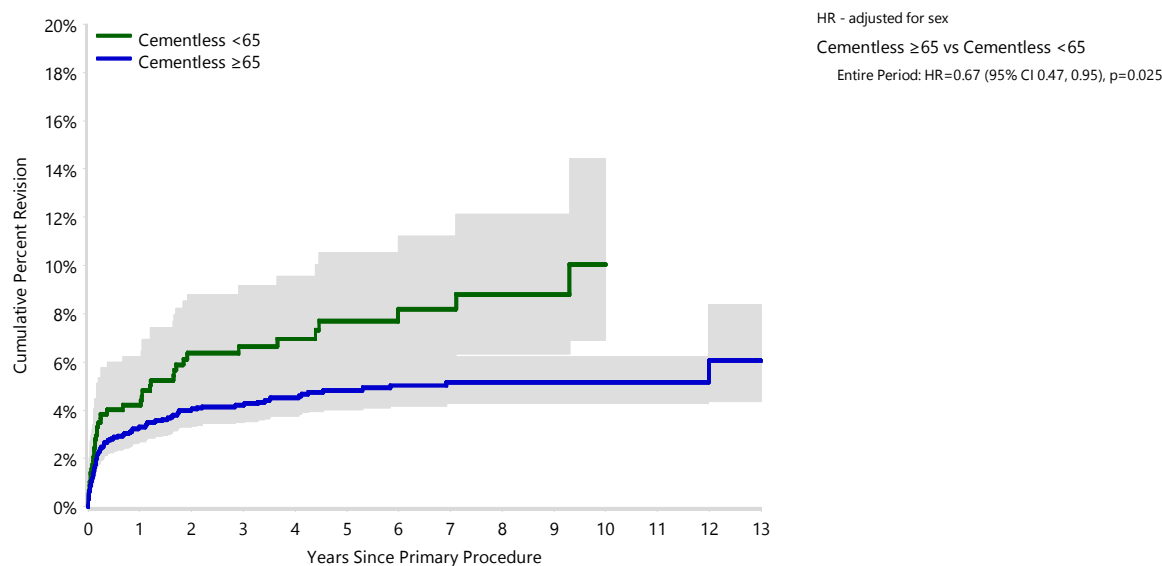


Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Hybrid (Humerus Cemented)	< 65	179	150	109	80	51	16	3
		≥ 65	1962	1731	1325	917	541	237	19

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

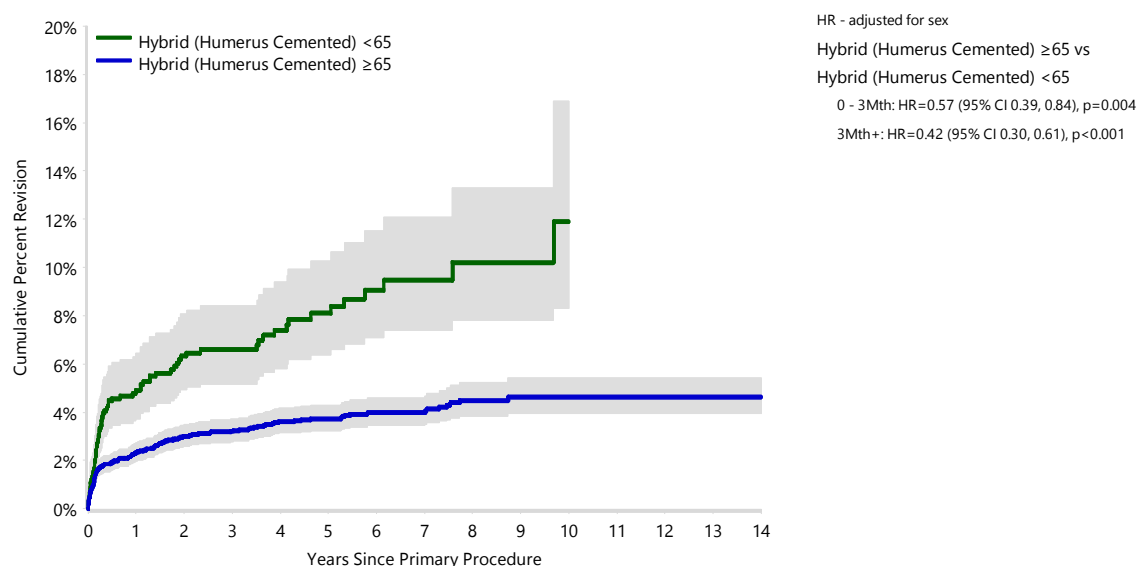
Figure ST101 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	13 Yrs
Fracture	Cementless	< 65	581	480	326	222	154	52	18
		≥ 65	2741	2276	1590	1102	700	257	55

Note: Restricted to modern prostheses

Figure ST102 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Age (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	13 Yrs
Fracture	Hybrid (Humerus Cemented)	< 65	1026	825	545	322	160	46	17
		≥ 65	6232	5188	3535	2217	1247	435	90

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST97 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Bearing Surface

Primary Diagnosis	Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1032	32174	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Ceramic/Non XLPE	0	5	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Ceramic/XLPE	4	88	2.5 (0.6, 9.5)	5.3 (2.0, 13.6)	5.3 (2.0, 13.6)			
	Metal/Non XLPE	20	502	1.2 (0.5, 2.7)	3.1 (1.9, 5.0)	3.3 (2.0, 5.3)	3.9 (2.5, 6.2)		
	Metal/XLPE	144	4897	2.0 (1.6, 2.4)	2.9 (2.5, 3.5)	3.1 (2.6, 3.7)	3.2 (2.7, 3.8)	3.7 (3.0, 4.5)	
	Non XLPE/Metal	682	18423	1.9 (1.7, 2.1)	3.1 (2.8, 3.4)	3.7 (3.4, 4.1)	4.5 (4.2, 4.9)	5.5 (5.1, 6.1)	7.4 (6.3, 8.8)
Rotator Cuff Arthropathy	XLPE/Metal	182	8259	1.4 (1.2, 1.7)	2.1 (1.8, 2.5)	2.7 (2.3, 3.1)	3.2 (2.7, 3.8)	3.8 (3.1, 4.6)	4.9 (3.7, 6.4)
		1046	28192	2.2 (2.1, 2.4)	3.5 (3.3, 3.8)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Ceramic/Non XLPE	0	10	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
	Ceramic/XLPE	2	77	1.3 (0.2, 8.9)	2.7 (0.7, 10.4)	2.7 (0.7, 10.4)			
	Metal/Non XLPE	22	467	2.4 (1.3, 4.2)	3.9 (2.5, 6.1)	4.6 (3.0, 7.0)	5.2 (3.4, 8.1)		
	Metal/XLPE	154	4153	2.5 (2.1, 3.0)	3.6 (3.0, 4.2)	3.8 (3.2, 4.5)	4.1 (3.5, 4.9)	4.6 (3.8, 5.6)	
Fracture	Non XLPE/Metal	680	16314	2.3 (2.1, 2.6)	3.7 (3.4, 4.0)	4.5 (4.2, 4.9)	5.0 (4.7, 5.5)	6.0 (5.5, 6.6)	6.7 (6.0, 7.6)
	XLPE/Metal	188	7171	1.9 (1.6, 2.2)	2.9 (2.5, 3.3)	3.5 (3.0, 4.1)	3.8 (3.2, 4.5)	4.7 (3.7, 5.9)	5.5 (4.2, 7.3)
		463	10881	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Ceramic/XLPE	0	4	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
	Metal/Non XLPE	14	285	1.8 (0.7, 4.2)	3.6 (2.0, 6.7)	4.9 (2.9, 8.3)	5.5 (3.3, 9.2)		
	Metal/XLPE	96	1718	3.9 (3.0, 4.9)	5.3 (4.3, 6.5)	6.0 (4.9, 7.3)	6.5 (5.3, 8.0)	6.5 (5.3, 8.0)	
TOTAL	Non XLPE/Metal	271	6252	2.9 (2.5, 3.4)	3.9 (3.4, 4.4)	4.7 (4.1, 5.3)	5.1 (4.5, 5.7)	6.1 (5.2, 7.0)	
	XLPE/Metal	82	2622	2.7 (2.2, 3.5)	3.4 (2.7, 4.2)	3.7 (2.9, 4.6)	3.7 (2.9, 4.6)	3.7 (2.9, 4.6)	

Note: Restricted to modern prostheses

Reported as humeral cup/glenosphere

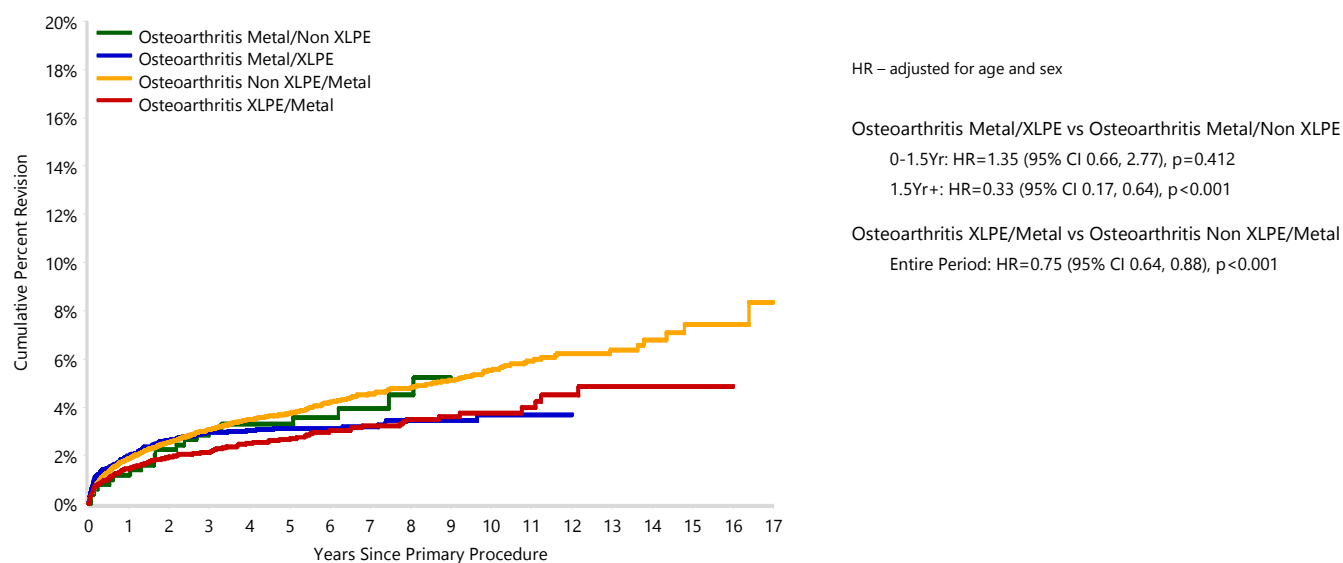
Excludes 129 procedures with unknown bearing surface

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Primary Total Shoulder Replacement

Figure ST103 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Bearing Surface (Primary Diagnosis OA)



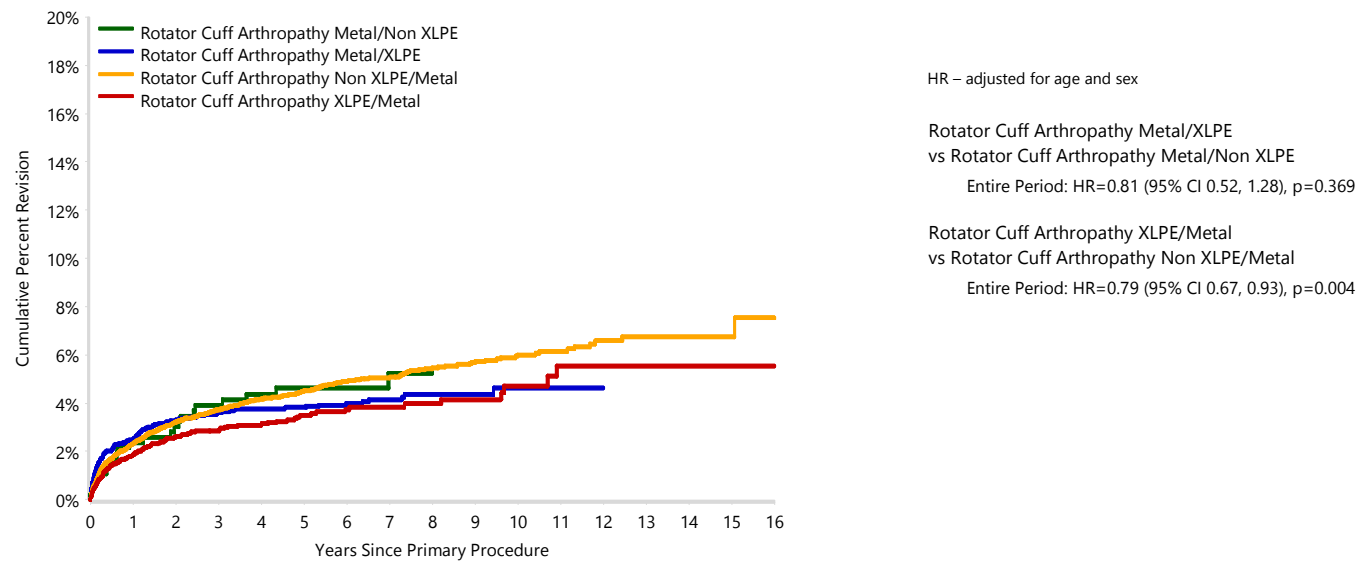
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Metal/Non XLPE	502	484	455	353	200	18	0
	Metal/XLPE	4897	4369	3329	2222	1241	314	2
	Non XLPE/Metal	18423	16103	11559	8138	5066	2023	235
	XLPE/Metal	8259	6222	3610	2156	1266	544	107

Note: Restricted to modern prostheses
 Reported as humeral cup/glenosphere



Primary Total Shoulder Replacement

Figure ST104 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Bearing Surface (Primary Diagnosis Rotator Cuff Arthropathy)

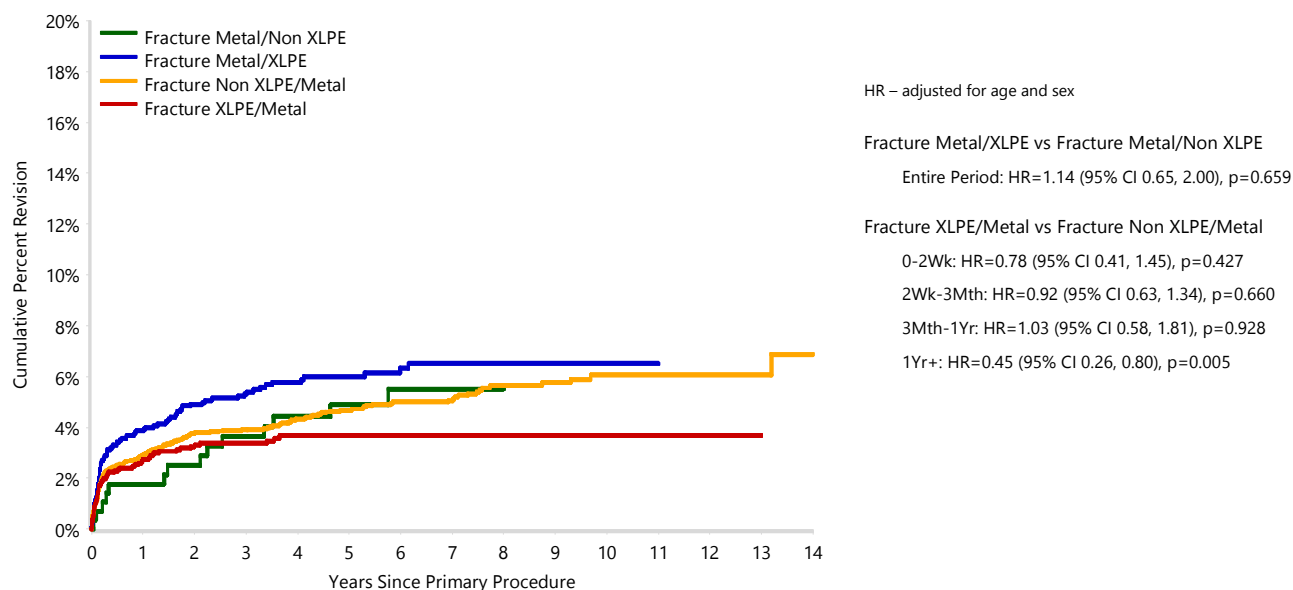


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Metal/Non XLPE	467	449	422	318	152	9	0
	Metal/XLPE	4153	3692	2779	1852	1050	252	1
	Non XLPE/Metal	16314	14052	9978	6766	4142	1554	122
	XLPE/Metal	7171	5155	2718	1422	778	304	51

Note: Restricted to modern prostheses
Reported as humeral cup/glenosphere

Primary Total Shoulder Replacement

Figure ST105 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Bearing Surface (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	Metal/Non XLPE	285	271	248	194	93	4	0
	Metal/XLPE	1718	1477	1071	679	383	104	0
	Non XLPE/Metal	6252	5322	3740	2428	1442	522	34
	XLPE/Metal	2622	1957	1113	652	392	170	30

Note: Restricted to modern prostheses
Reported as humeral cup/glenosphere



Primary Total Shoulder Replacement

Table ST98 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis OA)

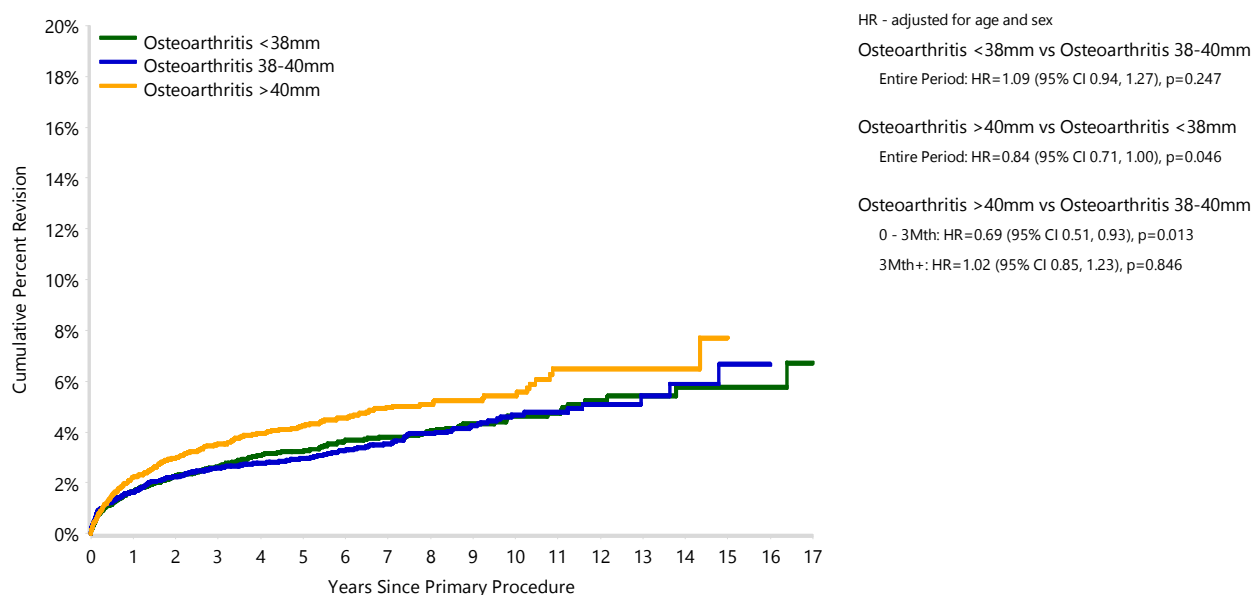
Primary Diagnosis	Glenosphere Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		966	29515	1.8 (1.6, 1.9)	2.8 (2.6, 3.0)	3.4 (3.1, 3.6)	4.0 (3.7, 4.3)	4.8 (4.5, 5.2)	6.5 (5.6, 7.5)
	<38mm	346	11680	1.6 (1.4, 1.9)	2.6 (2.3, 3.0)	3.2 (2.9, 3.6)	3.8 (3.4, 4.3)	4.6 (4.0, 5.3)	5.8 (4.7, 7.0)
	38-40mm	341	10997	1.6 (1.4, 1.9)	2.6 (2.3, 2.9)	3.0 (2.6, 3.3)	3.5 (3.1, 4.0)	4.7 (4.1, 5.4)	6.7 (4.9, 9.0)
	>40mm	279	6838	2.2 (1.9, 2.6)	3.5 (3.1, 4.0)	4.2 (3.7, 4.8)	5.0 (4.4, 5.6)	5.4 (4.7, 6.2)	7.7 (5.5, 10.8)
Rotator Cuff Arthropathy		981	26079	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.1 (3.9, 4.4)	4.6 (4.3, 4.9)	5.4 (5.0, 5.9)	6.1 (5.5, 6.8)
	<38mm	347	10153	2.1 (1.8, 2.4)	3.4 (3.0, 3.8)	4.0 (3.5, 4.4)	4.2 (3.8, 4.7)	5.5 (4.8, 6.4)	6.1 (5.1, 7.1)
	38-40mm	352	9406	2.3 (2.0, 2.6)	3.4 (3.0, 3.8)	4.0 (3.6, 4.4)	4.3 (3.9, 4.8)	4.9 (4.4, 5.6)	5.8 (4.8, 7.0)
	>40mm	282	6520	2.4 (2.0, 2.8)	3.8 (3.4, 4.4)	4.6 (4.0, 5.2)	5.4 (4.8, 6.1)	6.0 (5.2, 6.9)	
Fracture		442	10238	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.5 (5.3, 8.1)
	<38mm	157	4788	2.3 (1.9, 2.7)	3.1 (2.6, 3.6)	3.7 (3.1, 4.4)	4.1 (3.4, 4.8)	4.6 (3.8, 5.5)	5.7 (3.8, 8.6)
	38-40mm	174	3889	3.1 (2.6, 3.7)	4.1 (3.5, 4.8)	4.7 (4.0, 5.4)	4.9 (4.2, 5.7)	5.9 (4.9, 7.1)	
	>40mm	111	1561	4.9 (3.9, 6.1)	6.6 (5.5, 8.0)	7.8 (6.5, 9.4)	8.3 (6.9, 9.9)	8.3 (6.9, 9.9)	
TOTAL		2389	65832						

Note: Restricted to modern prostheses

Excludes 5,544 procedures with unknown glenosphere sizes

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Figure ST106 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis OA)

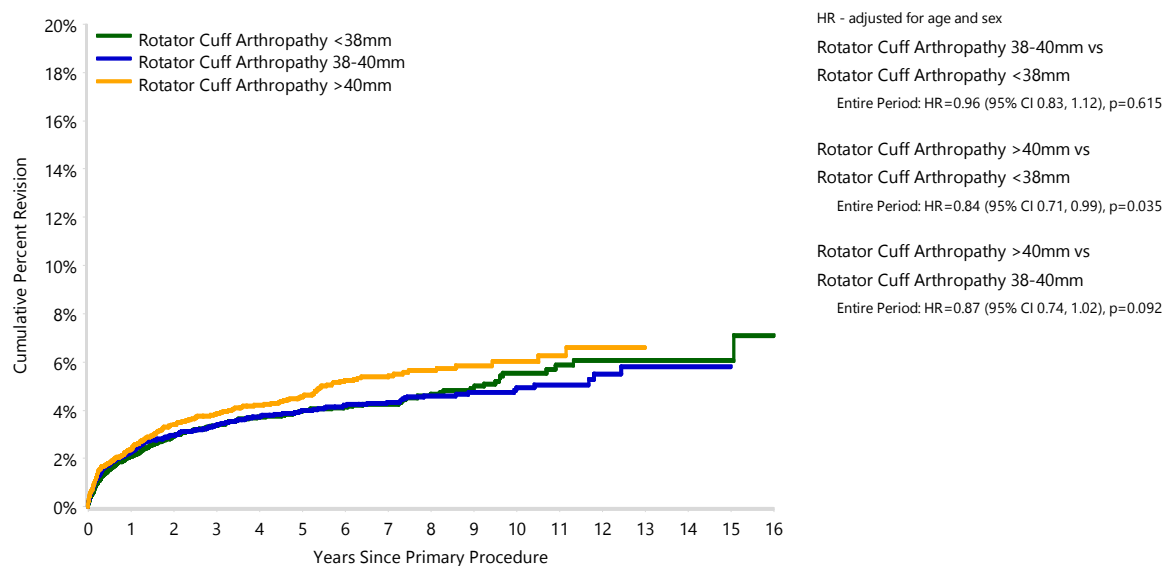


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	<38mm	11680	9632	6580	4451	2756	1161	180
	38-40mm	10997	9895	7307	5105	3101	1084	112
	>40mm	6838	6022	4479	3150	1889	655	52

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

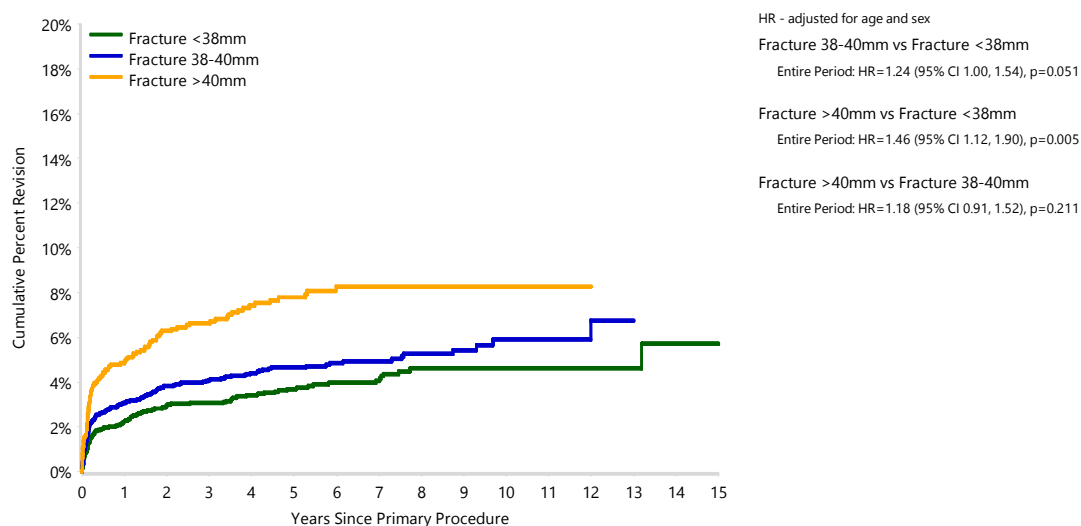
Figure ST107 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	<38mm	10153	8163	5341	3412	2067	764	92
	38-40mm	9406	8388	6020	4103	2521	899	66
	>40mm	6520	5626	4132	2728	1518	458	16

Note: Restricted to modern prostheses

Figure ST108 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenosphere Size (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	<38mm	4788	3876	2512	1578	957	365	40
	38-40mm	3889	3452	2539	1706	995	326	20
	>40mm	1561	1327	1009	668	364	114	4

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST99 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis, Bearing Surface and Glenosphere Size

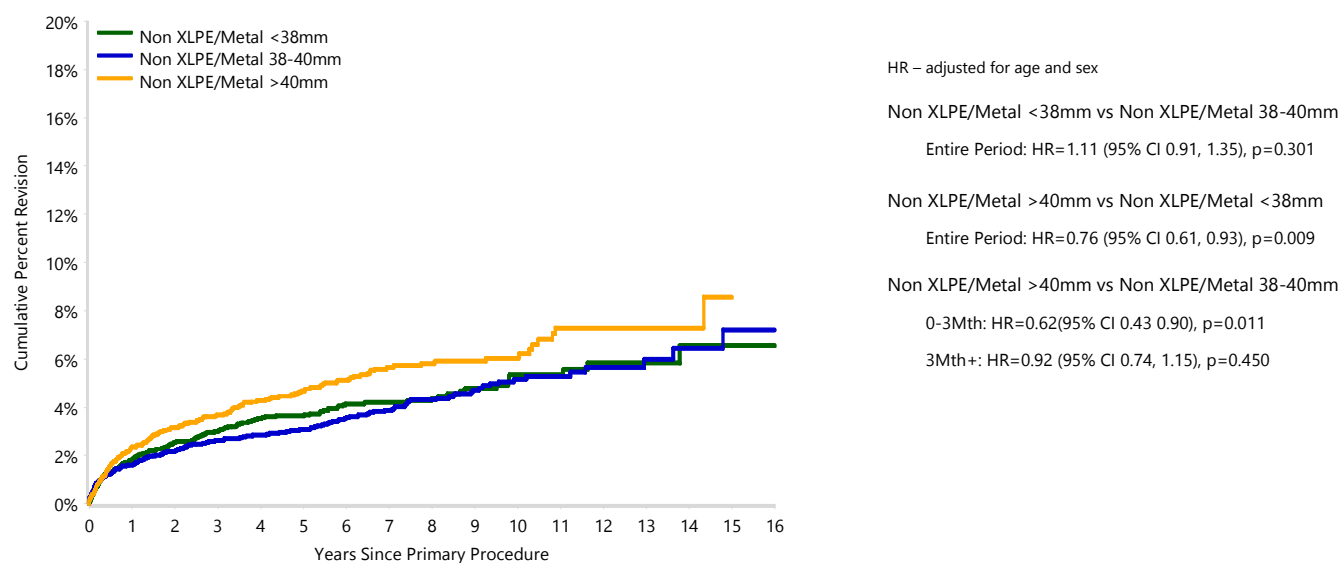
Primary Diagnosis	Bearing Surface	Glenospher e Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs	
Osteoarthritis	Metal/Non XLPE	<38mm	6	104	2.9 (0.9, 8.7)	4.9 (2.1, 11.3)	4.9 (2.1, 11.3)	4.9 (2.1, 11.3)			
		38-40mm	8	271	0.4 (0.1, 2.6)	1.9 (0.8, 4.5)	2.3 (1.0, 5.1)	3.6 (1.8, 7.3)			
		>40mm	6	126	1.6 (0.4, 6.2)	4.0 (1.7, 9.4)	4.0 (1.7, 9.4)	4.0 (1.7, 9.4)			
	Metal/XLPE	<38mm	1	34	0.0 (0.0, 0.0)	3.3 (0.5, 21.4)	3.3 (0.5, 21.4)				
		38-40mm	92	3347	1.9 (1.5, 2.4)	2.7 (2.2, 3.4)	2.9 (2.3, 3.6)	2.9 (2.3, 3.6)	3.7 (2.7, 4.9)		
		>40mm	51	1516	2.2 (1.5, 3.0)	3.4 (2.6, 4.5)	3.6 (2.7, 4.7)	3.8 (2.9, 5.0)	3.8 (2.9, 5.0)		
	Non XLPE/Metal	<38mm	184	5006	1.8 (1.5, 2.2)	3.0 (2.5, 3.5)	3.7 (3.1, 4.3)	4.2 (3.6, 4.9)	5.3 (4.5, 6.4)	6.6 (4.9, 8.7)	
		38-40mm	224	6408	1.6 (1.3, 2.0)	2.6 (2.2, 3.1)	3.1 (2.7, 3.6)	3.9 (3.4, 4.5)	5.2 (4.4, 6.0)	7.2 (5.4, 9.6)	
		>40mm	216	4829	2.3 (1.9, 2.8)	3.7 (3.2, 4.3)	4.7 (4.0, 5.4)	5.7 (4.9, 6.5)	6.0 (5.2, 7.0)	8.6 (6.2, 11.8)	
	XLPE/Metal	<38mm	154	6515	1.5 (1.2, 1.8)	2.2 (1.9, 2.7)	2.8 (2.3, 3.3)	3.4 (2.8, 4.1)	3.8 (3.1, 4.6)	4.9 (3.8, 6.5)	
		38-40mm	15	908	1.2 (0.6, 2.2)	1.7 (1.0, 2.9)	2.0 (1.2, 3.5)				
		>40mm	5	348	0.9 (0.3, 2.8)	1.3 (0.5, 3.5)	1.3 (0.5, 3.5)	1.3 (0.5, 3.5)			
Rotator Cuff Arthropathy	Metal/Non XLPE	<38mm	3	61	1.6 (0.2, 11.1)	4.9 (1.6, 14.5)	4.9 (1.6, 14.5)	4.9 (1.6, 14.5)			
		38-40mm	12	233	2.6 (1.2, 5.6)	3.5 (1.7, 6.8)	4.9 (2.7, 8.6)	6.0 (3.3, 10.6)			
		>40mm	7	173	2.3 (0.9, 6.1)	4.2 (2.0, 8.6)	4.2 (2.0, 8.6)	4.2 (2.0, 8.6)			
	Metal/XLPE	<38mm	0	28	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
		38-40mm	82	2624	2.1 (1.6, 2.8)	3.2 (2.6, 4.0)	3.3 (2.7, 4.1)	3.6 (2.8, 4.5)	3.8 (3.0, 4.8)		
		>40mm	72	1501	3.2 (2.4, 4.3)	4.4 (3.4, 5.5)	4.7 (3.7, 6.0)	5.2 (4.1, 6.5)	5.9 (4.5, 7.8)		
	Non XLPE/Metal	<38mm	199	4583	2.4 (2.0, 2.9)	3.9 (3.4, 4.6)	4.5 (3.9, 5.2)	4.8 (4.1, 5.5)	6.3 (5.3, 7.5)	6.7 (5.5, 8.1)	
		38-40mm	233	5698	2.3 (2.0, 2.8)	3.5 (3.0, 4.0)	4.2 (3.7, 4.8)	4.6 (4.0, 5.2)	5.3 (4.6, 6.1)	6.2 (5.1, 7.6)	
		>40mm	190	4453	2.2 (1.8, 2.7)	3.7 (3.2, 4.3)	4.6 (4.0, 5.4)	5.7 (4.9, 6.6)	6.3 (5.4, 7.5)		
	XLPE/Metal	<38mm	145	5466	1.9 (1.5, 2.3)	2.8 (2.3, 3.3)	3.4 (2.9, 4.1)	3.7 (3.1, 4.5)	4.6 (3.6, 5.9)	5.5 (4.1, 7.3)	
		38-40mm	23	795	1.9 (1.2, 3.2)	3.3 (2.2, 5.0)	3.3 (2.2, 5.0)				
		>40mm	13	365	1.8 (0.8, 4.0)	3.8 (2.1, 6.8)	4.4 (2.5, 7.8)	5.2 (2.9, 9.1)			
Fracture	Metal/Non XLPE	<38mm	0	3	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)					
		38-40mm	6	183	1.6 (0.5, 5.0)	2.2 (0.8, 5.8)	2.8 (1.2, 6.7)	3.8 (1.7, 8.5)			
		>40mm	8	99	2.0 (0.5, 7.9)	6.3 (2.9, 13.4)	8.6 (4.4, 16.4)	8.6 (4.4, 16.4)			
	Metal/XLPE	<38mm	0	3	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)					
		38-40mm	64	1362	3.2 (2.3, 4.3)	4.6 (3.5, 5.9)	5.2 (4.1, 6.7)	5.5 (4.2, 7.0)	5.5 (4.2, 7.0)		
		>40mm	32	353	6.6 (4.4, 9.8)	8.2 (5.7, 11.7)	9.0 (6.4, 12.7)	10.3 (7.3, 14.5)			
	Non XLPE/Metal	<38mm	83	2478	1.8 (1.3, 2.4)	2.7 (2.1, 3.5)	3.6 (2.8, 4.5)	4.2 (3.3, 5.3)	5.1 (4.0, 6.5)		
		38-40mm	97	2144	3.2 (2.5, 4.0)	4.0 (3.2, 4.9)	4.5 (3.7, 5.6)	4.7 (3.9, 5.8)	6.1 (4.8, 7.8)		
		>40mm	70	1066	4.7 (3.6, 6.2)	6.3 (4.9, 8.0)	7.4 (5.9, 9.3)	7.6 (6.0, 9.6)	7.6 (6.0, 9.6)		
	XLPE/Metal	<38mm	73	2298	2.8 (2.2, 3.6)	3.4 (2.7, 4.3)	3.7 (3.0, 4.7)	3.7 (3.0, 4.7)	3.7 (3.0, 4.7)		
		38-40mm	7	193	3.2 (1.4, 6.9)	3.9 (1.9, 8.0)					
		>40mm	1	40	2.5 (0.4, 16.5)	2.5 (0.4, 16.5)	2.5 (0.4, 16.5)	2.5 (0.4, 16.5)			
TOTAL			2382	65614							

Note: Restricted to modern prostheses. Restricted to non-ceramic bearing surface and known glenosphere size

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Primary Total Shoulder Replacement

Figure ST109 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Non XLPE/Metal Bearing Surface by Glenosphere Size (Primary Diagnosis OA)



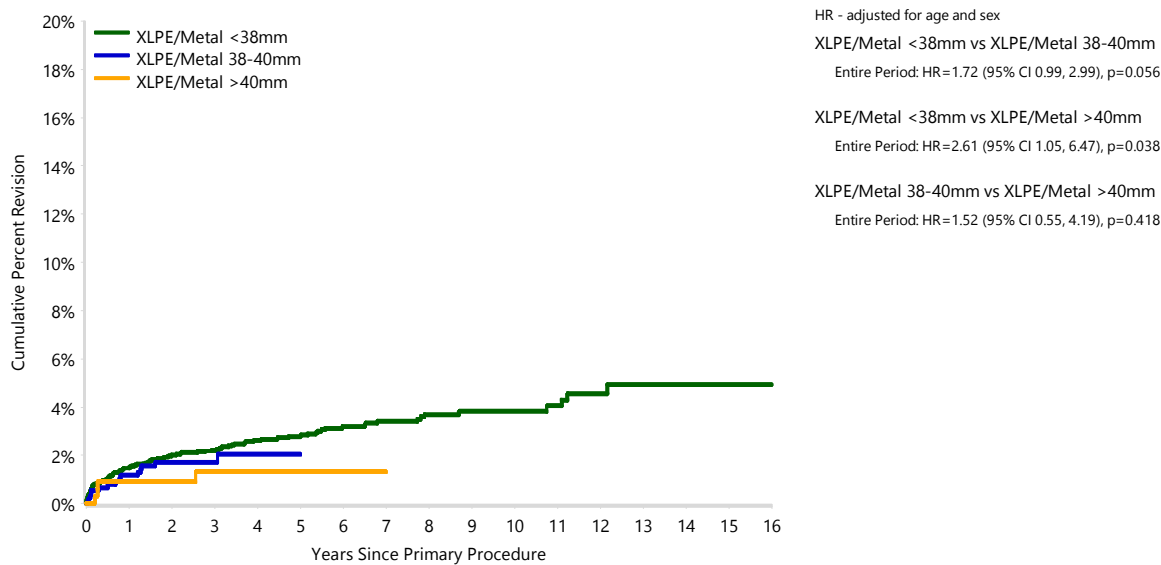
Number at Risk				0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Non XLPE/Metal	<38mm		5006	4478	3404	2457	1500	608	73
		38-40mm		6408	5871	4503	3350	2170	882	112
		>40mm		4829	4203	3029	2152	1363	533	50

Note: Restricted to modern prostheses. Reported as humeral cup/glenosphere



Primary Total Shoulder Replacement

Figure ST110 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with XLPE/Metal Bearing Surface by Glenosphere Size (Primary Diagnosis OA)

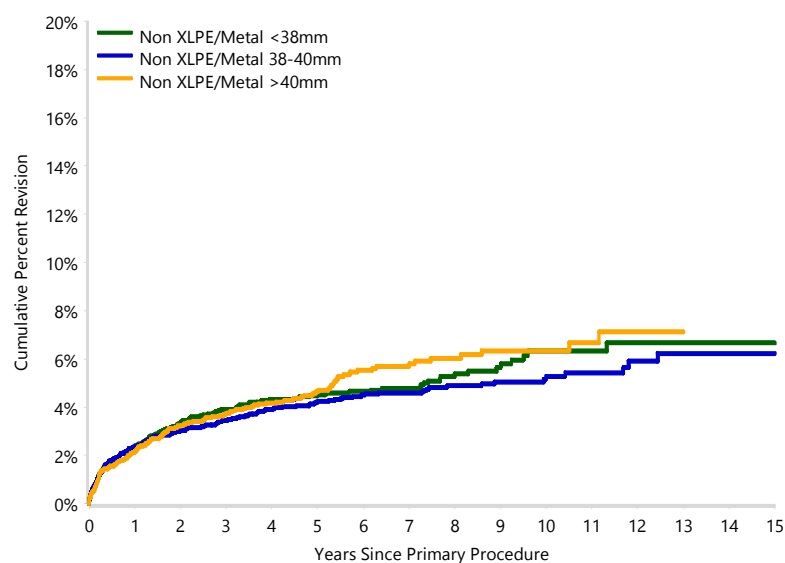


Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	XLPE/Metal	<38mm	6515	5003	3057	1908	1193	539	107
		38-40mm	908	751	318	69	0	0	0
		>40mm	348	306	220	175	73	5	0

Note: Restricted to modern prostheses. Reported as humeral cup/glenosphere

Primary Total Shoulder Replacement

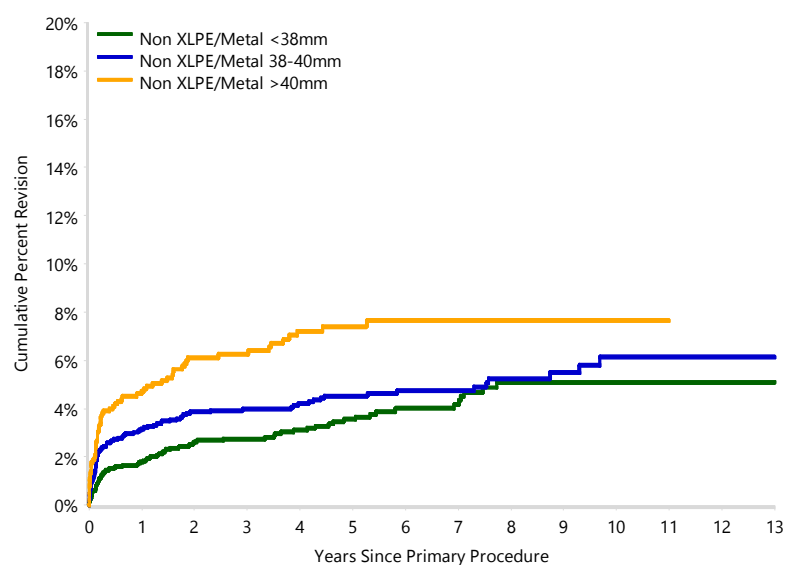
Figure ST111 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Non XLPE/Metal Bearing Surface by Glenosphere Size (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy Non XLPE/Metal	<38mm	4583	4035	3002	2117	1304	456	41
	38-40mm	5698	5137	3866	2841	1866	773	66
	>40mm	4453	3806	2654	1661	945	325	15

Note: Restricted to modern prostheses. Reported as humeral cup/glenosphere

Figure ST112 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Non XLPE/Metal Bearing Surface by Glenosphere Size (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture Non XLPE/Metal	<38mm	2478	2135	1493	950	568	194	10
	38-40mm	2144	1940	1474	1050	642	244	20
	>40mm	1066	888	649	419	230	83	4

Note: Restricted to modern prostheses. Reported as humeral cup/glenosphere



Primary Total Shoulder Replacement

Table ST100 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis, Glenosphere Size and Glenosphere Material

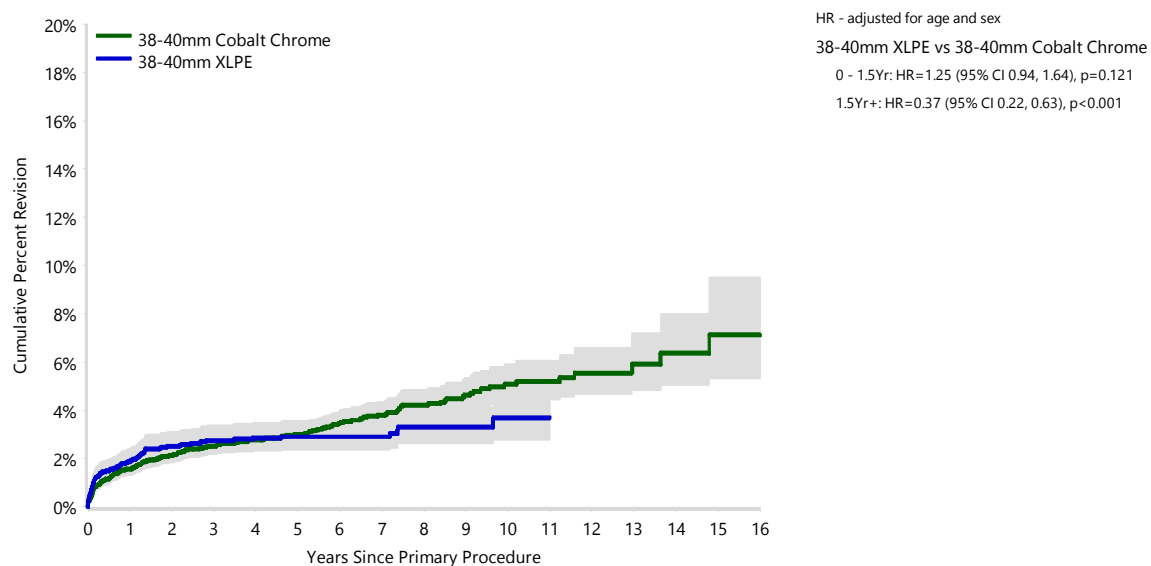
Primary Diagnosis	Glenosphere Size	Glenosphere Material	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	<38mm	Cobalt Chrome	334	11465	1.6 (1.4, 1.9)	2.6 (2.3, 2.9)	3.2 (2.9, 3.6)	3.8 (3.3, 4.2)	4.5 (4.0, 5.2)	5.7 (4.7, 7.0)
		Non XLPE	6	104	2.9 (0.9, 8.7)	4.9 (2.1, 11.3)	4.9 (2.1, 11.3)	4.9 (2.1, 11.3)		
		Stainless Steel	4	50	2.0 (0.3, 13.4)	4.2 (1.1, 15.7)	4.2 (1.1, 15.7)	6.6 (2.2, 19.3)	9.5 (3.6, 23.5)	9.5 (3.6, 23.5)
		Titanium	0	7	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
		XLPE	2	54	1.9 (0.3, 12.6)	4.0 (1.0, 15.2)	4.0 (1.0, 15.2)			
	38-40mm	Cobalt Chrome	239	7317	1.6 (1.3, 1.9)	2.5 (2.2, 2.9)	3.0 (2.6, 3.5)	3.8 (3.3, 4.4)	5.1 (4.3, 5.9)	7.1 (5.3, 9.5)
		Non XLPE	8	275	0.4 (0.1, 2.6)	1.9 (0.8, 4.5)	2.3 (1.0, 5.0)	3.6 (1.7, 7.2)		
		XLPE	94	3405	1.9 (1.5, 2.4)	2.7 (2.2, 3.4)	2.9 (2.4, 3.6)	2.9 (2.4, 3.6)	3.7 (2.8, 4.9)	
	>40mm	Cobalt Chrome	221	5176	2.2 (1.9, 2.7)	3.5 (3.0, 4.1)	4.4 (3.9, 5.1)	5.4 (4.7, 6.2)	5.9 (5.0, 6.8)	8.4 (6.0, 11.7)
		Non XLPE	6	127	1.6 (0.4, 6.1)	4.0 (1.7, 9.4)	4.0 (1.7, 9.4)	4.0 (1.7, 9.4)		
		Titanium	0	1						
		XLPE	52	1534	2.2 (1.6, 3.1)	3.4 (2.6, 4.5)	3.6 (2.8, 4.8)	3.8 (2.9, 5.0)	3.8 (2.9, 5.0)	
Rotator Cuff Arthropathy	<38mm	Cobalt Chrome	341	10019	2.1 (1.8, 2.4)	3.3 (3.0, 3.8)	4.0 (3.5, 4.4)	4.2 (3.8, 4.8)	5.5 (4.7, 6.3)	6.0 (5.1, 7.1)
		Non XLPE	3	64	1.6 (0.2, 10.6)	4.7 (1.5, 13.8)	4.7 (1.5, 13.8)	4.7 (1.5, 13.8)		
		Stainless Steel	3	29	3.4 (0.5, 22.1)	6.9 (1.8, 24.9)	6.9 (1.8, 24.9)	6.9 (1.8, 24.9)	12.4 (4.0, 34.7)	12.4 (4.0, 34.7)
		Titanium	0	5	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
		XLPE	0	36	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)		
	38-40mm	Cobalt Chrome	256	6494	2.3 (2.0, 2.7)	3.5 (3.0, 4.0)	4.2 (3.7, 4.7)	4.6 (4.0, 5.2)	5.2 (4.5, 6.1)	6.2 (5.1, 7.5)
		Non XLPE	12	238	2.5 (1.1, 5.5)	3.4 (1.7, 6.6)	4.8 (2.7, 8.4)	5.8 (3.2, 10.5)		
		XLPE	84	2674	2.1 (1.6, 2.7)	3.2 (2.6, 4.0)	3.3 (2.7, 4.1)	3.6 (2.9, 4.5)	3.8 (3.0, 4.8)	
	>40mm	Cobalt Chrome	203	4820	2.1 (1.8, 2.6)	3.7 (3.2, 4.3)	4.6 (4.0, 5.4)	5.7 (4.9, 6.6)	6.3 (5.4, 7.4)	
		Non XLPE	7	175	2.3 (0.9, 6.0)	4.1 (2.0, 8.5)	4.1 (2.0, 8.5)	4.1 (2.0, 8.5)		
		Titanium	72	1525	3.2 (2.4, 4.2)	4.3 (3.4, 5.5)	4.7 (3.7, 5.9)	5.1 (4.0, 6.4)	5.8 (4.4, 7.7)	
		XLPE	341	10019	2.1 (1.8, 2.4)	3.3 (3.0, 3.8)	4.0 (3.5, 4.4)	4.2 (3.8, 4.8)	5.5 (4.7, 6.3)	6.0 (5.1, 7.1)
Fracture	<38mm	Cobalt Chrome	156	4760	2.3 (1.9, 2.7)	3.1 (2.6, 3.6)	3.7 (3.1, 4.4)	4.1 (3.4, 4.8)	4.6 (3.8, 5.6)	
		Non XLPE	0	3	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
		Stainless Steel	1	21	5.0 (0.7, 30.5)	5.0 (0.7, 30.5)	5.0 (0.7, 30.5)	5.0 (0.7, 30.5)	5.0 (0.7, 30.5)	
		Titanium	0	1						
		XLPE	0	3	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)				
	38-40mm	Cobalt Chrome	104	2339	3.2 (2.5, 4.0)	4.0 (3.2, 4.9)	4.5 (3.7, 5.5)	4.7 (3.9, 5.8)	6.1 (4.8, 7.8)	
		Non XLPE	6	183	1.6 (0.5, 5.0)	2.2 (0.8, 5.8)	2.8 (1.2, 6.7)	3.8 (1.7, 8.5)		
		XLPE	64	1367	3.2 (2.3, 4.2)	4.6 (3.5, 5.9)	5.2 (4.1, 6.7)	5.4 (4.2, 7.0)	5.4 (4.2, 7.0)	
	>40mm	Cobalt Chrome	71	1108	4.6 (3.5, 6.1)	6.1 (4.8, 7.8)	7.2 (5.7, 9.1)	7.4 (5.9, 9.4)	7.4 (5.9, 9.4)	
		Non XLPE	8	99	2.0 (0.5, 7.9)	6.3 (2.9, 13.4)	8.6 (4.4, 16.4)	8.6 (4.4, 16.4)		
		Titanium	32	354	6.6 (4.4, 9.8)	8.2 (5.7, 11.6)	9.0 (6.4, 12.6)	10.3 (7.3, 14.5)		
		XLPE	156	4760	2.3 (1.9, 2.7)	3.1 (2.6, 3.6)	3.7 (3.1, 4.4)	4.1 (3.4, 4.8)	4.6 (3.8, 5.6)	
TOTAL			2389	65832						

Note: Restricted to modern prostheses

Excludes 5,544 procedures with unknown glenosphere size or glenosphere material

Primary Total Shoulder Replacement

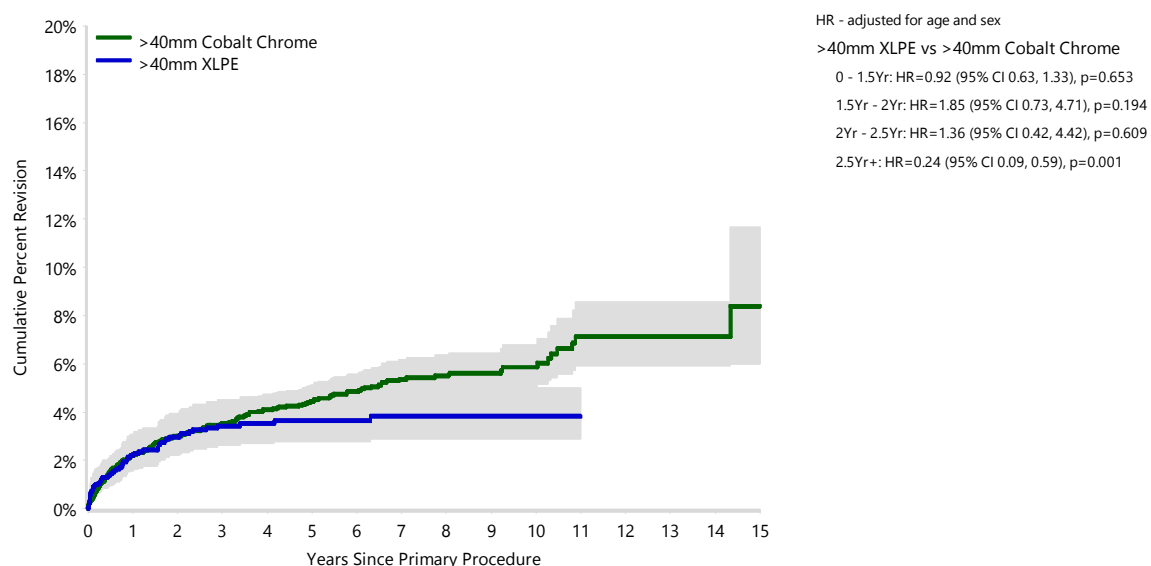
Figure ST113 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a 38-40mm Glenosphere by Glenosphere Material (Primary Diagnosis OA)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	38-40mm Cobalt Chrome		7317	6623	4821	3419	2170	882	112
	XLPE		3405	3005	2239	1498	837	199	0

Note: Restricted to modern prostheses

Figure ST114 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a >40mm Glenosphere by Glenosphere Material (Primary Diagnosis OA)



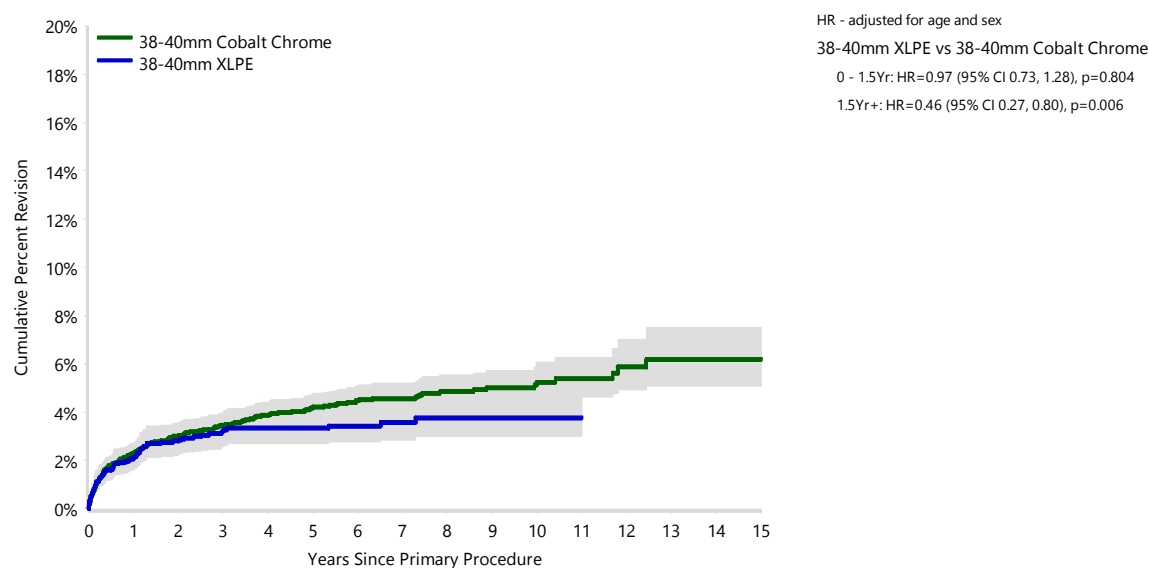
Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	>40mm Cobalt Chrome		5176	4508	3248	2326	1436	538	50
	XLPE		1534	1390	1113	732	407	116	2

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

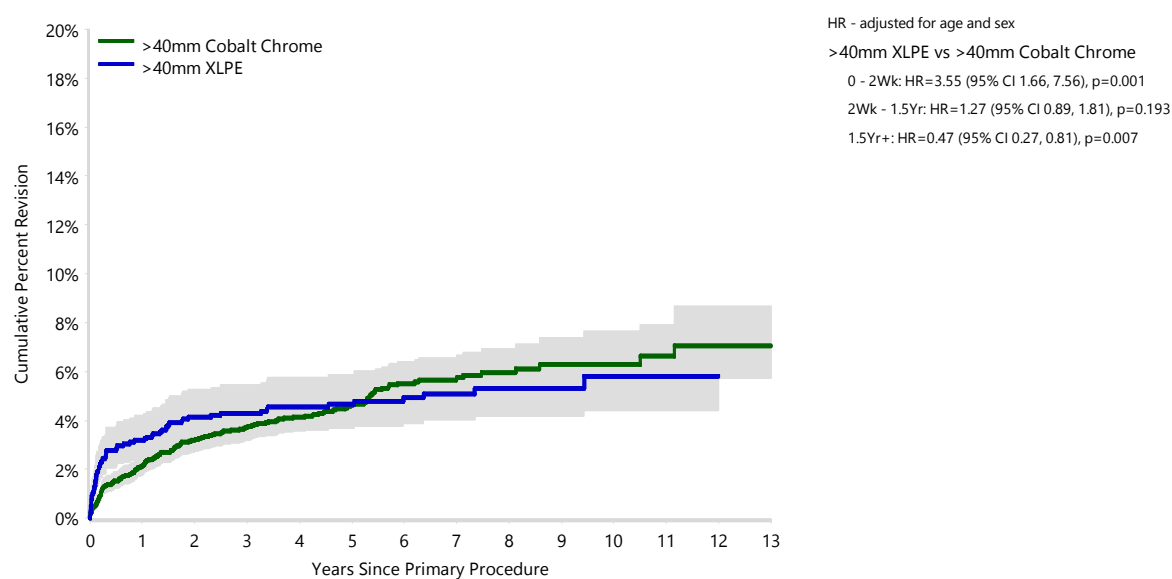
Figure ST115 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a 38-40mm Glenosphere by Glenosphere Material (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy 38-40mm	Cobalt Chrome	6494	5799	4124	2883	1867	773	66
	XLPE	2674	2360	1678	1051	567	123	0

Note: Restricted to modern prostheses

Figure ST116 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a >40mm Glenosphere by Glenosphere Material (Primary Diagnosis Rotator Cuff Arthropathy)

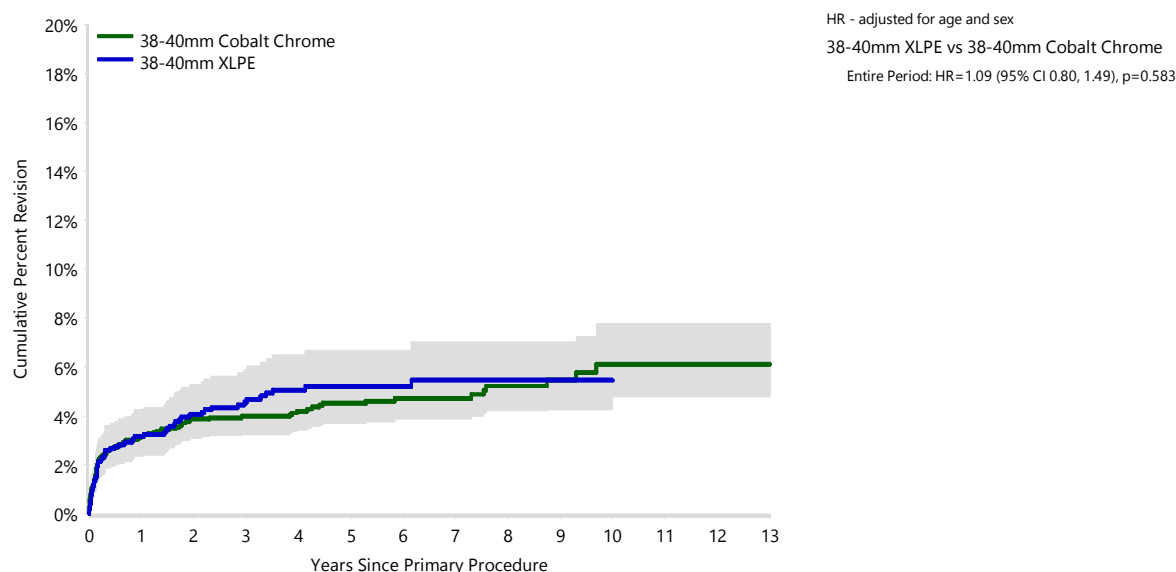


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy >40mm	Cobalt Chrome	4820	4083	2837	1796	993	327	15
	XLPE	1525	1376	1141	822	485	130	1

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

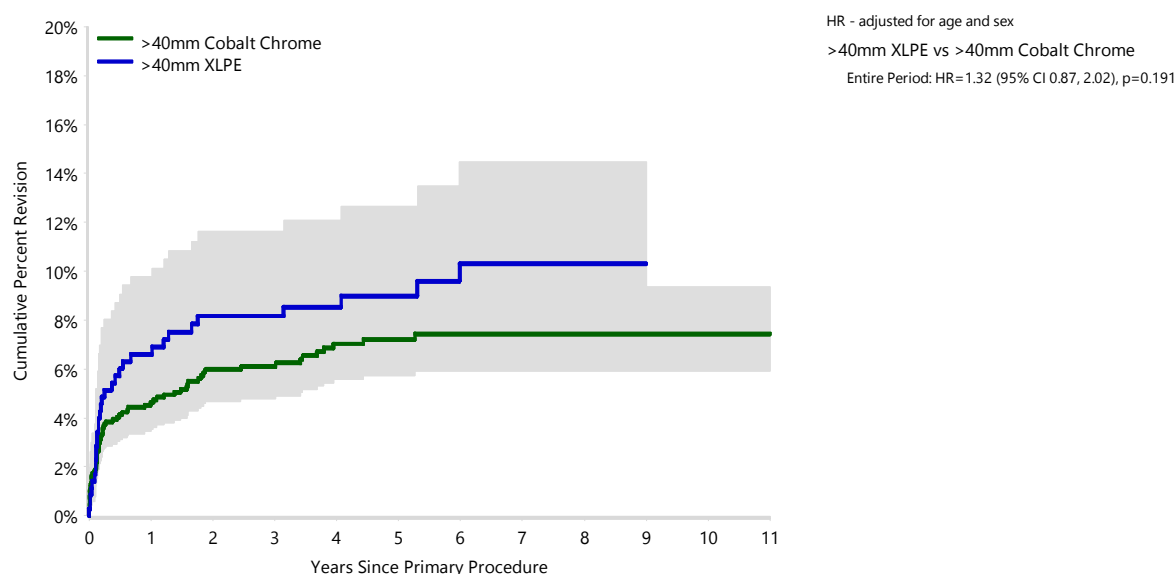
Figure ST117 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a 38-40mm Glenosphere by Glenosphere Material (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	38-40mm	Cobalt Chrome	2339	2109	1552	1060	642	244	20
		XLPE	1367	1170	828	521	291	78	0

Note: Restricted to modern prostheses

Figure ST118 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a >40mm Glenosphere by Glenosphere Material (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	>40mm	Cobalt Chrome	1108	922	676	440	240	86	4
		XLPE	354	310	247	160	94	28	0

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

IMPLANT SIZING VARIATIONS (ISV)

ISV are modifications to a prosthesis design range beyond simple size change.

Glenoid Baseplate Augmentation

A glenoid baseplate is categorised as augmented if the backside has been modified for glenoid deformity (e.g. wedged, stepped, angulated, or lateralised). When stratified by primary diagnosis, the rate of revision for non-augmented glenoid baseplates is increased up to 3 months for osteoarthritis and rotator cuff arthropathy, and for fracture over the entire analysis period. After 2 years, the revision rate is higher for augmented glenoid baseplates in osteoarthritis (Figure ST101, Figure ST119, Figure ST120 and Figure ST121).

When stratified by glenoid morphology, glenoid baseplate augmentation varies with differing primary diagnoses. In osteoarthritis, for the first 3 months there is a higher rate of revision for non-augmented glenoid baseplates utilised for type A glenoid morphology, and from 9 months, augmented glenoid baseplates revision risk was increased for type B glenoids. For type C glenoid morphology, the rate of revision was higher for non-augmented glenoid baseplates in the first 3 years, but after that time the revision risk reverses and augmented glenoid baseplates have a higher rate of revision. The rate of revision is not different for rotator cuff arthropathy or fracture in this setting (Table ST102, Figure ST122, Figure ST123 and Figure ST124).

Humeral, Stem Type and Stem Length,

There is an increased rate of revision for non-fracture humeral stems compared to fracture humeral stems (Table ST103 and Figure ST125). When compared by fixation, a cemented fracture stem has a lower rate of revision than a cemented non-fracture stem (Table ST104 and Figure ST126). There is no difference in the rate of revision when cementless fixation stems are used.

A short humeral stem (<100 mm) has a lower rate of revision compared to a conventional stem (≥100mm) from 3 months to 6 months and then after 1.5 years in osteoarthritis patients only (Table ST105 and Figure ST127). Conventional stem lengths have higher cumulative incidence of infection compared to short stems (Figure ST128).

STEM LENGTH BY BEARING SURFACE

The stratification of stem length by bearing surface finds that short stems combined with non-XLPE/metal bearing surface have a higher revision risk than short stems with XLPE/metal in osteoarthritis (Table ST106 and Figure ST129). The bearing surface combinations with conventional stem lengths were not different (Figure ST130).

In cases of rotator cuff arthropathy, non-XLPE/metal bearing surface has an increased revision rate with short stems compared to a XLPE/metal bearing surface from 3 months (Table ST106 and Figure ST131). In contrast, there is no difference between convention stem bearing surface combinations where numbers allowed assessment (Figure ST132).

For fracture, while short stem by bearing surface found no significant changes in rates of revision, conventional humeral stem length in combination with non-XLPE/metal have an increased rate of revision compared to XLPE/metal surfaces with convention stems (Table ST106 and Figure ST133).

Glenosphere Lateralisation

A glenosphere is categorised as lateralised when its design laterally displaces the radius of curvature of the articular surface. There is no difference in the rate of revision for total stemmed reverse shoulder replacements with lateralised glenospheres when compared to total stemmed reverse shoulder replacements with standard glenospheres for all primary diagnoses analysed (Table ST107).

Standard Prostheses and ISVs

There are three ISV types: augmentation of glenoid baseplate, a short humeral stem, or a lateralised glenosphere. Standard prostheses have no ISVs (0 ISV). The use of 1 or 2 ISV in primary total stemmed reverse for osteoarthritis decreases the rate of revision compared to standard implants (Table ST108 and Figure ST134). Standard implants have an increased rate of revision when compared to 2 ISV prosthesis constructs in rotator cuff arthropathy, but there is no difference in fracture (Figure ST135 and Figure ST136).

Primary Total Shoulder Replacement

Table ST101 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Glenoid Augmentation

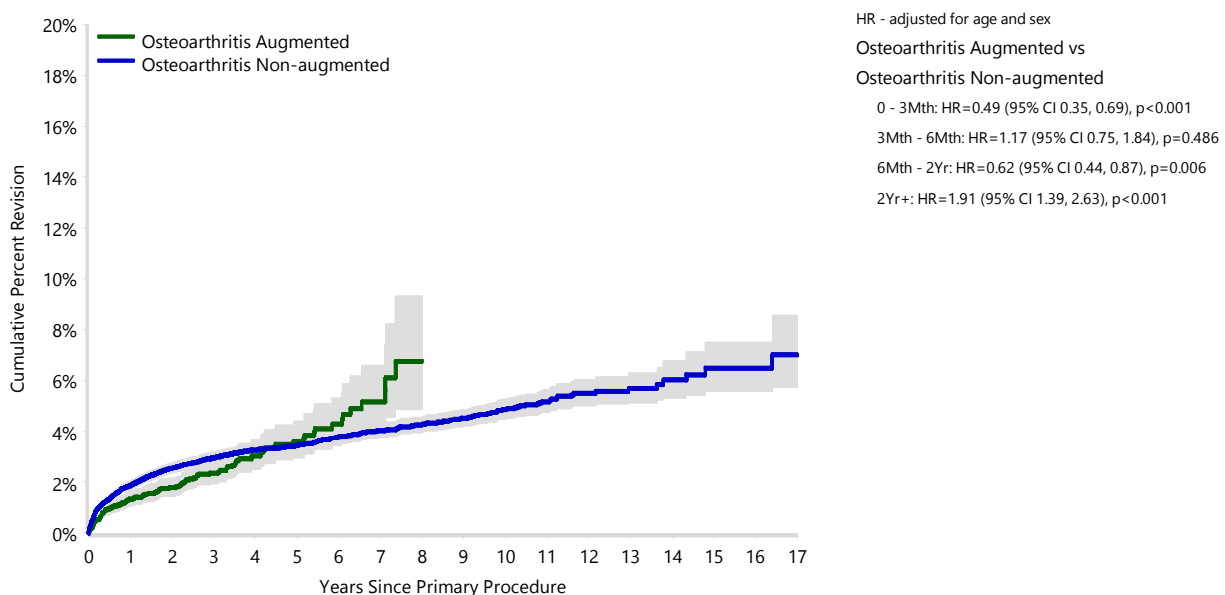
Primary Diagnosis	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1030	32211	1.8 (1.6, 1.9)	2.8 (2.7, 3.0)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Augmented	146	6781	1.3 (1.1, 1.7)	2.4 (2.0, 2.9)	3.6 (2.9, 4.4)	5.2 (4.0, 6.6)		
	Non-augmented	884	25430	1.9 (1.7, 2.0)	3.0 (2.8, 3.2)	3.4 (3.2, 3.7)	4.0 (3.7, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
Rotator Cuff Arthropathy		1046	28228	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Augmented	135	5541	1.9 (1.6, 2.4)	2.9 (2.4, 3.5)	3.4 (2.8, 4.1)	4.9 (3.7, 6.4)		
	Non-augmented	911	22687	2.3 (2.1, 2.5)	3.6 (3.4, 3.9)	4.3 (4.0, 4.6)	4.7 (4.4, 5.0)	5.6 (5.2, 6.0)	6.3 (5.7, 6.9)
Fracture		464	10904	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Augmented	28	1227	2.0 (1.3, 3.0)	2.6 (1.7, 3.8)	4.9 (2.7, 9.0)			
	Non-augmented	436	9677	3.1 (2.8, 3.5)	4.2 (3.8, 4.6)	4.8 (4.4, 5.3)	5.2 (4.7, 5.7)	5.8 (5.2, 6.5)	6.7 (5.4, 8.2)
TOTAL		2540	71343						

Note: Restricted to modern prostheses

Excludes 33 procedures with unknown glenoid augmentation

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Figure ST119 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis OA)



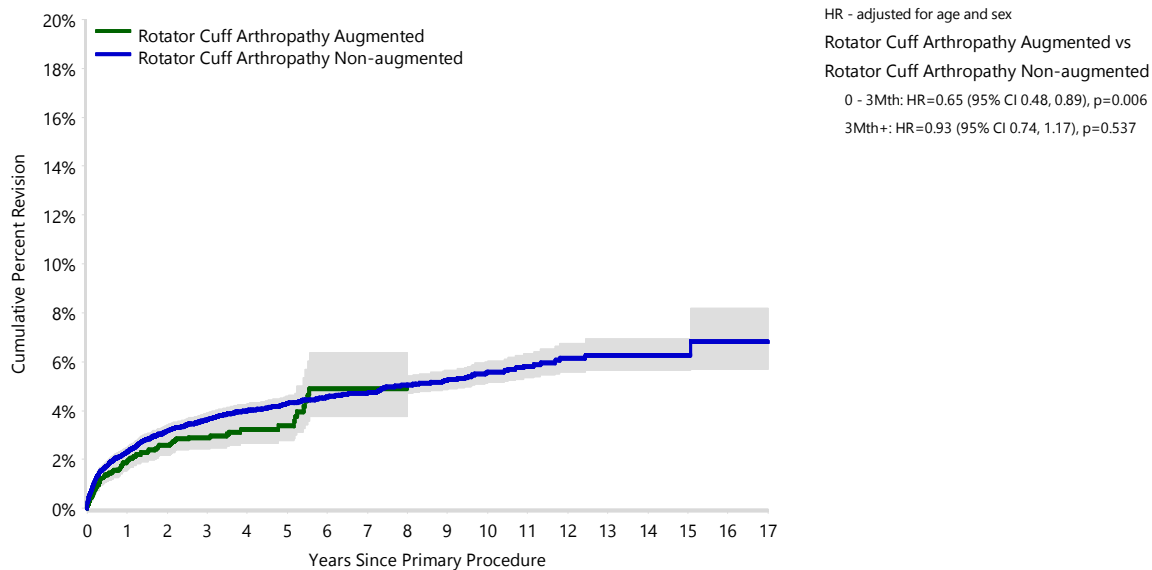
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Augmented	6781	4708	2119	918	221	14	0
	Non-augmented	25430	22558	16887	11974	7561	2887	345

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

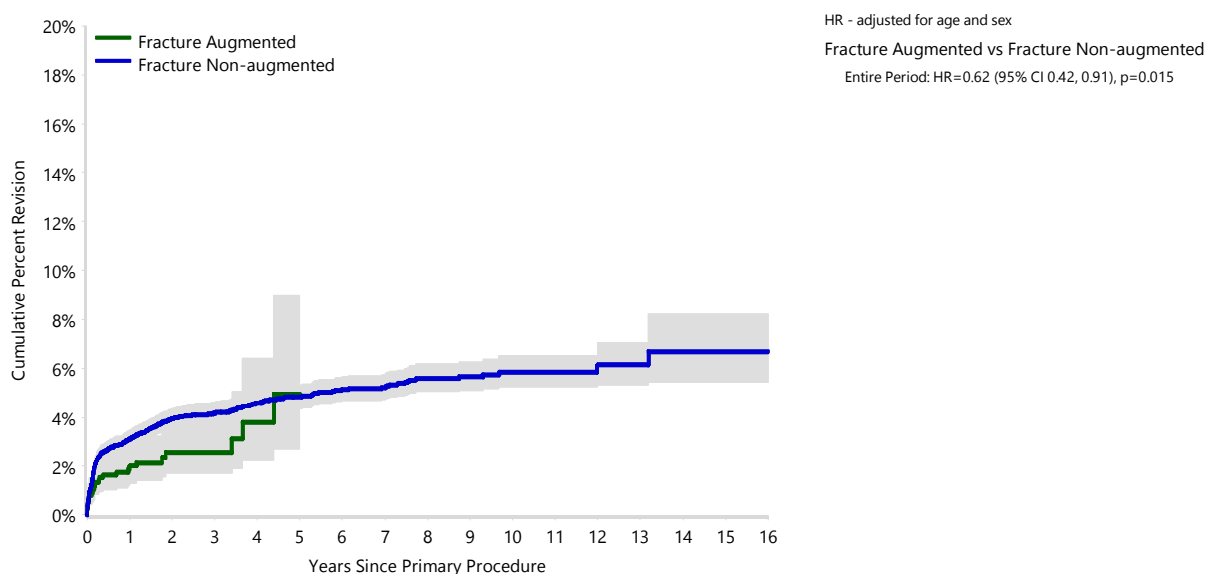
Figure ST120 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Augmented	5541	3731	1545	566	130	10	0
	Non-augmented	22687	19713	14430	9835	6005	2112	175

Note: Restricted to modern prostheses

Figure ST121 Cumulative Percent Revision of Primary Total Stemmed Reverses Shoulder Replacement by Glenoid Augmentation (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture	Augmented	1227	747	238	48	10	4	0
	Non-augmented	9677	8303	5950	3916	2310	803	64

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST102 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis, Glenoid Morphology and Glenoid Augmentation

Primary Diagnosis	Glenoid Morphology	Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Osteoarthritis									
	A	Augmented	41	2137	1.4 (1.0, 2.1)	2.5 (1.8, 3.5)			
		Non-augmented	253	9122	1.6 (1.3, 1.9)	2.9 (2.5, 3.3)	3.2 (2.8, 3.7)	3.7 (3.2, 4.3)	4.0 (3.4, 4.7)
	B	Augmented	72	3189	1.3 (0.9, 1.8)	2.6 (2.0, 3.5)	3.8 (2.9, 5.0)	5.2 (3.6, 7.5)	
		Non-augmented	135	5387	1.6 (1.3, 2.0)	2.5 (2.1, 3.0)	3.0 (2.5, 3.6)	3.5 (2.9, 4.2)	3.5 (2.9, 4.2)
	C	Augmented	11	657	0.9 (0.4, 2.1)	0.9 (0.4, 2.1)	3.9 (1.9, 7.9)		
		Non-augmented	33	843	2.5 (1.6, 3.8)	3.9 (2.7, 5.6)	4.6 (3.2, 6.6)	5.1 (3.5, 7.4)	5.1 (3.5, 7.4)
Rotator Cuff Arthropathy									
	A	Augmented	60	2704	1.9 (1.4, 2.5)	2.7 (2.1, 3.6)	3.1 (2.3, 4.1)		
		Non-augmented	439	12336	2.2 (2.0, 2.5)	3.6 (3.3, 4.0)	4.2 (3.8, 4.6)	4.6 (4.2, 5.1)	5.0 (4.4, 5.6)
	B	Augmented	45	2033	1.6 (1.1, 2.3)	2.7 (1.9, 3.7)	3.3 (2.3, 4.7)	5.0 (3.1, 7.8)	
		Non-augmented	102	3229	2.0 (1.6, 2.6)	3.2 (2.6, 3.9)	3.7 (3.0, 4.5)	4.1 (3.3, 5.1)	4.9 (3.7, 6.4)
	C	Augmented	11	392	2.1 (1.1, 4.3)	3.0 (1.6, 5.6)	3.8 (2.0, 7.3)		
		Non-augmented	14	418	1.8 (0.9, 3.8)	3.4 (2.0, 6.0)	4.7 (2.7, 8.1)	4.7 (2.7, 8.1)	
Fracture									
	A	Augmented	22	870	2.1 (1.3, 3.4)	2.9 (1.8, 4.7)			
		Non-augmented	223	5451	3.0 (2.6, 3.5)	4.0 (3.5, 4.6)	4.7 (4.1, 5.4)	5.1 (4.4, 5.9)	5.7 (4.7, 6.8)
	B	Augmented	4	168	2.5 (0.9, 6.5)				
		Non-augmented	16	347	3.0 (1.6, 5.5)	4.3 (2.5, 7.4)	6.3 (3.8, 10.4)	6.3 (3.8, 10.4)	
	C	Augmented	0	28	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
		Non-augmented	2	43	4.9 (1.2, 18.1)	4.9 (1.2, 18.1)	4.9 (1.2, 18.1)	4.9 (1.2, 18.1)	
TOTAL			1483	49354					

Note: Restricted to modern prostheses

Excludes 22,022 procedures with unknown glenoid augmentation or unknown/B3 glenoid morphology

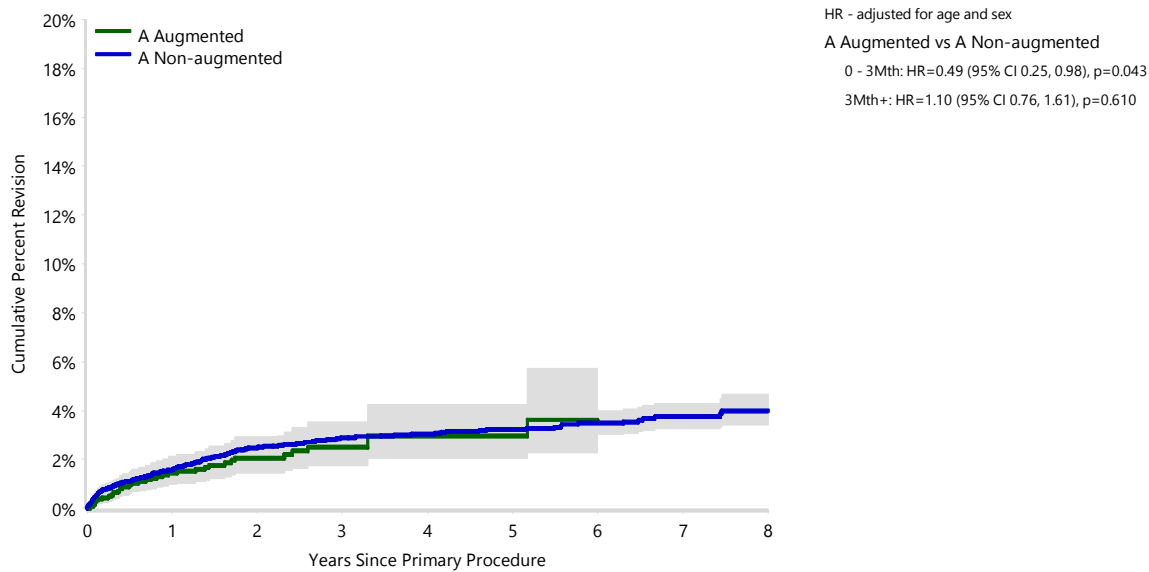
Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report



Primary Total Shoulder Replacement

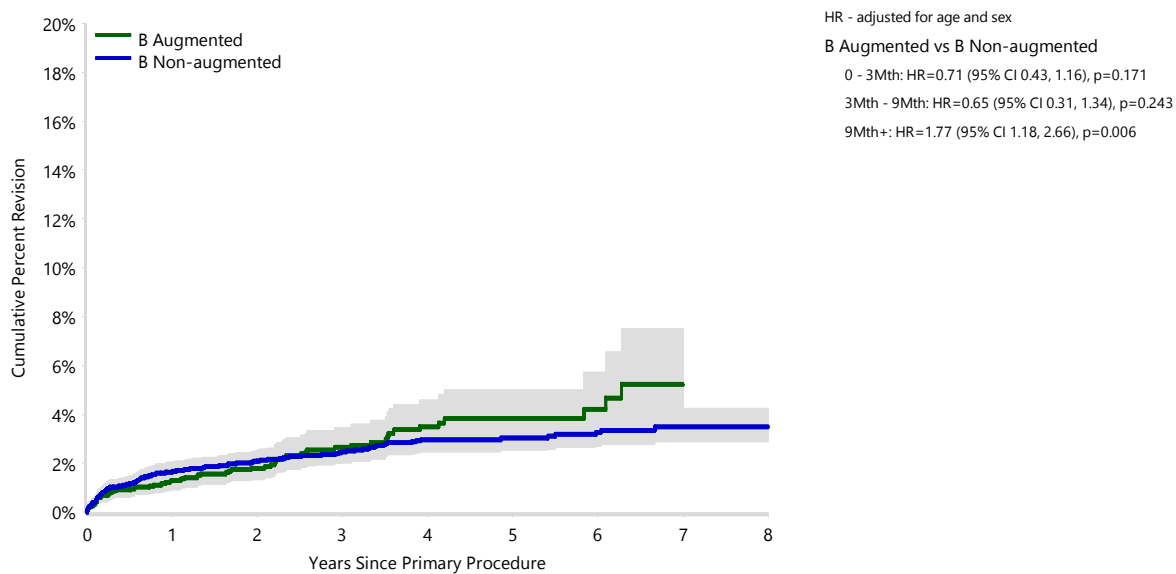
Figure ST122 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Glenoid Morphology A by Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Osteoarthritis	A	Augmented	2137	1354	500	159	29	11
		Non-augmented	9122	7762	4993	2807	1078	412

Note: Restricted to modern prostheses

Figure ST123 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Glenoid Morphology B by Glenoid Augmentation (Primary Diagnosis OA)

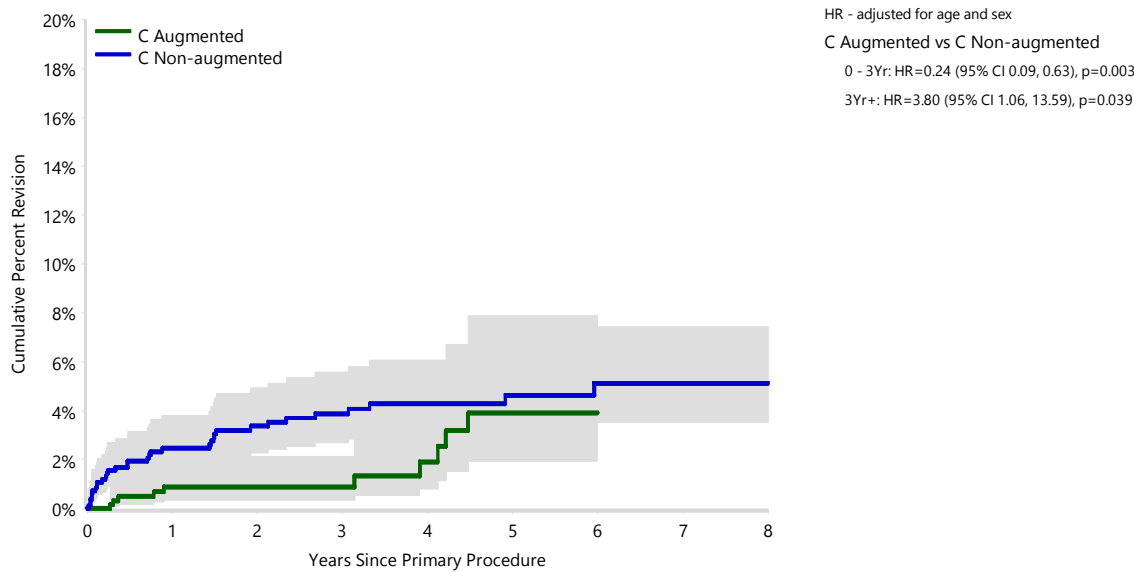


Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Osteoarthritis	B	Augmented	3189	2232	994	415	89	18
		Non-augmented	5387	4540	2877	1563	581	229

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST124 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Glenoid Morphology C by Glenoid Augmentation (Primary Diagnosis OA)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	8 Yrs
Osteoarthritis	C	Augmented	657	490	236	106	24	9
		Non-augmented	843	710	495	275	105	40

Note: Restricted to modern prostheses



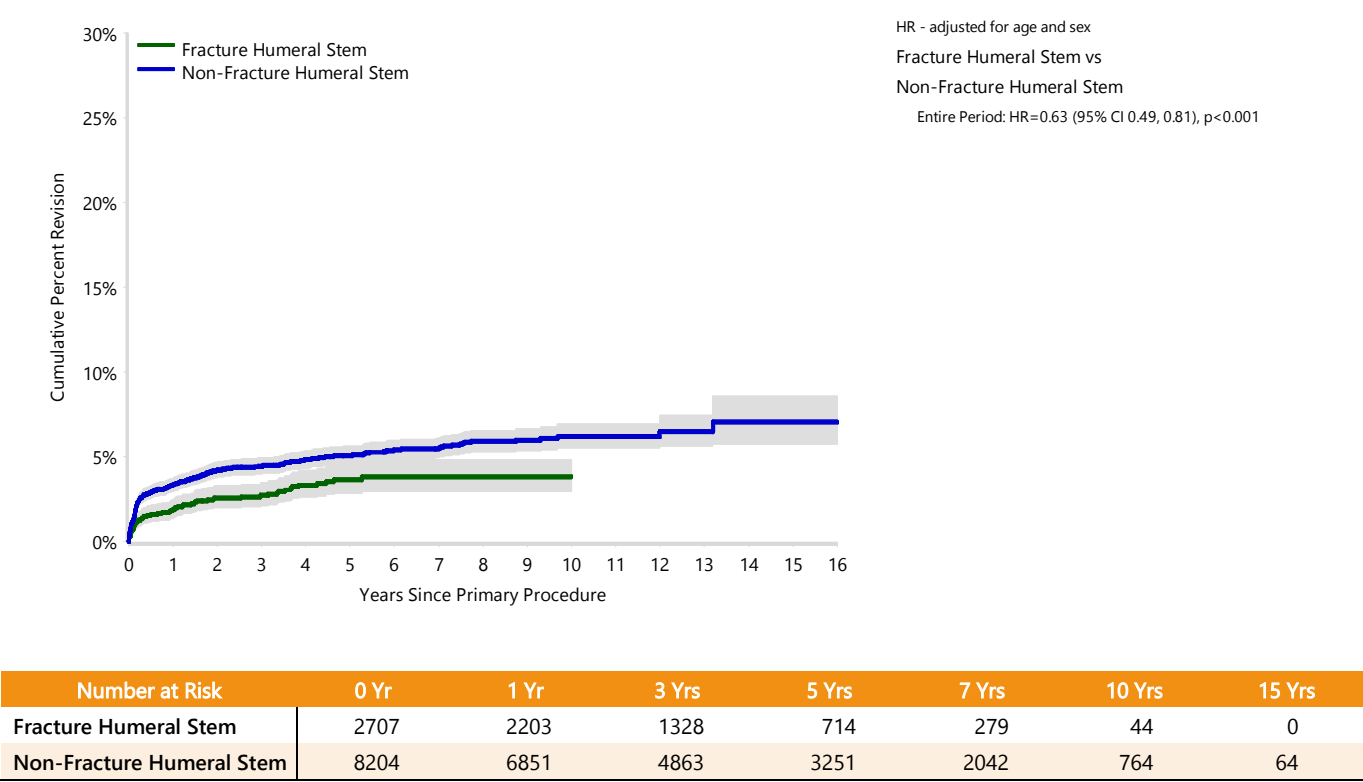
Primary Total Shoulder Replacement

Table ST103 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Stem Type (Primary Diagnosis Fracture)

Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture Humeral Stem	76	2707	1.9 (1.4, 2.5)	2.7 (2.1, 3.5)	3.7 (2.9, 4.7)	3.8 (3.0, 4.9)	3.8 (3.0, 4.9)	
Non-Fracture Humeral Stem	389	8204	3.4 (3.0, 3.8)	4.4 (4.0, 4.9)	5.1 (4.6, 5.6)	5.5 (4.9, 6.1)	6.2 (5.5, 6.9)	7.0 (5.7, 8.6)
TOTAL	465	10911						

Note: Restricted to modern prostheses

Figure ST125 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Stem Type (Primary Diagnosis Fracture)



Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

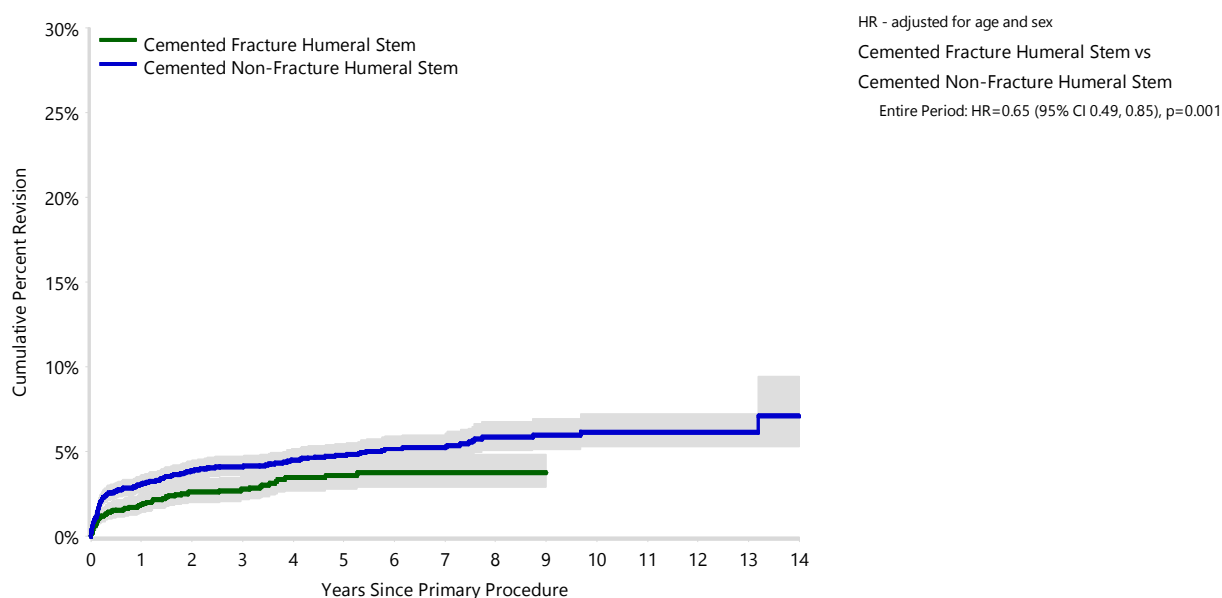
Table ST104 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Humeral Fixation and Stem Type (Primary Diagnosis Fracture)

Humeral Fixation	Stem Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cementless	Fracture Humeral Stem	8	272	1.9 (0.8, 4.4)	2.3 (1.0, 5.0)	4.4 (2.0, 9.4)			
	Non-Fracture Humeral Stem	166	3256	3.7 (3.1, 4.5)	4.9 (4.2, 5.8)	5.5 (4.8, 6.5)	5.9 (5.0, 6.9)	6.3 (5.3, 7.4)	7.0 (5.4, 8.9)
Cemented	Fracture Humeral Stem	68	2435	1.9 (1.4, 2.5)	2.8 (2.2, 3.6)	3.6 (2.8, 4.6)	3.8 (2.9, 4.8)		
	Non-Fracture Humeral Stem	223	4948	3.1 (2.7, 3.6)	4.1 (3.6, 4.7)	4.8 (4.2, 5.5)	5.2 (4.5, 6.0)	6.2 (5.3, 7.2)	7.1 (5.3, 9.4)
TOTAL		465	10911						

Note: Restricted to modern prostheses

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Figure ST126 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Cemented Humeral Fixation by Stem Type (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Cemented	Fracture Humeral Stem	2435	1973	1190	634	247	38	2
	Non-Fracture Humeral Stem	4948	4152	2976	1957	1192	455	58

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST105 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Humeral Stem Length

Primary Diagnosis	Humeral Stem Length	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1032	32225	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Short (<100mm)	409	15694	1.8 (1.6, 2.0)	2.6 (2.4, 2.9)	3.0 (2.7, 3.3)	3.4 (3.1, 3.8)	3.9 (3.5, 4.5)	4.8 (3.9, 5.9)
	Conventional (≥100mm)	623	16531	1.8 (1.6, 2.0)	3.0 (2.7, 3.3)	3.7 (3.4, 4.0)	4.4 (4.1, 4.8)	5.4 (5.0, 6.0)	7.3 (6.2, 8.7)
Rotator Cuff Arthropathy		1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Short (<100mm)	447	13767	2.2 (2.0, 2.5)	3.4 (3.1, 3.7)	3.9 (3.6, 4.3)	4.3 (3.9, 4.8)	5.1 (4.5, 5.9)	5.6 (4.7, 6.6)
	Conventional (≥100mm)	599	14471	2.3 (2.0, 2.5)	3.6 (3.3, 3.9)	4.3 (4.0, 4.7)	4.8 (4.4, 5.2)	5.7 (5.2, 6.3)	6.5 (5.7, 7.3)
Fracture		465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Short (<100mm)	146	3102	3.6 (3.0, 4.3)	4.9 (4.1, 5.7)	5.3 (4.5, 6.3)	5.5 (4.7, 6.5)	5.5 (4.7, 6.5)	
	Conventional (≥100mm)	319	7809	2.8 (2.4, 3.2)	3.7 (3.3, 4.2)	4.5 (4.0, 5.0)	4.9 (4.4, 5.5)	5.8 (5.1, 6.7)	
TOTAL		2543	71374						

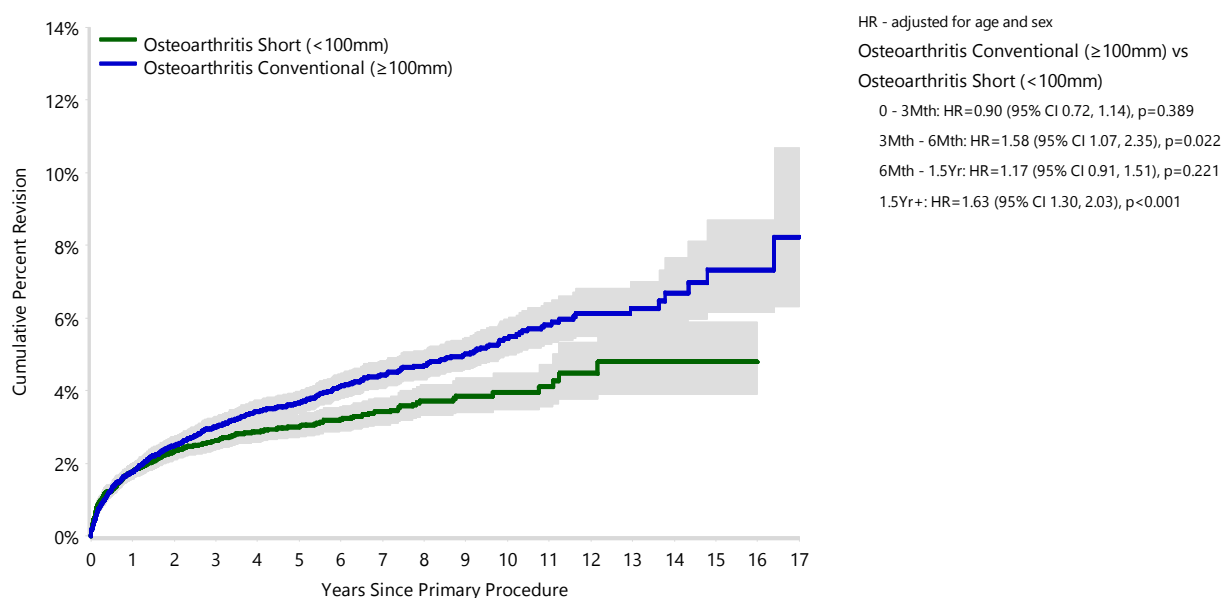
Note: Restricted to modern prostheses

Excludes 2 procedures with unknown humeral stem length

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Figure ST127 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Humeral Stem Length (Primary Diagnosis OA)

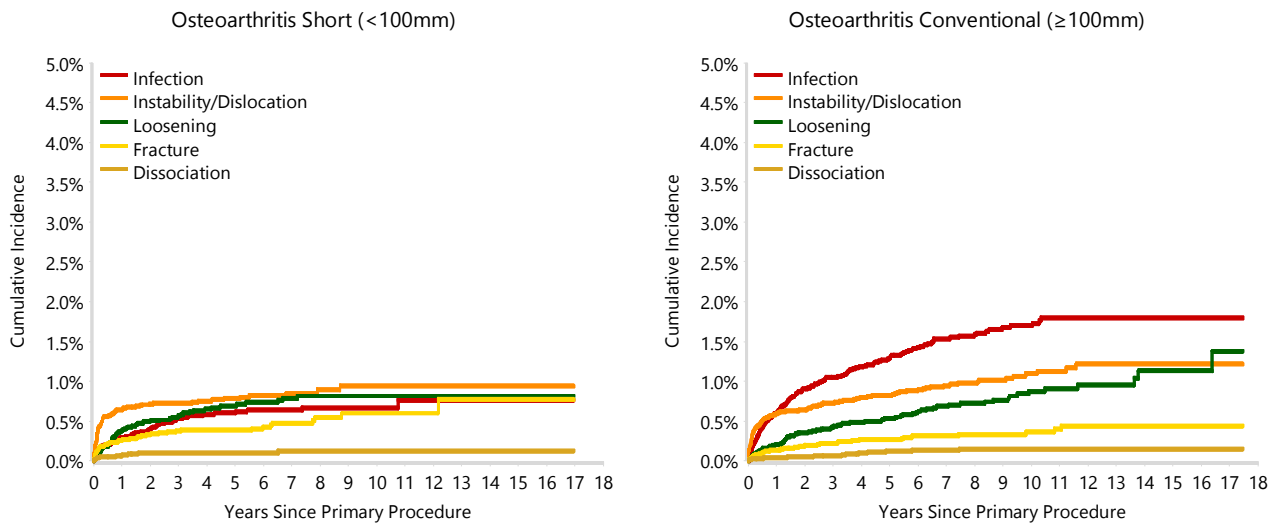


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Short (<100mm)	15694	12471	7885	4910	2672	866	109
	Conventional (≥100mm)	16531	14798	11122	7982	5110	2035	236

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST128 Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Humeral Stem Length



Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

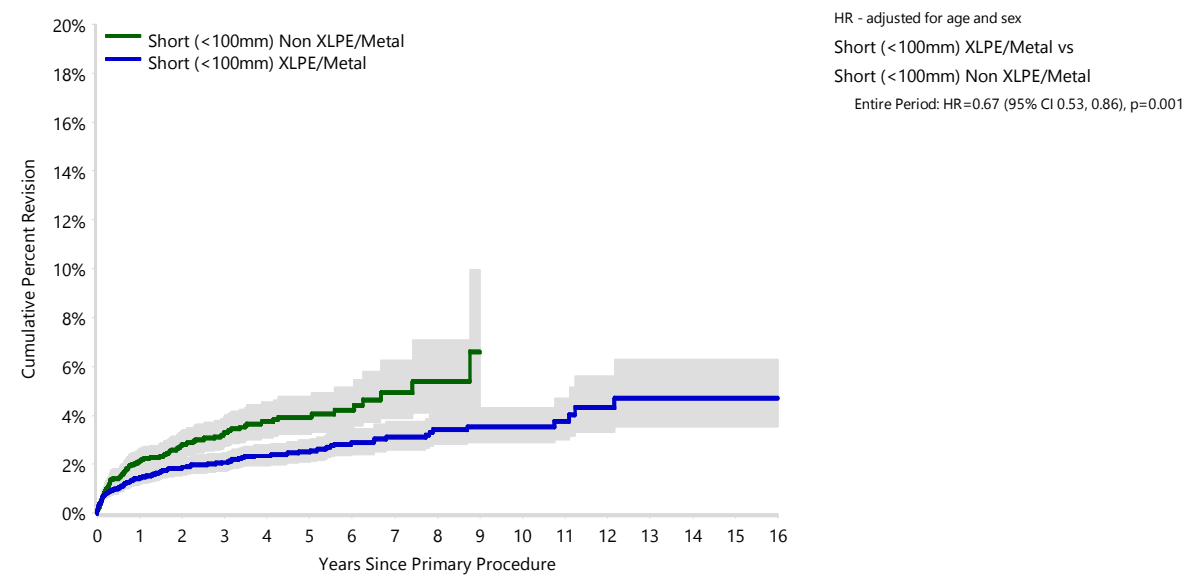
Table ST106 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis, Humeral Stem Length and Bearing Surface

Primary Diagnosis	Humeral Stem Length	Bearing Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis										
	Short (<100mm)	Ceramic/XLPE	1	4	33.3 (5.5, 94.6)	33.3 (5.5, 94.6)	33.3 (5.5, 94.6)	33.3 (5.5, 94.6)		
		Metal/Non XLPE	0	1						
		Metal/XLPE	134	4631	1.9 (1.6, 2.4)	2.9 (2.4, 3.4)	3.1 (2.6, 3.6)	3.1 (2.6, 3.7)	3.7 (2.9, 4.5)	
		Non XLPE/Metal	125	4205	2.1 (1.7, 2.6)	3.3 (2.7, 4.0)	3.9 (3.2, 4.8)	4.9 (3.9, 6.3)		
		XLPE/Metal	149	6808	1.4 (1.2, 1.7)	2.1 (1.7, 2.5)	2.5 (2.1, 3.0)	3.1 (2.6, 3.7)	3.5 (2.9, 4.3)	4.7 (3.5, 6.3)
	Conventional (≥100mm)	Ceramic/Non XLPE	0	5						
		Ceramic/XLPE	3	84	1.2 (0.2, 8.4)	4.2 (1.4, 12.5)	4.2 (1.4, 12.5)			
		Metal/Non XLPE	20	501	1.2 (0.5, 2.7)	3.1 (1.9, 5.0)	3.3 (2.0, 5.3)	3.9 (2.5, 6.2)		
		Metal/XLPE	10	266	2.6 (1.3, 5.4)	3.9 (2.1, 7.1)	3.9 (2.1, 7.1)	3.9 (2.1, 7.1)		
		Non XLPE/Metal	557	14218	1.8 (1.6, 2.0)	3.0 (2.7, 3.3)	3.7 (3.4, 4.0)	4.5 (4.1, 4.9)	5.4 (4.9, 6.0)	7.3 (6.2, 8.7)
		XLPE/Metal	33	1449	1.5 (1.0, 2.3)	2.5 (1.7, 3.7)	3.8 (2.5, 5.8)	3.8 (2.5, 5.8)		
Rotator Cuff Arthropathy										
	Short (<100mm)	Ceramic/XLPE	0	2						
		Metal/XLPE	147	3937	2.6 (2.1, 3.1)	3.6 (3.1, 4.3)	3.8 (3.2, 4.5)	4.2 (3.5, 4.9)	4.6 (3.8, 5.7)	
		Non XLPE/Metal	148	4092	2.3 (1.9, 2.9)	4.1 (3.4, 4.9)	5.3 (4.4, 6.3)	6.1 (4.9, 7.4)		
		XLPE/Metal	152	5703	1.8 (1.5, 2.2)	2.8 (2.3, 3.3)	3.4 (2.9, 4.1)	3.8 (3.2, 4.6)	4.7 (3.7, 6.0)	5.6 (4.1, 7.5)
	Conventional (≥100mm)	Ceramic/Non XLPE	0	10	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
		Ceramic/XLPE	2	75	1.3 (0.2, 9.1)	2.8 (0.7, 10.7)	2.8 (0.7, 10.7)			
		Metal/Non XLPE	22	467	2.4 (1.3, 4.2)	3.9 (2.5, 6.1)	4.6 (3.0, 7.0)	5.2 (3.4, 8.1)		
		Metal/XLPE	7	216	0.9 (0.2, 3.7)	2.6 (1.1, 6.1)	3.9 (1.9, 8.0)			
		Non XLPE/Metal	532	12222	2.3 (2.1, 2.6)	3.6 (3.3, 4.0)	4.4 (4.0, 4.8)	4.9 (4.5, 5.3)	5.8 (5.3, 6.4)	6.6 (5.8, 7.4)
		XLPE/Metal	36	1468	2.0 (1.4, 3.0)	3.2 (2.3, 4.6)	3.5 (2.5, 5.0)			
Fracture										
	Short (<100mm)	Ceramic/XLPE	0	1						
		Metal/XLPE	84	1561	3.9 (3.0, 5.0)	5.3 (4.2, 6.6)	5.7 (4.6, 7.1)	6.1 (4.9, 7.6)	6.1 (4.9, 7.6)	
		Non XLPE/Metal	17	394	3.3 (1.9, 5.8)	5.1 (3.1, 8.3)	6.3 (3.6, 10.8)			
		XLPE/Metal	44	1131	3.3 (2.3, 4.5)	4.1 (3.1, 5.6)	4.5 (3.4, 6.1)	4.5 (3.4, 6.1)	4.5 (3.4, 6.1)	
	Conventional (≥100mm)	Ceramic/XLPE	0	3						
		Metal/Non XLPE	14	285	1.8 (0.7, 4.2)	3.6 (2.0, 6.7)	4.9 (2.9, 8.3)	5.5 (3.3, 9.2)		
		Metal/XLPE	12	157	4.0 (1.8, 8.6)	5.7 (2.9, 11.1)	8.9 (5.0, 15.9)			
		Non XLPE/Metal	254	5858	2.9 (2.5, 3.4)	3.8 (3.4, 4.4)	4.6 (4.1, 5.2)	5.0 (4.4, 5.7)	6.0 (5.2, 7.0)	
		XLPE/Metal	38	1491	2.4 (1.7, 3.3)	2.8 (2.0, 3.8)	3.0 (2.1, 4.1)	3.0 (2.1, 4.1)		
TOTAL			2541	71245						

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST129 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a Short (<100mm) Humeral Stem by Bearing Surface (Primary Diagnosis OA)



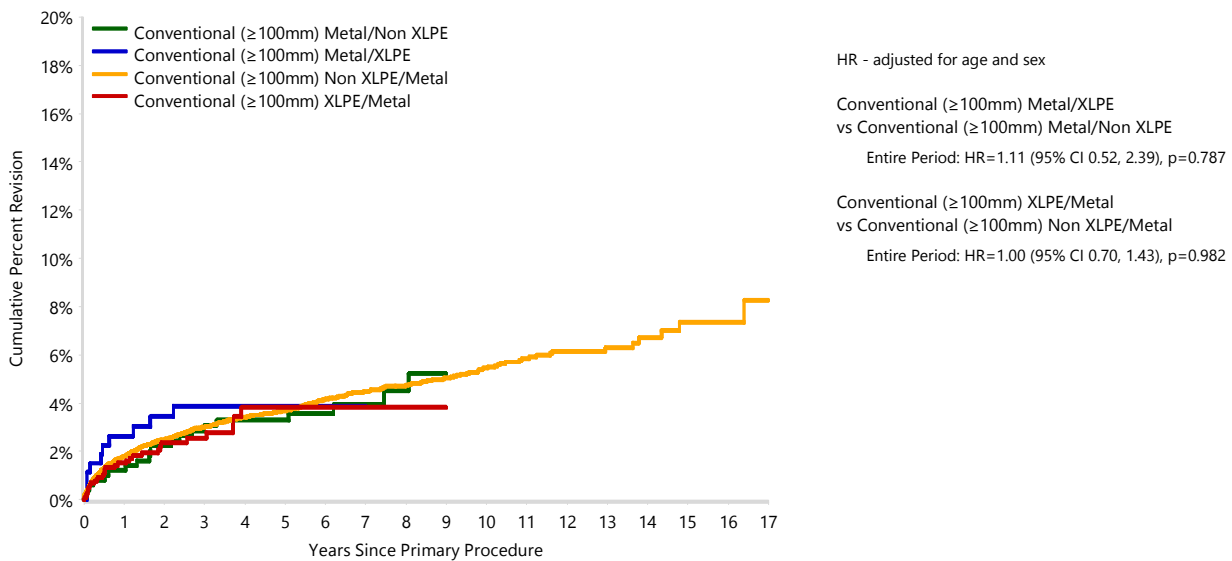
Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Short(<100mm)	XLPE/Metal	4205	3147	1541	771	266	39	0
		Non XLPE/Metal	6808	5195	3186	2013	1199	513	106

Note: Restricted to modern prostheses
Bearing surface reported as humeral cup/glenoid



Primary Total Shoulder Replacement

Figure ST130 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a Conventional ($\geq 100\text{mm}$) Humeral Stem by Bearing Surface (Primary Diagnosis OA)

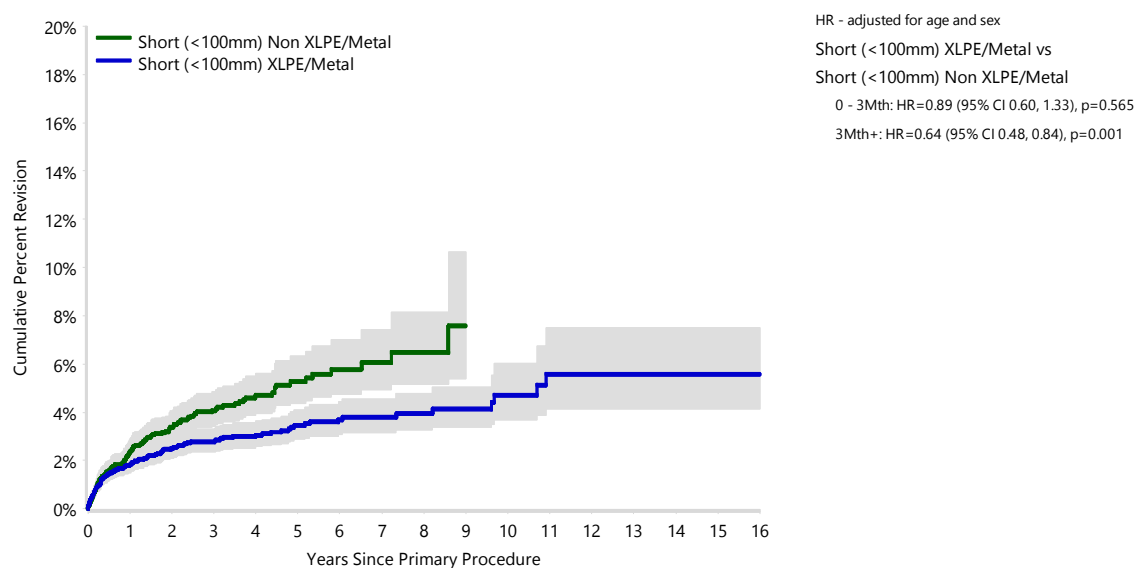


Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	Conventional ($\geq 100\text{mm}$)	Metal/Non XLPE	501	484	455	353	200	18	0
		Metal/XLPE	266	253	180	105	41	2	0
		Non XLPE/Metal	14218	12956	10018	7367	4800	1984	235
		XLPE/Metal	1449	1026	424	143	67	31	1

Note: Restricted to modern prostheses
Bearing surface reported as humeral head/glenoid

Primary Total Shoulder Replacement

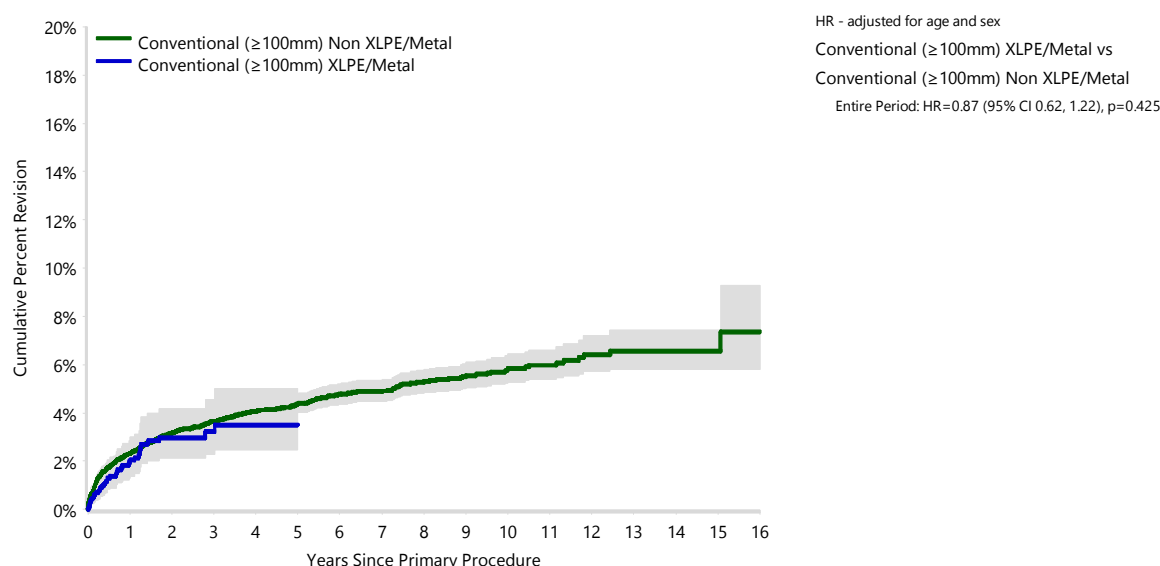
Figure ST131 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a Short (<100mm) Humeral Stem by Bearing Surface (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Short (<100mm) XLPE/Metal	4092	3055	1508	671	254	36	0
	Non XLPE/Metal	5703	4180	2374	1334	747	291	51

Note: Restricted to modern prostheses. Bearing surface reported as humeral head/glenoid

Figure ST132 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a Conventional (≥100mm) Humeral Stem by Bearing Surface (Primary Diagnosis Rotator Cuff Arthropathy)



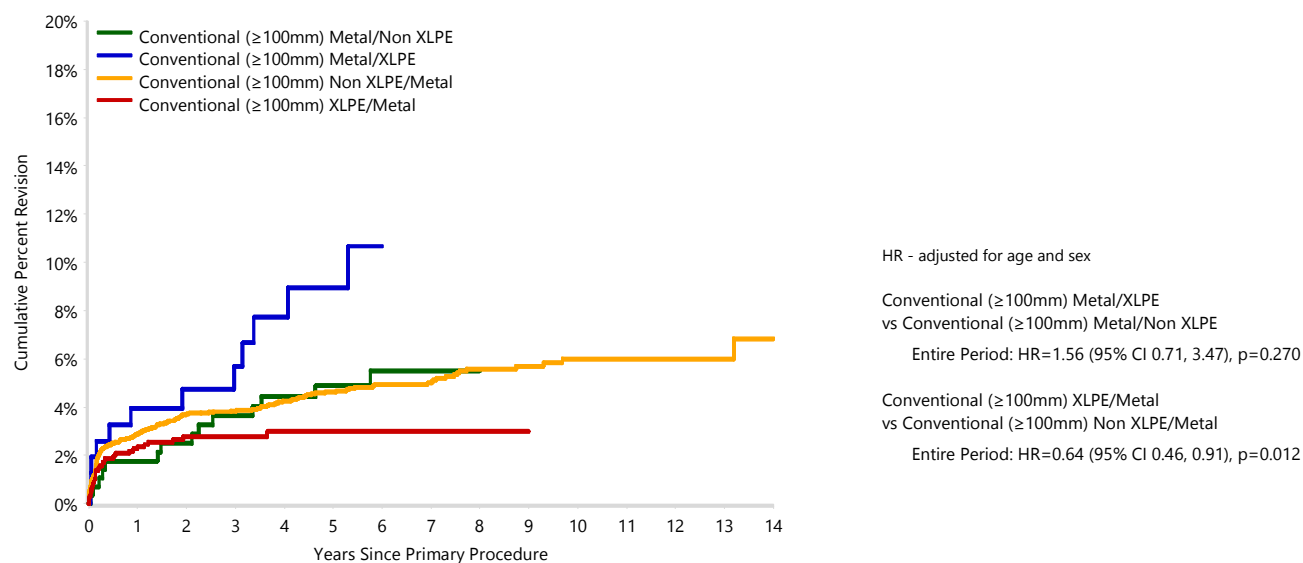
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy	Conventional (≥100mm) Non XLPE/Metal	12222	10997	8470	6095	3888	1518	122
	XLPE/Metal	1468	975	344	88	31	13	0

Note: Restricted to modern prostheses. Bearing surface reported as humeral head/glenoid



Primary Total Shoulder Replacement

Figure ST133 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with a Conventional ($\geq 100\text{mm}$) Humeral Stem by Bearing Surface (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs
Fracture	Conventional ($\geq 100\text{mm}$)	Metal/Non XLPE	285	271	248	194	93	4	0	0	0	0
		Metal/XLPE	157	135	99	56	25	9	4	2	2	0
		Non XLPE/Metal	5858	5050	3628	2382	1421	519	333	208	122	63
		XLPE/Metal	1491	1109	577	277	110	21	10	4	2	2

Note: Restricted to modern prostheses
Bearing surface reported as humeral head/glenoid



Primary Total Shoulder Replacement

Table ST107 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Glenosphere Lateralisation

Primary Diagnosis	Glenoid Lateralisation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1030	32223	1.8 (1.6, 1.9)	2.8 (2.7, 3.0)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	Lateralised	32	1652	1.6 (1.1, 2.4)	2.4 (1.6, 3.5)	3.8 (2.1, 6.7)	5.1 (2.6, 9.8)		
	Standard	998	30571	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
Rotator Cuff Arthropathy		1046	28233	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	Lateralised	41	1421	2.6 (1.8, 3.7)	3.8 (2.7, 5.4)	5.1 (3.3, 7.7)			
	Standard	1005	26812	2.2 (2.0, 2.4)	3.5 (3.3, 3.7)	4.1 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.8)
Fracture		464	10904	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	Lateralised	20	514	3.9 (2.5, 6.1)	4.2 (2.7, 6.6)				
	Standard	444	10390	2.9 (2.6, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.6 (5.0, 6.3)	6.5 (5.2, 8.0)
TOTAL		2540	71360						

Note: Restricted to modern prostheses

Excludes 16 procedures with unknown lateralisation

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Table ST108 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Number of Implant Sizing Variation

Primary Diagnosis	Number of Implant Sizing Variation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis		1030	32209	1.8 (1.6, 1.9)	2.8 (2.7, 3.0)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)	6.5 (5.6, 7.5)
	0 ISV	516	13125	1.8 (1.6, 2.1)	3.0 (2.8, 3.4)	3.6 (3.3, 3.9)	4.3 (3.9, 4.7)	5.2 (4.7, 5.8)	7.1 (6.0, 8.5)
	1 ISV	446	14325	1.9 (1.7, 2.1)	2.9 (2.6, 3.2)	3.4 (3.1, 3.8)	4.0 (3.6, 4.4)	4.6 (4.1, 5.2)	5.4 (4.5, 6.5)
	2 ISVs	65	4491	1.2 (0.9, 1.6)	1.9 (1.5, 2.5)	2.4 (1.8, 3.3)	3.1 (1.9, 5.0)		
	3 ISVs	3	268	1.3 (0.4, 3.9)	1.3 (0.4, 3.9)				
Rotator Cuff Arthropathy		1046	28225	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)	6.2 (5.6, 6.9)
	0 ISV	517	11992	2.2 (2.0, 2.5)	3.6 (3.3, 4.0)	4.3 (3.9, 4.7)	4.8 (4.4, 5.2)	5.7 (5.2, 6.3)	6.4 (5.7, 7.3)
	1 ISV	441	12053	2.4 (2.1, 2.7)	3.6 (3.3, 4.0)	4.2 (3.8, 4.6)	4.6 (4.2, 5.1)	5.4 (4.7, 6.1)	5.8 (5.0, 6.9)
	2 ISVs	82	3874	1.8 (1.4, 2.3)	2.8 (2.2, 3.5)	3.5 (2.6, 4.8)			
	3 ISVs	6	306	1.9 (0.8, 4.6)	1.9 (0.8, 4.6)				
Fracture		464	10904	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)	6.6 (5.3, 8.1)
	0 ISV	283	6568	2.8 (2.4, 3.2)	3.8 (3.3, 4.3)	4.5 (4.0, 5.1)	5.0 (4.4, 5.6)	5.7 (5.0, 6.6)	
	1 ISV	169	3857	3.3 (2.8, 4.0)	4.6 (3.9, 5.3)	5.1 (4.3, 5.9)	5.3 (4.5, 6.2)	5.6 (4.7, 6.7)	
	2 ISVs	12	458	3.0 (1.6, 5.4)	3.0 (1.6, 5.4)				
	3 ISVs	0	21	0.0 (0.0, 0.0)					
TOTAL		2540	71338						

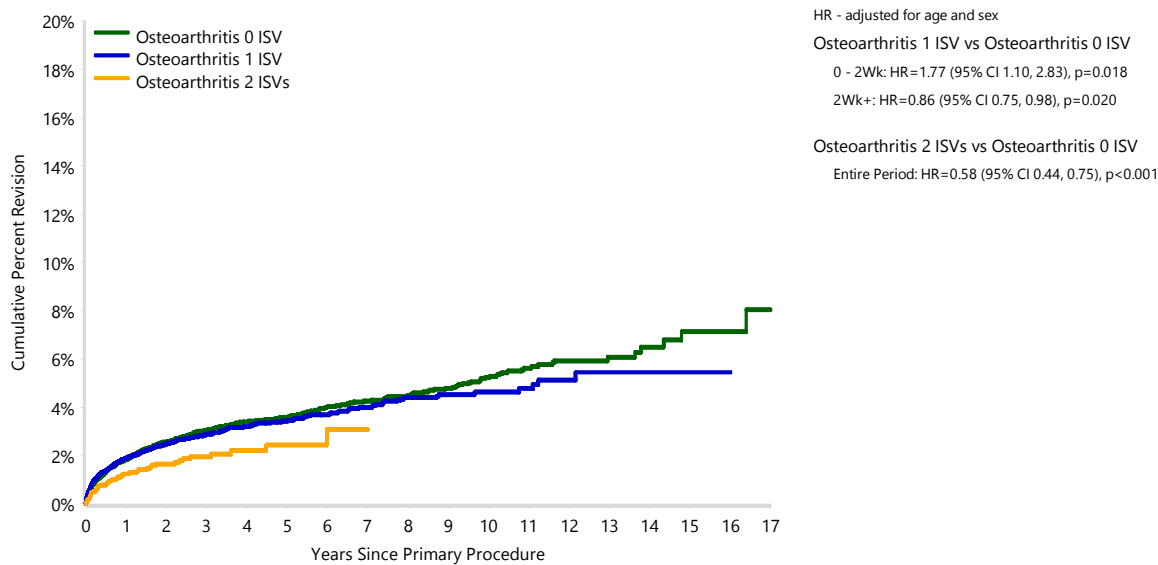
Note: Restricted to modern prostheses

Excludes 38 procedures with unknown number of implant sizing variations



Primary Total Shoulder Replacement

Figure ST134 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Number of Implant Sizing Variation (Primary Diagnosis OA)

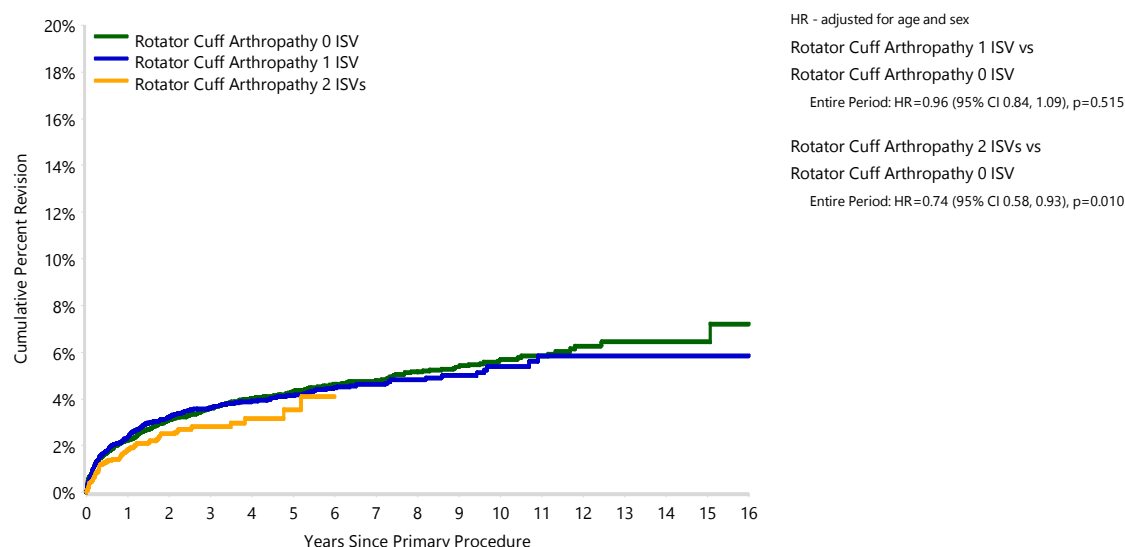


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Osteoarthritis	0 ISV	13125	12106	9738	7315	4889	2019	236
	1 ISV	14325	12226	8278	5239	2853	880	108
	2 ISVs	4491	2792	942	323	40	2	1

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

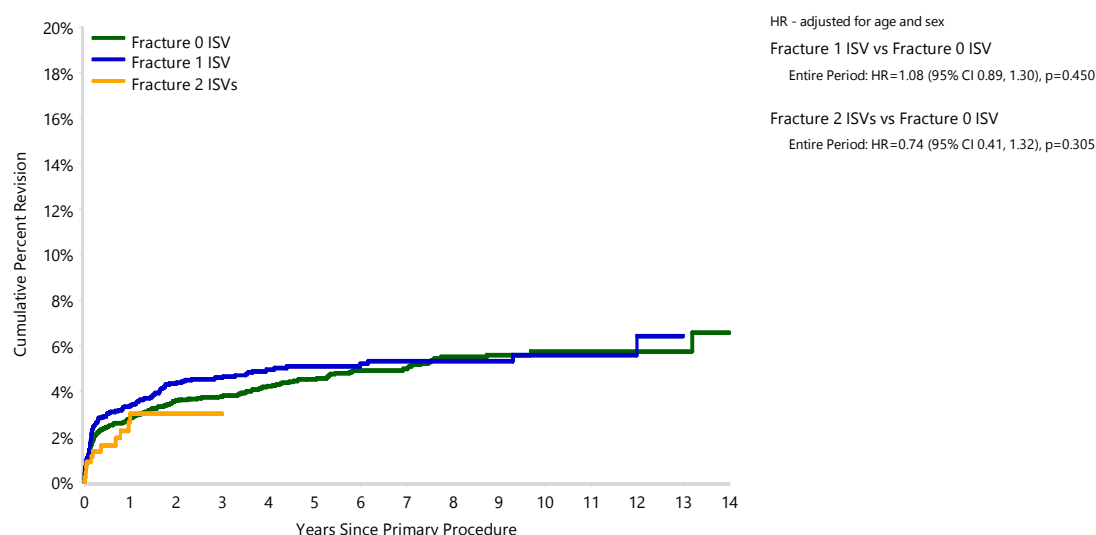
Figure ST135 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Number of Implant Sizing Variation (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Rotator Cuff Arthropathy 0 ISV	11992	10867	8587	6209	3984	1529	122
1 ISV	12053	9983	6512	3976	2135	592	53
2 ISVs	3874	2425	836	210	15	1	0

Note: Restricted to modern prostheses

Figure ST136 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Number of Implant Sizing Variation (Primary Diagnosis Fracture)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Fracture 0 ISV	6568	5774	4276	2857	1640	553	34
1 ISV	3857	3004	1834	1096	680	254	30
2 ISVs	458	263	76	11	0	0	0

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

SURGEON ASSISTIVE TOOLS (SAT)

For the first time, the numbers of SAT, including 141 robotic assistance and 10 mixed reality assisted total stemmed reverse replacements, recorded since the last annual report, are provided. Traditional instrumentation is defined as no SAT has been recorded in the implantation of the prosthesis. Overall, SATs decrease the rate of revision for primary total stemmed reverse shoulder replacement in the first 3 months, and between 6 months and 2 years. At all other time points, there is no difference in the rate of revision between SATs and traditional instrumentation (Table ST109 and Figure ST137).

An image derived instrument (IDI) is defined as custom made pin guides or cutting blocks derived from CT or MRI images by 3D printing specifically for each patient.

There are 8,845 (30.2%) total stemmed reverse shoulder replacements for osteoarthritis, 7,973 (30.6%) for rotator cuff arthropathy, and 749 (7.4%) for fracture utilising an IDI since their first use in 2014. In 2025, IDI are used in 44.1% of

osteoarthritis procedures, 42.9% of rotator cuff arthropathy and 12.6% of fracture procedures.

For osteoarthritis, traditional instrumentation has a higher revision rate than IDI use in the first 6 years, and after that time the revision risk is increased with IDI usage. When used for rotator cuff arthropathy and fracture, there is no significant difference in the rate of revision between IDI and traditional instrumentation (Table ST111 and Figure ST138).

When glenoid augmentation is stratified by IDI use, there is no difference in the rate of revision for augmented glenoid baseplates, but an increased risk of revision when traditional instrumentation is utilised with non-augmented glenoid baseplates in osteoarthritis (Table ST112, Figure ST139 and Figure ST140). IDI usage does not change the revision rate for glenoid augmentation in rotator cuff arthropathy or fracture (Table ST112, Figure ST141 to Figure ST144).

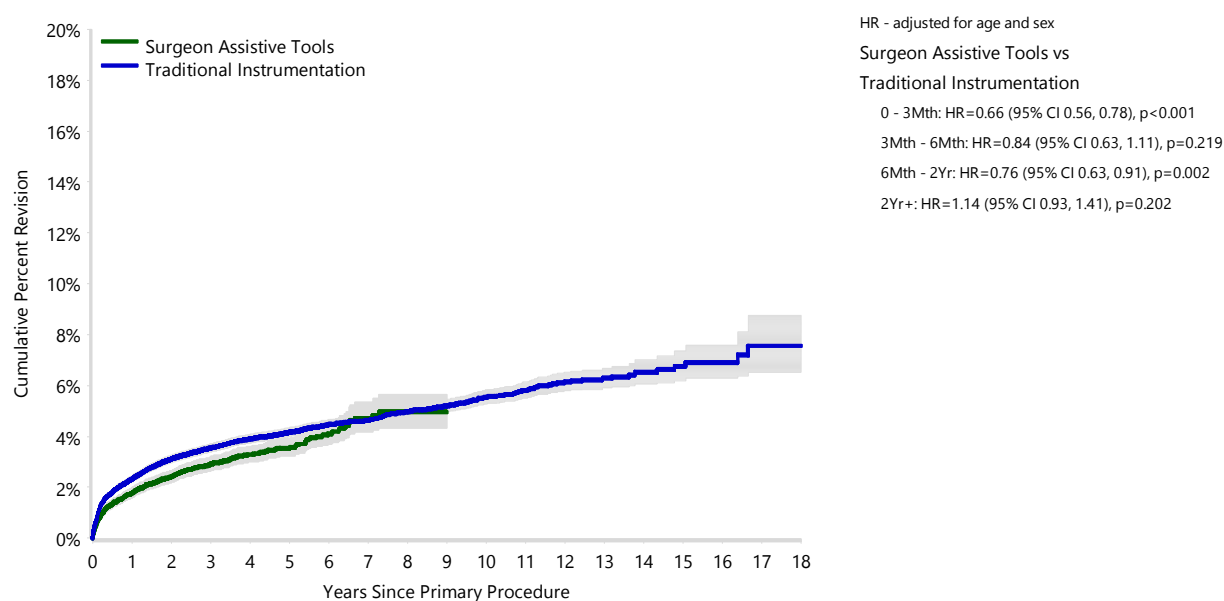
Primary Total Shoulder Replacement

Table ST109 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Surgeon Assistive Tools (All Diagnoses)

Surgeon Assistive Tools	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Surgeon Assistive Tools	500	18602	1.8 (1.6, 2.0)	2.9 (2.6, 3.2)	3.5 (3.2, 3.9)	4.7 (4.2, 5.3)		
Traditional Instrumentation	2239	56117	2.3 (2.2, 2.5)	3.5 (3.4, 3.7)	4.2 (4.0, 4.3)	4.6 (4.4, 4.8)	5.5 (5.3, 5.8)	6.8 (6.2, 7.4)
TOTAL	2739	74719						

Note: Restricted to modern prostheses

Figure ST137 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Surgeon Assistive Tools (All Diagnoses)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Surgeon Assistive Tools	18602	14211	7551	3349	972	37	0
Traditional Instrumentation	56117	48329	35512	25184	16062	6101	639

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST110 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Surgeon Assistive Tools

Primary Diagnosis	Surgeon Assistive Tools	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs
Osteoarthritis		1032	32227	1.8 (1.6, 1.9)	2.9 (2.7, 3.1)	3.4 (3.2, 3.6)	4.0 (3.8, 4.3)	4.9 (4.5, 5.3)
	Surgeon Assistive Tools	193	8976	1.3 (1.1, 1.6)	2.3 (2.0, 2.7)	2.8 (2.4, 3.2)	4.1 (3.4, 5.1)	
	Traditional Instrumentation	839	23251	1.9 (1.7, 2.1)	3.0 (2.8, 3.3)	3.6 (3.3, 3.9)	4.2 (3.9, 4.5)	5.0 (4.6, 5.4)
Rotator Cuff Arthropathy		1046	28238	2.2 (2.1, 2.4)	3.5 (3.3, 3.7)	4.2 (3.9, 4.4)	4.6 (4.3, 4.9)	5.5 (5.1, 5.9)
	Surgeon Assistive Tools	252	8086	2.1 (1.8, 2.4)	3.4 (3.0, 3.9)	4.1 (3.6, 4.7)	5.1 (4.3, 6.0)	
	Traditional Instrumentation	794	20152	2.3 (2.1, 2.5)	3.6 (3.3, 3.8)	4.2 (3.9, 4.5)	4.6 (4.3, 4.9)	5.5 (5.0, 6.0)
Fracture		465	10911	3.0 (2.7, 3.3)	4.0 (3.6, 4.4)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)
	Surgeon Assistive Tools	27	766	2.5 (1.6, 3.9)	3.6 (2.4, 5.4)	5.9 (3.7, 9.3)		
	Traditional Instrumentation	438	10145	3.0 (2.7, 3.4)	4.0 (3.7, 4.5)	4.7 (4.3, 5.2)	5.1 (4.6, 5.6)	5.7 (5.1, 6.4)
TOTAL		2543	71376					

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Table ST111 Cumulative Percent Revision of Primary Total Stemmed Reverse Replacement Since 2014 by Primary Diagnosis and IDI Usage

Primary Diagnosis	IDI Use	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Osteoarthritis	IDI Used	190	8845	1.3 (1.1, 1.6)	2.3 (2.0, 2.7)	2.7 (2.3, 3.2)	4.1 (3.3, 5.1)	4.3 (3.5, 5.4)	
	Traditional Instrumentation	659	20424	1.8 (1.7, 2.0)	2.9 (2.7, 3.2)	3.5 (3.2, 3.7)	4.0 (3.7, 4.3)	4.3 (4.0, 4.7)	5.0 (4.5, 5.7)
Rotator Cuff Arthropathy	IDI Used	251	7973	2.1 (1.8, 2.5)	3.4 (3.0, 3.9)	4.1 (3.6, 4.7)	5.1 (4.3, 6.0)	5.4 (4.5, 6.5)	
	Traditional Instrumentation	666	18069	2.2 (2.0, 2.5)	3.5 (3.2, 3.8)	4.1 (3.8, 4.4)	4.5 (4.2, 4.9)	5.0 (4.6, 5.5)	5.4 (4.9, 6.0)
Fracture	IDI Used	27	749	2.5 (1.6, 4.0)	3.7 (2.4, 5.5)	6.0 (3.8, 9.4)			
	Traditional Instrumentation	396	9316	3.0 (2.7, 3.4)	4.1 (3.7, 4.5)	4.8 (4.3, 5.3)	5.1 (4.6, 5.7)	5.5 (4.9, 6.2)	5.7 (5.0, 6.4)
TOTAL		2189	65376						

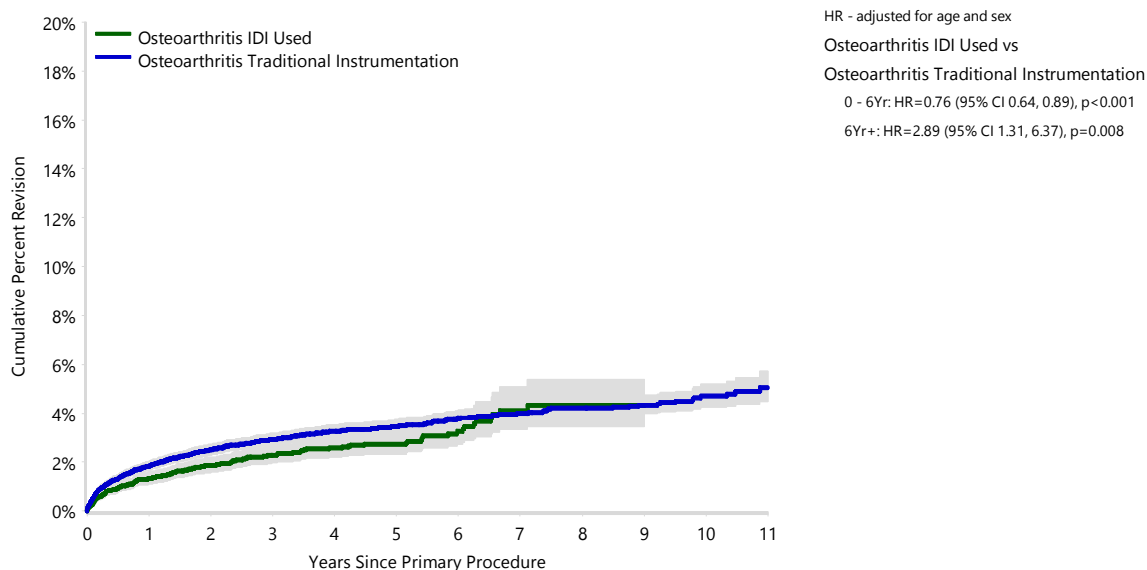
Note: Restricted to modern prostheses

Excludes 260 procedures that used non-IDI surgeon assistive tools

Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty

Comparative Analyses: No Difference Observed Supplementary Report

Figure ST138 Cumulative Percent Revision of Primary Total Stemmed Reverse Replacement Since 2014 by IDI Usage (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Osteoarthritis	IDI Used	8845	6889	3722	1695	513	40	5
	Traditional Instrumentation	20424	17644	12724	8854	5198	2337	539

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Table ST112 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement Since 2014 by Primary Diagnosis, Glenoid Augmentation and IDI Usage

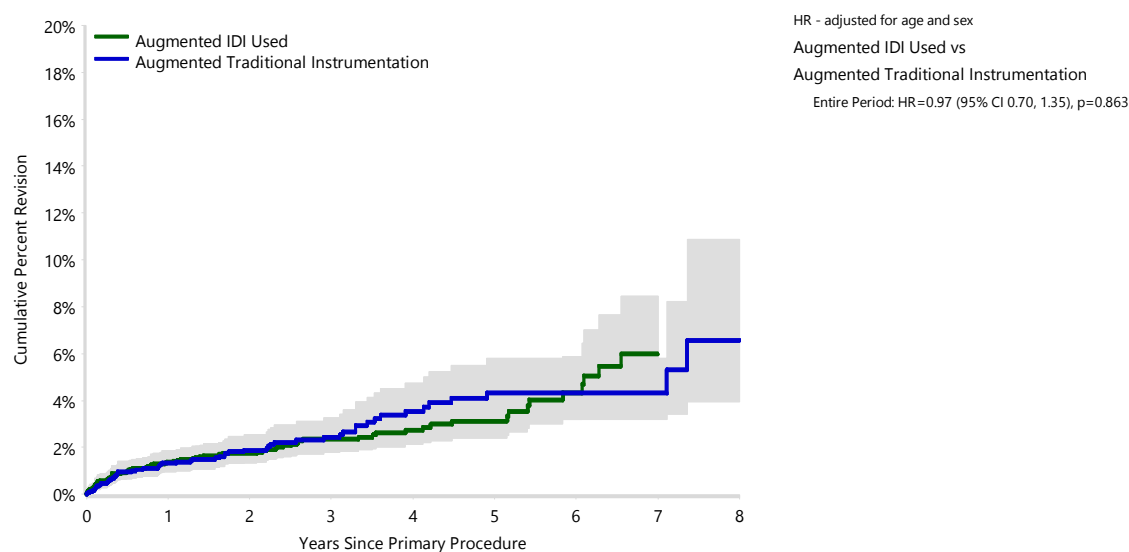
Primary Diagnosis	Glenoid Augmentation	IDI Usage	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Osteoarthritis	Augmented	IDI Used	82	3703	1.4 (1.0, 1.8)	2.3 (1.8, 3.0)	3.1 (2.4, 4.1)	6.0 (4.2, 8.5)		
		Traditional Instrumentation	64	2992	1.3 (1.0, 1.8)	2.4 (1.8, 3.3)	4.3 (3.2, 5.8)	4.3 (3.2, 5.8)		
	Non- augmented	IDI Used	108	5134	1.3 (1.0, 1.7)	2.3 (1.9, 2.8)	2.5 (2.1, 3.1)	3.3 (2.6, 4.3)	3.3 (2.6, 4.3)	
		Traditional Instrumentation	593	17425	1.9 (1.7, 2.1)	3.0 (2.8, 3.3)	3.5 (3.2, 3.8)	4.0 (3.7, 4.3)	4.3 (4.0, 4.7)	5.0 (4.4, 5.7)
Rotator Cuff Arthropathy	Augmented	IDI Used	85	2952	2.1 (1.6, 2.7)	3.3 (2.6, 4.1)	3.9 (3.0, 5.1)	6.1 (4.4, 8.4)		
		Traditional Instrumentation	49	2503	1.7 (1.3, 2.4)	2.4 (1.8, 3.2)	2.6 (1.9, 3.5)	3.1 (2.0, 4.7)		
	Non- augmented	IDI Used	166	5015	2.1 (1.7, 2.6)	3.5 (2.9, 4.1)	4.2 (3.6, 4.9)	4.8 (4.0, 5.8)	5.1 (4.1, 6.4)	
		Traditional Instrumentation	617	15562	2.3 (2.1, 2.6)	3.6 (3.3, 4.0)	4.2 (3.9, 4.6)	4.7 (4.3, 5.0)	5.1 (4.7, 5.6)	5.5 (5.0, 6.2)
Fracture	Augmented	IDI Used	6	283	1.1 (0.4, 3.4)	1.9 (0.7, 5.4)				
		Traditional Instrumentation	22	938	2.3 (1.5, 3.6)	2.7 (1.8, 4.3)				
	Non- augmented	IDI Used	21	466	3.3 (2.0, 5.5)	4.6 (3.0, 7.2)	6.2 (3.8, 10.0)			
		Traditional Instrumentation	373	8374	3.1 (2.8, 3.5)	4.2 (3.8, 4.7)	4.9 (4.4, 5.4)	5.2 (4.7, 5.8)	5.6 (5.0, 6.3)	5.8 (5.1, 6.5)
TOTAL			2186	65347						

Note: Restricted to modern prostheses

Excludes 289 procedures that used non-IDI surgeon assistive tools or unknown glenoid augmentation

Primary Total Shoulder Replacement

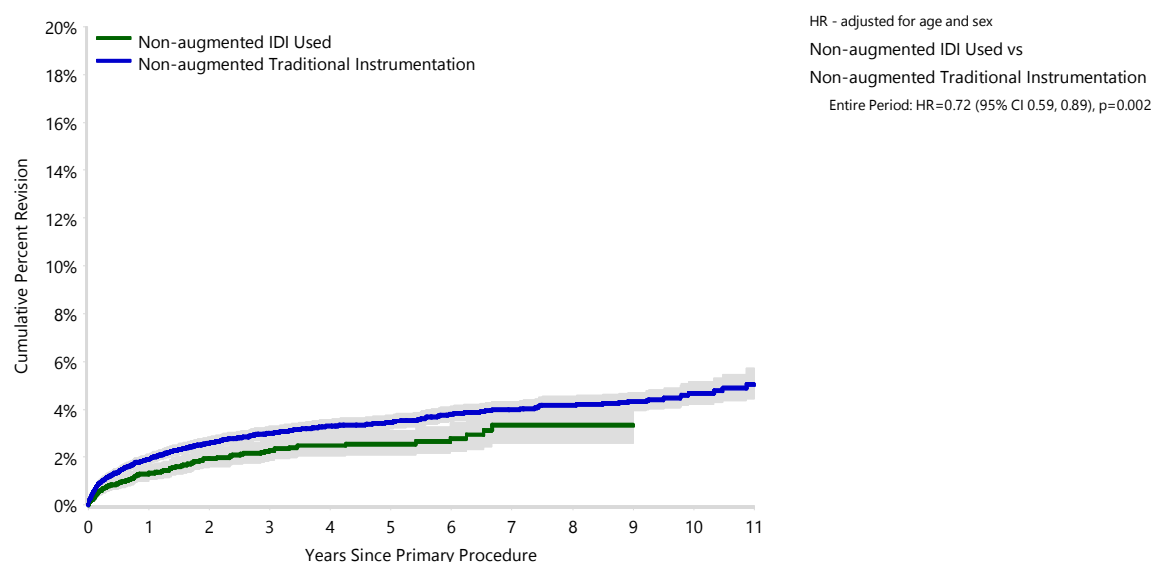
Figure ST139 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Augmented Glenoid Since 2014 by IDI Usage (Primary Diagnosis OA)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Osteoarthritis	Augmented IDI Used	3703	2654	1280	513	122	0	0
	Traditional Instrumentation	2992	2040	839	405	99	25	5

Note: Restricted to modern prostheses

Figure ST140 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Non-augmented Glenoid Since 2014 by IDI Usage (Primary Diagnosis OA)



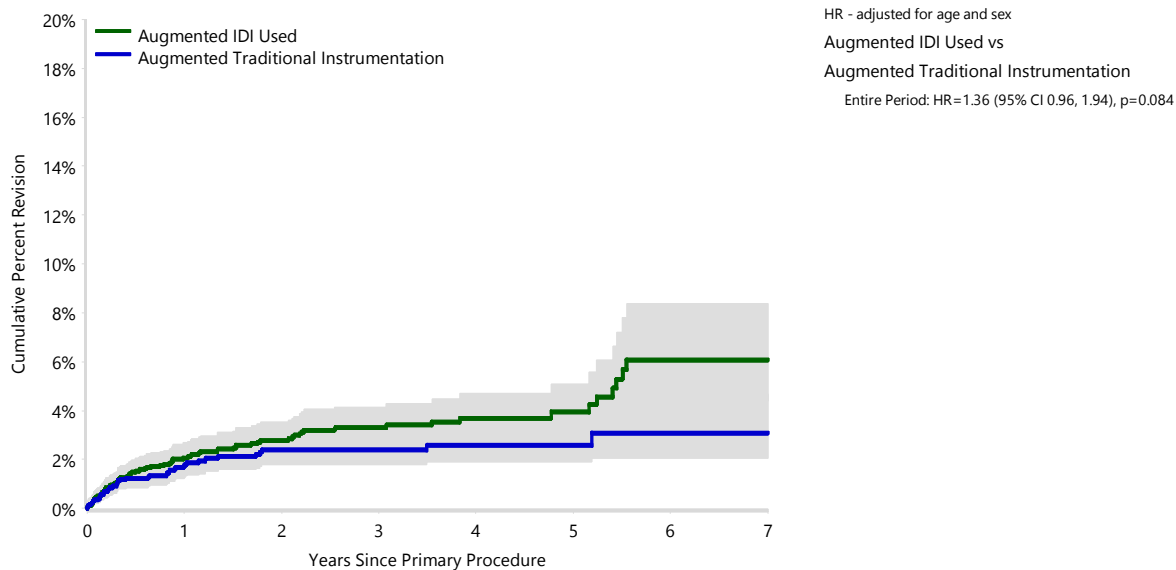
Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Osteoarthritis	Non-augmented IDI Used	5134	4232	2442	1182	391	40	5
	Traditional Instrumentation	17425	15603	11884	8449	5099	2312	534

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

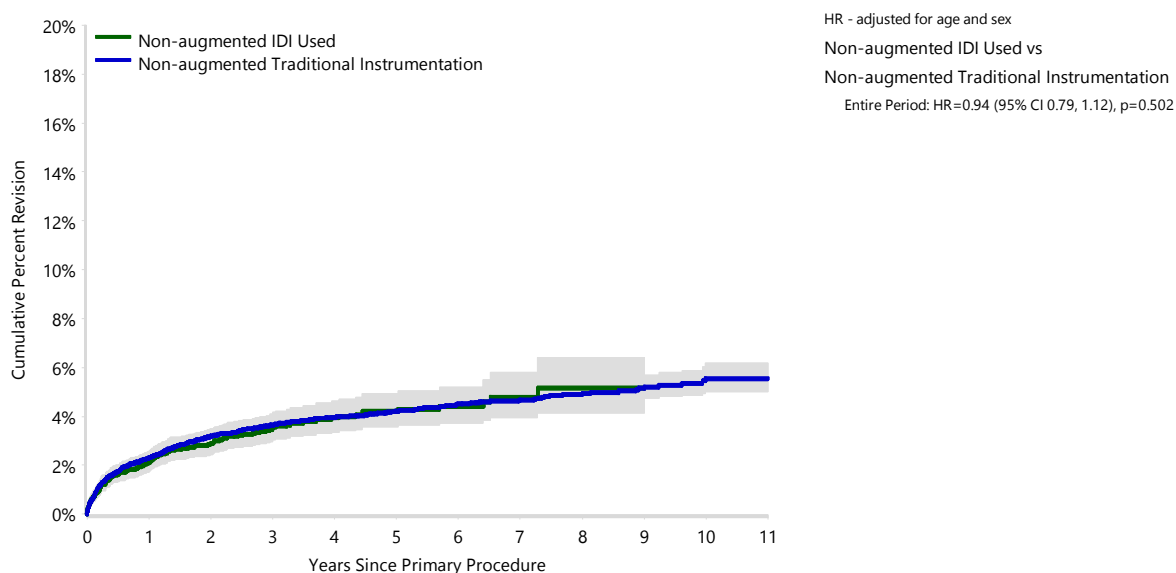
Figure ST141 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Augmented Glenoid Since 2014 by IDI Usage (Primary Diagnosis Rotator Cuff Arthropathy)



Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Rotator Cuff Arthropathy Augmented	IDI Used	2952	2083	912	345	68	1	0
	Traditional Instrumentation	2503	1630	633	221	62	20	3

Note: Restricted to modern prostheses

Figure ST142 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Non-augmented Glenoid Since 2014 by IDI Usage (Primary Diagnosis Rotator Cuff Arthropathy)

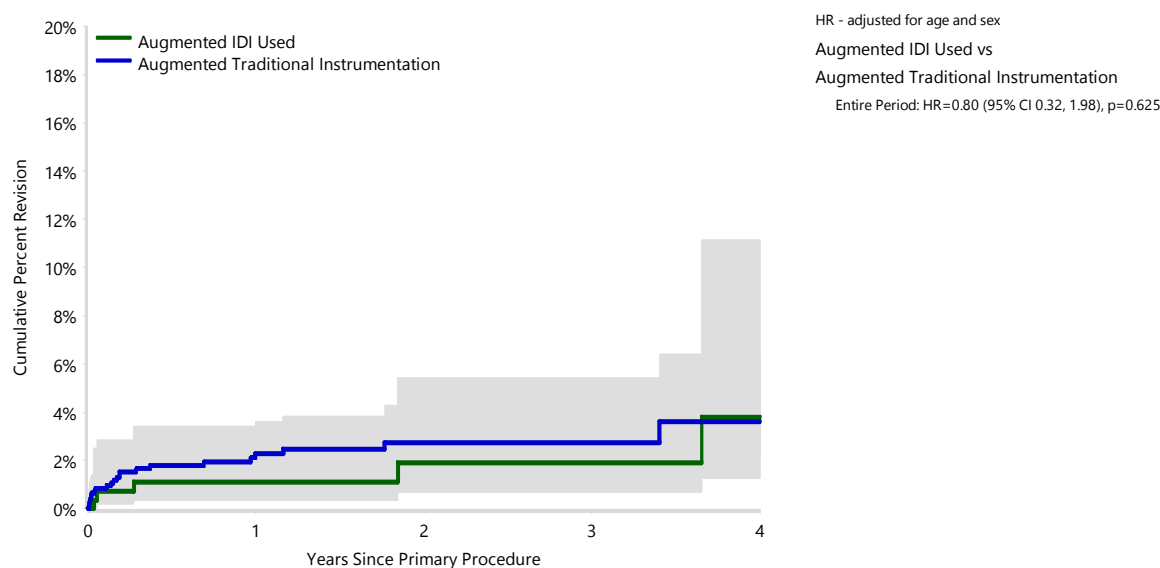


Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Rotator Cuff Arthropathy Non-augmented	IDI Used	2952	2083	912	345	68	1	0
	Traditional Instrumentation	2503	1630	633	221	62	20	3

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

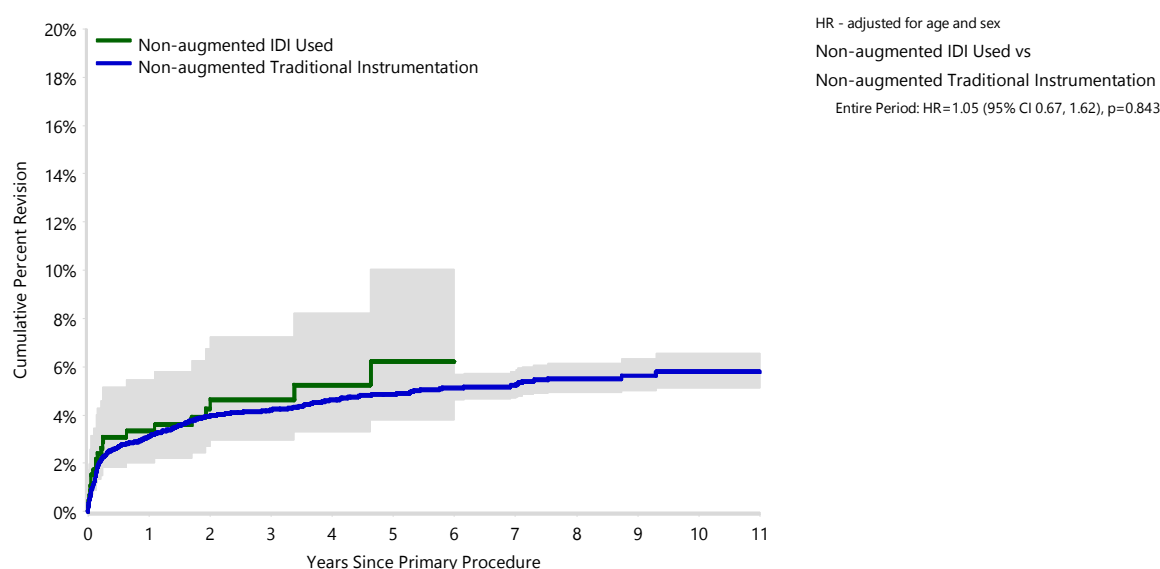
Figure ST143 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Augmented Glenoid Since 2014 by IDI Usage (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Fracture	Augmented	IDI Used	283	189	73	22	4	0	0
	Traditional Instrumentation		938	556	165	26	6	4	1

Note: Restricted to modern prostheses

Figure ST144 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement with Non-augmented Glenoid Since 2014 by IDI Usage (Primary Diagnosis Fracture)



Number at Risk			0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs	11 Yrs
Fracture	Non-augmented	IDI Used	466	374	181	77	19	0	0
	Traditional Instrumentation		8374	7154	5072	3224	1758	724	158

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

OPERATIVE TECHNIQUE ROTATOR CUFF REPAIR

When a rotator cuff repair is not undertaken as part of the implantation of a total stemmed reverse shoulder replacement, there is an increased rate of revision for osteoarthritis and fracture. For rotator cuff arthropathy, the

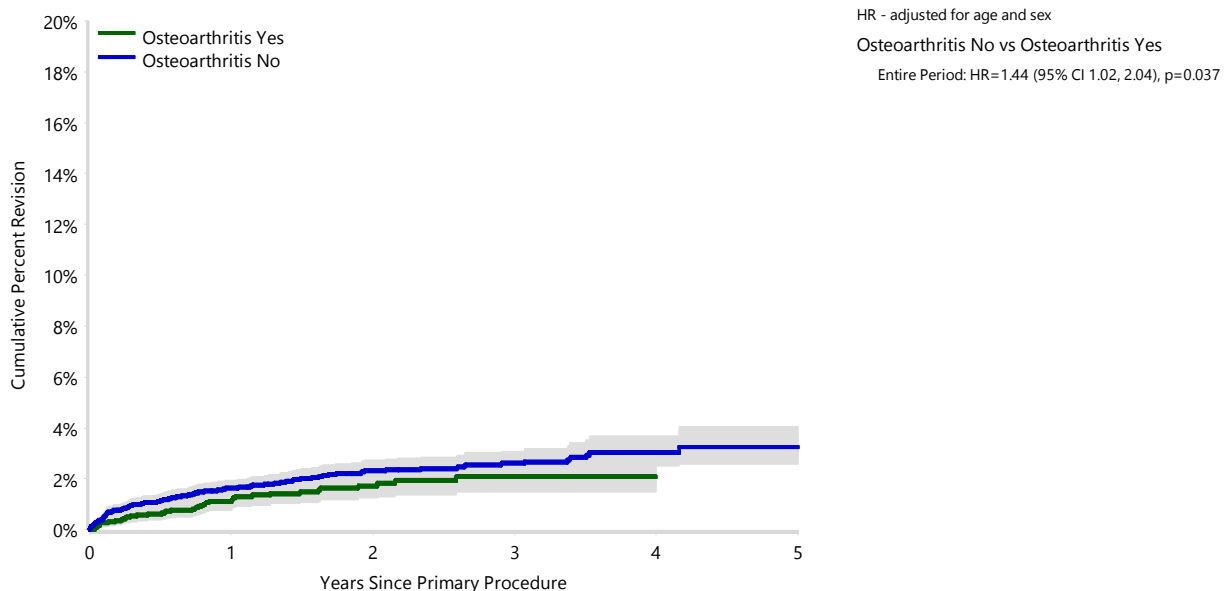
revision risk is higher for the first 3 months only (Table ST113, Figure ST145, Figure ST146 and Figure ST147).

Table ST113 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Primary Diagnosis and Rotator Cuff Repair

Primary Diagnosis	Rotator Cuff Repair	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis	Yes	41	2956	1.1 (0.8, 1.6)	1.7 (1.2, 2.4)	2.1 (1.5, 2.9)	2.1 (1.5, 2.9)	
	No	154	7691	1.6 (1.3, 1.9)	2.3 (1.9, 2.7)	2.6 (2.2, 3.1)	3.0 (2.5, 3.7)	3.2 (2.6, 4.0)
Rotator Cuff Arthropathy	Yes	60	2614	1.8 (1.3, 2.5)	3.2 (2.4, 4.1)	3.3 (2.5, 4.3)	3.7 (2.7, 5.1)	
	No	234	8277	2.3 (2.0, 2.7)	3.2 (2.8, 3.7)	3.7 (3.2, 4.3)	4.1 (3.5, 4.8)	
Fracture	Yes	29	1339	1.8 (1.2, 2.8)	2.4 (1.6, 3.5)	3.1 (2.0, 4.9)	3.1 (2.0, 4.9)	
	No	72	1713	3.5 (2.7, 4.6)	4.6 (3.6, 5.8)	4.7 (3.7, 6.0)	5.9 (4.4, 8.0)	
TOTAL		590	24590					

Note: Restricted to modern prostheses. Figures (with sufficient revisions) are not shown where the results are not statistically significant ($p > 0.05$). They are available in the Shoulder Arthroplasty Comparative Analyses: No Difference Observed Supplementary Report

Figure ST145 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis OA)

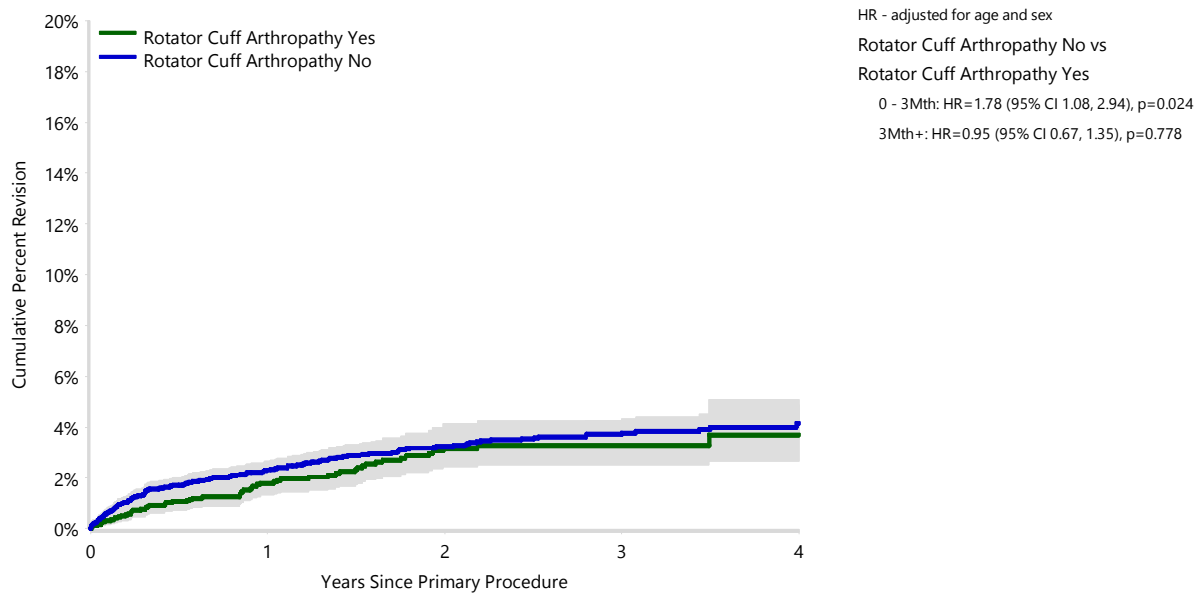


Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Osteoarthritis	Yes	2956	1930	1039	421	115	1
	No	7691	5187	3132	1633	558	58

Note: Restricted to modern prostheses

Primary Total Shoulder Replacement

Figure ST146 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis Rotator Cuff Arthropathy)



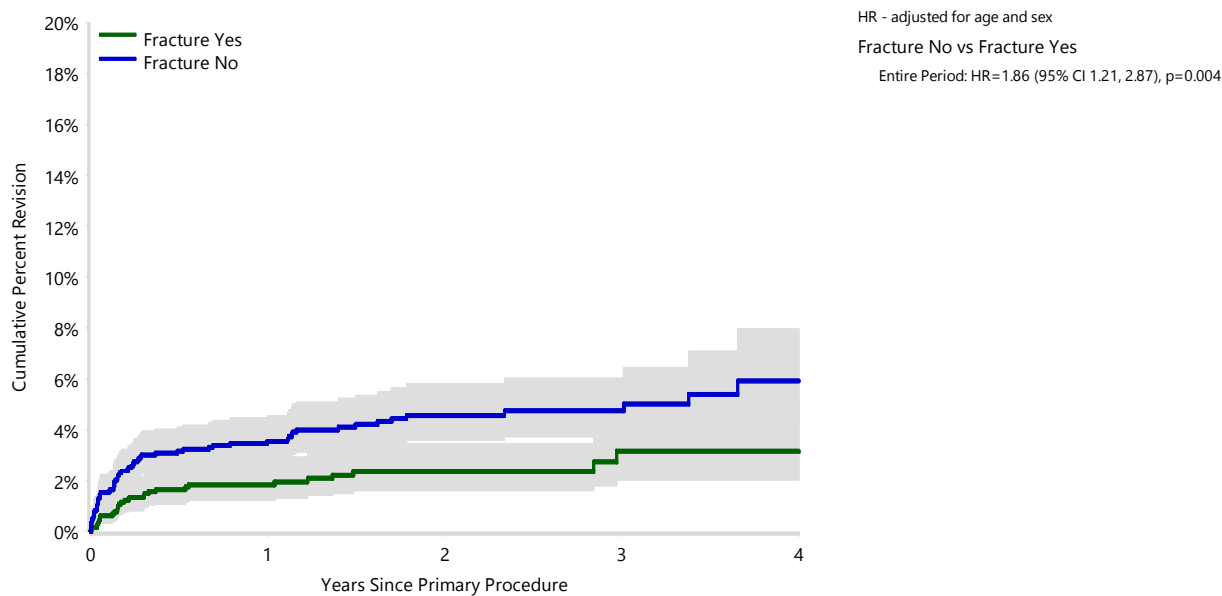
Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Rotator Cuff Arthropathy	Yes	2614	1720	983	427	115	8
	No	8277	5547	3436	1751	633	37

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

Figure ST147 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Rotator Cuff Repair (Primary Diagnosis Fracture)



Number at Risk		0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs
Fracture	Yes	1339	862	493	230	71	3
	No	1713	1137	679	344	120	14

Note: Restricted to modern prostheses



Primary Total Shoulder Replacement

PROSTHESIS COMBINATIONS BY PRIMARY DIAGNOSIS

The outcomes of the most commonly used prosthesis combinations are listed in Table ST114 to Table ST116.

The most commonly used cementless prosthesis combinations are listed in Table ST117 to Table ST119.

The most commonly used hybrid (humerus cemented) prosthesis combinations are listed in Table ST120 to Table ST122.

Table ST114 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	85	1632	2.0 (1.4, 2.8)	3.4 (2.6, 4.4)	3.9 (3.0, 5.0)	5.3 (4.3, 6.7)	6.5 (5.2, 8.1)	7.4 (5.8, 9.3)
	Perform Reversed	4	162	0.7 (0.1, 4.7)	2.6 (0.8, 8.0)				
Affinis	Affinis	29	841	1.3 (0.7, 2.4)	3.0 (2.0, 4.4)	3.2 (2.1, 4.6)	3.7 (2.5, 5.4)		
AltiVate Reverse	RSP	30	1547	1.5 (1.0, 2.3)	2.5 (1.7, 3.6)	2.5 (1.7, 3.6)			
Ascend Flex	Aequalis	84	2234	2.1 (1.6, 2.8)	3.5 (2.8, 4.5)	4.3 (3.4, 5.3)	5.3 (4.1, 6.9)		
	Perform Reversed	23	1609	1.6 (1.0, 2.4)	1.7 (1.1, 2.5)	1.7 (1.1, 2.5)			
Comprehensive	Comprehensive Reverse	71	4961	0.9 (0.7, 1.2)	1.5 (1.2, 2.0)	1.9 (1.5, 2.5)	2.2 (1.6, 2.9)	2.9 (1.7, 4.9)	
Delta Xtend	Delta Xtend	215	5767	1.8 (1.5, 2.1)	2.7 (2.3, 3.2)	3.2 (2.8, 3.8)	3.8 (3.3, 4.3)	4.6 (3.9, 5.3)	6.9 (5.3, 8.8)
Equinox	Equinox	153	3905	2.0 (1.6, 2.5)	3.1 (2.6, 3.8)	4.3 (3.6, 5.2)	6.2 (5.1, 7.5)	9.5 (6.5, 13.7)	
Global Unite	Delta Xtend	22	844	1.3 (0.7, 2.4)	3.3 (2.1, 5.2)	3.7 (2.4, 5.8)	4.3 (2.7, 6.7)		
MSS	MSS	6	544	1.0 (0.4, 2.6)	1.3 (0.5, 3.3)				
RSP	RSP	35	801	2.4 (1.5, 3.7)	3.8 (2.7, 5.4)	4.6 (3.3, 6.3)	4.6 (3.3, 6.3)		
SMR	SMR	6	286	1.6 (0.6, 4.2)					
	SMR Axioma	5	120	1.7 (0.4, 6.6)	4.4 (1.9, 10.3)	4.4 (1.9, 10.3)			
	SMR L1	200	5522	2.3 (1.9, 2.7)	3.2 (2.8, 3.7)	3.5 (3.0, 4.0)	3.8 (3.3, 4.4)	4.4 (3.7, 5.1)	5.3 (4.2, 6.5)
Trabecular Metal	Comprehensive Reverse	4	260	1.2 (0.4, 3.6)	2.0 (0.7, 5.4)	2.0 (0.7, 5.4)			
	Trabecular Metal	42	861	1.5 (0.9, 2.6)	3.8 (2.7, 5.4)	4.9 (3.5, 6.7)	5.1 (3.7, 6.9)	5.8 (4.2, 8.0)	
Other (21)		18	331	5.3 (3.2, 8.7)	5.3 (3.2, 8.7)	7.7 (4.7, 12.5)			
TOTAL		1032	32227						

Note: Restricted to modern prostheses

Only prostheses with >100 procedures have been listed



Primary Total Shoulder Replacement

Table ST115 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Rotator Cuff Arthropathy)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	75	1374	2.2 (1.6, 3.2)	3.7 (2.8, 4.9)	4.8 (3.7, 6.2)	5.3 (4.2, 6.7)	7.1 (5.5, 9.0)	
	Perform Reversed	2	137	1.6 (0.4, 6.4)	1.6 (0.4, 6.4)				
Affinis	Affinis	30	765	1.7 (1.0, 2.9)	3.3 (2.2, 4.8)	4.1 (2.8, 5.8)	4.5 (3.1, 6.7)		
AltiVate	RSP	2	113	2.0 (0.5, 7.8)					
AltiVate Reverse	RSP	66	1784	2.6 (1.9, 3.5)	4.5 (3.5, 5.8)	5.1 (4.0, 6.6)			
Ascend Flex	Aequalis	96	2074	2.5 (1.9, 3.3)	4.4 (3.6, 5.5)	5.7 (4.6, 7.0)	6.3 (5.1, 7.9)		
	Perform Reversed	38	1720	1.9 (1.3, 2.8)	3.1 (2.2, 4.5)	3.5 (2.4, 5.2)			
Comprehensive	Comprehensive Reverse	87	4306	1.4 (1.0, 1.8)	2.3 (1.8, 2.9)	2.7 (2.2, 3.5)	3.0 (2.4, 3.9)	3.0 (2.4, 3.9)	
	Trabecular Metal	1	44	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.0 (0.4, 19.6)			
Delta Xtend	Delta Xtend	197	5123	1.9 (1.6, 2.4)	3.0 (2.6, 3.5)	3.7 (3.1, 4.2)	4.2 (3.6, 4.9)	4.7 (4.1, 5.5)	5.7 (4.7, 7.0)
Equinox	Equinox	119	3110	2.1 (1.7, 2.7)	3.4 (2.8, 4.2)	4.5 (3.7, 5.5)	5.4 (4.4, 6.6)		
Global Unite	Delta Xtend	21	622	2.2 (1.3, 3.8)	3.7 (2.3, 5.7)	4.3 (2.8, 6.5)	4.3 (2.8, 6.5)		
MSS	MSS	13	476	3.0 (1.6, 5.7)	4.5 (2.6, 7.8)				
RSP	RSP	34	775	2.9 (1.9, 4.3)	4.1 (2.9, 5.8)	4.4 (3.2, 6.2)	4.4 (3.2, 6.2)		
SMR	SMR	4	177	2.0 (0.6, 6.1)					
	SMR Axioma	6	59	5.1 (1.7, 14.9)	11.0 (5.1, 23.0)	11.0 (5.1, 23.0)			
	SMR L1	186	4525	2.8 (2.3, 3.3)	3.7 (3.2, 4.3)	4.1 (3.5, 4.7)	4.4 (3.8, 5.1)	5.2 (4.4, 6.1)	5.7 (4.7, 7.0)
Trabecular Metal	Comprehensive Reverse	17	199	6.8 (4.0, 11.5)	9.8 (6.1, 15.5)	9.8 (6.1, 15.5)			
	Trabecular Metal	49	759	3.8 (2.7, 5.5)	5.4 (4.0, 7.3)	5.9 (4.4, 7.9)	6.5 (4.9, 8.6)	7.5 (5.6, 10.0)	
Other (18)		3	96	3.2 (0.8, 12.1)	5.2 (1.7, 15.5)	5.2 (1.7, 15.5)			
TOTAL		1046	28238						

Note Restricted to modern prostheses

Only prostheses with >25 procedures have been listed



Primary Total Shoulder Replacement

Table ST116 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Fracture)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	59	1507	2.0 (1.4, 2.9)	2.7 (2.0, 3.7)	3.8 (2.9, 5.0)	4.5 (3.4, 5.9)	5.7 (4.3, 7.6)	
	Perform Reversed	6	291	2.1 (0.9, 5.1)					
Aequalis Flex Revive	Perform Reversed	4	121	2.6 (0.8, 7.7)					
Affinis	Affinis	20	374	2.2 (1.1, 4.3)	3.9 (2.3, 6.5)	5.6 (3.6, 8.7)	6.1 (4.0, 9.5)		
AltiVate Reverse	RSP	14	438	2.7 (1.5, 4.9)	3.4 (2.0, 5.9)				
Ascend Flex	Aequalis	4	89	2.3 (0.6, 9.0)	4.9 (1.9, 12.6)	4.9 (1.9, 12.6)	4.9 (1.9, 12.6)		
	Perform Reversed	4	121	4.1 (1.6, 10.8)					
Comprehensive	Comprehensive Reverse	37	1656	2.0 (1.4, 2.8)	2.3 (1.6, 3.2)	2.8 (2.0, 4.0)	2.8 (2.0, 4.0)		
Delta Xtend	Delta Xtend	91	1575	4.2 (3.3, 5.4)	5.2 (4.2, 6.4)	5.6 (4.5, 6.9)	5.8 (4.7, 7.1)	6.8 (5.4, 8.4)	
Equinox	Equinox	45	959	3.1 (2.2, 4.4)	4.7 (3.4, 6.4)	6.0 (4.4, 8.3)	6.0 (4.4, 8.3)		
Global Unite	Delta Xtend	24	745	2.1 (1.3, 3.5)	3.0 (1.9, 4.6)	4.1 (2.7, 6.4)	4.7 (3.0, 7.4)		
MSS	MSS	2	55	3.8 (1.0, 14.3)					
RSP	RSP	16	228	3.6 (1.8, 7.0)	6.0 (3.5, 10.2)	7.3 (4.4, 11.8)	8.1 (5.0, 13.0)		
SMR	SMR L1	123	2160	4.2 (3.4, 5.2)	5.6 (4.7, 6.7)	6.0 (5.0, 7.2)	6.3 (5.3, 7.6)	6.3 (5.3, 7.6)	
Trabecular Metal	Comprehensive Reverse	4	168	2.4 (0.9, 6.2)	2.4 (0.9, 6.2)				
	Trabecular Metal	10	309	2.3 (1.1, 4.8)	3.0 (1.6, 5.8)	3.0 (1.6, 5.8)	3.7 (1.9, 6.8)	3.7 (1.9, 6.8)	
Other (11)		2	115	1.8 (0.5, 7.1)	1.8 (0.5, 7.1)				
TOTAL		465	10911						

Note Restricted to modern prostheses

Only prostheses with >50 procedures have been listed



Primary Total Shoulder Replacement

Table ST117 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	69	1233	2.0 (1.3, 2.9)	3.6 (2.7, 4.9)	4.1 (3.1, 5.4)	5.6 (4.3, 7.2)	6.9 (5.4, 8.9)	
	Perform Reversed	2	139	0.8 (0.1, 5.4)	0.8 (0.1, 5.4)				
Affinis	Affinis	19	528	1.1 (0.5, 2.5)	3.2 (2.0, 5.2)	3.4 (2.2, 5.5)	3.9 (2.4, 6.3)		
AltiVate	RSP	2	76	3.0 (0.7, 11.5)	3.0 (0.7, 11.5)				
AltiVate Reverse	RSP	27	1436	1.6 (1.0, 2.4)	2.4 (1.6, 3.6)	2.4 (1.6, 3.6)			
Ascend Flex	Aequalis	79	1992	2.1 (1.6, 2.9)	3.7 (2.9, 4.7)	4.5 (3.6, 5.7)	5.7 (4.4, 7.3)		
	Perform Reversed	22	1425	1.7 (1.1, 2.6)	1.8 (1.2, 2.7)	1.8 (1.2, 2.7)			
Comprehensive	Comprehensive Reverse	67	4777	0.9 (0.7, 1.2)	1.5 (1.2, 2.0)	1.9 (1.5, 2.5)	2.2 (1.6, 2.8)	2.2 (1.6, 2.8)	
	Custom Made (Comprehensive)	2	57	1.8 (0.2, 11.8)	1.8 (0.2, 11.8)	4.5 (1.1, 17.3)	4.5 (1.1, 17.3)		
	Trabecular Metal	1	31	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.8 (0.6, 24.3)			
Delta Xtend	Delta Xtend	171	4504	1.8 (1.5, 2.3)	2.9 (2.4, 3.4)	3.4 (2.9, 4.0)	3.9 (3.3, 4.6)	4.9 (4.2, 5.8)	8.4 (5.9, 12.0)
Equinox	Equinox	144	3707	1.9 (1.5, 2.4)	3.1 (2.6, 3.8)	4.3 (3.6, 5.2)	6.0 (4.9, 7.3)	9.5 (6.4, 14.1)	
Global Unite	Delta Xtend	17	757	1.2 (0.6, 2.3)	2.8 (1.7, 4.7)	3.2 (1.9, 5.4)	3.8 (2.3, 6.5)		
MSS	MSS	6	539	1.0 (0.4, 2.6)	1.3 (0.5, 3.3)				
RSP	RSP	30	693	2.5 (1.5, 3.9)	3.7 (2.5, 5.4)	4.5 (3.2, 6.4)	4.5 (3.2, 6.4)		
SMR	Custom Made (Lima)	6	57	9.4 (4.0, 21.1)	9.4 (4.0, 21.1)	13.7 (6.0, 29.8)			
	SMR	6	283	1.6 (0.6, 4.3)					
	SMR Axioma	4	118	1.7 (0.4, 6.7)	3.6 (1.4, 9.3)	3.6 (1.4, 9.3)			
	SMR L1	191	5394	2.2 (1.9, 2.7)	3.1 (2.7, 3.7)	3.4 (2.9, 3.9)	3.7 (3.2, 4.3)	4.3 (3.7, 5.0)	5.2 (4.2, 6.5)
Trabecular Metal	Comprehensive Reverse	3	236	0.9 (0.2, 3.4)	1.7 (0.5, 5.4)	1.7 (0.5, 5.4)			
	Trabecular Metal	37	788	1.6 (0.9, 2.7)	3.7 (2.6, 5.4)	4.7 (3.4, 6.6)	4.9 (3.5, 6.9)	5.7 (4.1, 8.0)	
Univers Revers	Univers Revers	0	28						
Verso	Verso	5	30	16.8 (7.4, 35.8)	16.8 (7.4, 35.8)	16.8 (7.4, 35.8)			
Other (12)		0	28	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
TOTAL		910	28856						

Note Restricted to modern prostheses

Only prostheses with >25 procedures have been listed



Primary Total Shoulder Replacement

Table ST118 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Rotator Cuff Arthropathy)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	64	1166	2.1 (1.4, 3.1)	3.6 (2.7, 4.9)	4.9 (3.7, 6.4)	5.3 (4.1, 6.9)	7.2 (5.5, 9.4)	
	Perform Reversed	2	113	2.0 (0.5, 7.8)	2.0 (0.5, 7.8)				
Affinis	Affinis	21	455	1.8 (0.9, 3.5)	3.6 (2.2, 5.9)	4.7 (3.1, 7.3)	5.5 (3.5, 8.7)		
AltıVate	RSP	2	113	2.0 (0.5, 7.8)					
AltıVate Reverse	RSP	61	1690	2.5 (1.8, 3.4)	4.6 (3.5, 5.9)	5.0 (3.9, 6.5)			
Ascend Flex	Aequalis	84	1797	2.6 (1.9, 3.4)	4.5 (3.6, 5.7)	5.6 (4.5, 7.0)	6.2 (4.9, 7.8)		
	Perform Reversed	36	1544	2.1 (1.5, 3.1)	3.2 (2.2, 4.6)	3.6 (2.4, 5.4)			
Comprehensive	Comprehensive Reverse	83	4196	1.3 (1.0, 1.7)	2.2 (1.8, 2.8)	2.7 (2.1, 3.4)	3.0 (2.3, 3.8)	3.0 (2.3, 3.8)	
	Trabecular Metal	1	44	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	3.0 (0.4, 19.6)			
Delta Xtend	Delta Xtend	177	4430	2.0 (1.6, 2.4)	3.1 (2.6, 3.7)	3.8 (3.3, 4.5)	4.5 (3.8, 5.2)	5.0 (4.3, 5.9)	6.3 (5.1, 7.7)
Equinox	Equinox	114	3001	2.1 (1.7, 2.7)	3.4 (2.7, 4.1)	4.5 (3.7, 5.5)	5.4 (4.3, 6.6)		
Global Unite	Delta Xtend	20	563	2.5 (1.4, 4.2)	3.8 (2.4, 6.0)	4.5 (2.9, 6.9)	4.5 (2.9, 6.9)		
MSS	MSS	13	468	3.1 (1.6, 5.8)	4.6 (2.6, 8.0)				
RSP	RSP	31	713	2.7 (1.7, 4.2)	4.0 (2.8, 5.8)	4.4 (3.1, 6.3)	4.4 (3.1, 6.3)		
SMR	SMR	4	176	2.0 (0.6, 6.2)					
	SMR Axioma	5	58	3.4 (0.9, 13.1)	9.5 (4.0, 21.4)	9.5 (4.0, 21.4)			
	SMR L1	176	4415	2.6 (2.2, 3.2)	3.6 (3.1, 4.2)	3.9 (3.4, 4.6)	4.3 (3.7, 5.0)	5.1 (4.3, 6.1)	5.6 (4.6, 6.9)
Trabecular Metal	Comprehensive Reverse	14	179	5.9 (3.2, 10.7)	9.2 (5.5, 15.2)	9.2 (5.5, 15.2)			
	Trabecular Metal	47	711	4.0 (2.8, 5.7)	5.7 (4.2, 7.7)	6.2 (4.6, 8.3)	6.8 (5.1, 9.0)	7.5 (5.6, 10.0)	
Other (14)		2	89	1.7 (0.2, 11.6)	4.0 (1.0, 15.3)	4.0 (1.0, 15.3)	4.0 (1.0, 15.3)		
TOTAL		957	25921						

Note Restricted to modern prostheses

Only prostheses with >25 procedures have been listed



Primary Total Shoulder Replacement

Table ST119 Cumulative Percent Revision of Cementless Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Fracture)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	7	66	3.0 (0.8, 11.6)	3.0 (0.8, 11.6)	8.7 (3.7, 19.9)	11.2 (5.1, 23.6)	13.8 (6.7, 27.3)	
Aequalis Flex Revive	Perform Reversed	2	100	2.0 (0.5, 7.9)	2.0 (0.5, 7.9)				
Ascend Flex	Perform Reversed	2	54	4.4 (1.1, 16.4)	4.4 (1.1, 16.4)				
Comprehensive	Comprehensive Reverse	9	404	2.2 (1.1, 4.4)	2.7 (1.4, 5.1)	2.7 (1.4, 5.1)			
Delta Xtend	Delta Xtend	10	237	2.6 (1.2, 5.6)	4.0 (2.1, 7.5)	4.0 (2.1, 7.5)	4.7 (2.5, 8.6)	4.7 (2.5, 8.6)	
Equinox	Equinox	12	166	4.2 (2.0, 8.7)	5.9 (3.1, 11.1)	9.0 (4.8, 16.6)			
Global Unite	Delta Xtend	6	152	2.0 (0.6, 6.1)	2.7 (1.0, 7.1)	5.9 (2.5, 13.6)			
SMR	SMR L1	104	1830	4.2 (3.4, 5.2)	5.6 (4.6, 6.8)	6.0 (4.9, 7.3)	6.2 (5.2, 7.6)	6.2 (5.2, 7.6)	
Trabecular Metal	Trabecular Metal	2	59	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	3.4 (0.9, 12.9)	
Other (15)		7	254	2.1 (0.9, 4.9)	3.2 (1.5, 6.7)	3.2 (1.5, 6.7)			
TOTAL		161	3322						

Note Restricted to modern prostheses

Only prostheses with >50 procedures have been listed

Table ST120 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis OA)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	14 Yrs
Aequalis	Aequalis	16	374	2.2 (1.1, 4.3)	2.8 (1.5, 5.1)	3.5 (2.0, 6.0)	4.9 (2.9, 8.1)	5.6 (3.3, 9.2)	
Affinis	Affinis	9	292	1.7 (0.7, 4.1)	2.5 (1.2, 5.1)	2.5 (1.2, 5.1)	3.1 (1.5, 6.2)		
AltıVate Reverse	RSP	3	101	1.0 (0.1, 6.9)	3.6 (1.1, 10.8)				
Ascend Flex	Aequalis	5	217	1.9 (0.7, 4.9)	2.4 (1.0, 5.7)	2.4 (1.0, 5.7)			
	Perform Reversed	1	176	0.8 (0.1, 5.5)					
Comprehensive	Comprehensive Reverse	3	171	1.2 (0.3, 4.6)	1.2 (0.3, 4.6)				
Delta Xtend	Delta Xtend	43	1200	1.7 (1.1, 2.6)	2.5 (1.8, 3.6)	2.8 (2.0, 3.9)	3.4 (2.5, 4.6)	3.7 (2.7, 5.1)	4.6 (3.3, 6.4)
Equinox	Equinox	8	183	2.2 (0.8, 5.9)	3.6 (1.6, 7.9)	3.6 (1.6, 7.9)			
Global Unite	Delta Xtend	5	82	2.6 (0.6, 9.9)	7.6 (3.2, 17.5)	7.6 (3.2, 17.5)	7.6 (3.2, 17.5)		
RSP	RSP	5	102	2.0 (0.5, 7.6)	5.1 (2.2, 11.9)	5.1 (2.2, 11.9)			
SMR	SMR L1	6	89	4.5 (1.7, 11.7)	7.0 (3.2, 15.0)	7.0 (3.2, 15.0)	7.0 (3.2, 15.0)	7.0 (3.2, 15.0)	
Trabecular Metal	Trabecular Metal	4	63	1.6 (0.2, 10.7)	5.3 (1.7, 15.6)	7.9 (3.0, 20.2)	7.9 (3.0, 20.2)	7.9 (3.0, 20.2)	
Other (16)		5	76	4.7 (1.5, 13.8)	10.0 (4.0, 23.5)	10.0 (4.0, 23.5)			
TOTAL		113	3126						

Note Restricted to modern prostheses

Only prostheses with >25 procedures have been listed



Primary Total Shoulder Replacement

Table ST121 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Rotator Cuff Arthropathy)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	11	204	3.0 (1.4, 6.5)	4.5 (2.4, 8.5)	4.5 (2.4, 8.5)	5.2 (2.8, 9.6)	6.4 (3.5, 11.6)	
Affinis	Affinis	9	287	1.8 (0.7, 4.2)	2.9 (1.5, 5.8)	3.3 (1.7, 6.3)	3.3 (1.7, 6.3)		
AltiVate Reverse	RSP	3	84	2.5 (0.6, 9.5)	2.5 (0.6, 9.5)	5.0 (1.5, 15.9)			
Ascend Flex	Aequalis	9	267	1.2 (0.4, 3.6)	3.3 (1.6, 7.0)	4.6 (2.1, 9.6)			
	Perform Reversed	2	166	0.0 (0.0, 0.0)					
Comprehensive	Comprehensive Reverse	4	103	3.1 (1.0, 9.3)	4.8 (1.8, 12.8)				
Delta Xtend	Delta Xtend	19	673	1.8 (1.0, 3.1)	2.6 (1.6, 4.1)	2.8 (1.8, 4.4)	3.0 (1.9, 4.7)	3.0 (1.9, 4.7)	
Equinox	Equinox	4	97	3.3 (1.1, 10.0)	4.6 (1.8, 11.9)	4.6 (1.8, 11.9)			
Global Unite	Delta Xtend	1	56	0.0 (0.0, 0.0)	2.6 (0.4, 17.2)	2.6 (0.4, 17.2)	2.6 (0.4, 17.2)		
RSP	RSP	3	59	5.1 (1.7, 15.0)	5.1 (1.7, 15.0)	5.1 (1.7, 15.0)	5.1 (1.7, 15.0)		
SMR	SMR L1	4	44	6.8 (2.3, 19.7)	9.2 (3.6, 22.7)	9.2 (3.6, 22.7)	9.2 (3.6, 22.7)	9.2 (3.6, 22.7)	
Trabecular Metal	Trabecular Metal	2	43	2.3 (0.3, 15.4)	2.3 (0.3, 15.4)	2.3 (0.3, 15.4)	2.3 (0.3, 15.4)	9.3 (2.0, 37.2)	
Other (10)		5	58	8.8 (3.8, 19.8)	8.8 (3.8, 19.8)	8.8 (3.8, 19.8)			
TOTAL		76	2141						

Note Restricted to modern prostheses

Only prostheses with >25 procedures have been listed

Table ST122 Cumulative Percent Revision of Hybrid (Humerus Cemented) Primary Total Stemmed Reverse Shoulder Replacement by Prosthesis Combination (Primary Diagnosis Fracture)

Humeral Stem	Glenoid Component	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Aequalis	Aequalis	51	1418	2.0 (1.4, 2.9)	2.7 (2.0, 3.8)	3.4 (2.5, 4.6)	3.9 (2.9, 5.2)	5.0 (3.7, 6.9)	
	Perform Reversed	6	286	2.2 (0.9, 5.2)					
Affinis	Affinis	19	350	2.0 (1.0, 4.2)	3.9 (2.3, 6.6)	5.7 (3.6, 8.9)	6.3 (4.0, 9.7)		
AltiVate Reverse	RSP	13	362	3.0 (1.6, 5.6)	3.9 (2.2, 6.8)				
Ascend Flex	Perform Reversed	2	61	4.4 (1.1, 17.1)					
Comprehensive	Comprehensive Reverse	25	1179	1.9 (1.2, 2.9)	2.1 (1.4, 3.2)	2.6 (1.7, 4.0)	2.6 (1.7, 4.0)		
Delta Xtend	Delta Xtend	78	1315	4.4 (3.4, 5.6)	5.2 (4.1, 6.6)	5.7 (4.6, 7.2)	5.9 (4.7, 7.3)	7.1 (5.6, 9.0)	
Equinox	Equinox	29	765	2.6 (1.7, 4.0)	4.2 (2.9, 6.1)	4.6 (3.2, 6.8)	4.6 (3.2, 6.8)		
Global Unite	Delta Xtend	17	548	2.2 (1.2, 3.9)	3.2 (1.9, 5.2)	3.6 (2.2, 6.0)			
RSP	RSP	15	180	4.0 (1.9, 8.1)	7.1 (4.1, 12.2)	8.7 (5.2, 14.3)	9.7 (5.9, 15.7)		
SMR	SMR L1	13	295	3.2 (1.7, 6.0)	4.6 (2.6, 7.9)	4.6 (2.6, 7.9)	5.7 (3.2, 10.3)		
Trabecular Metal	Comprehensive Reverse	4	144	2.8 (1.1, 7.2)	2.8 (1.1, 7.2)				
	Trabecular Metal	8	233	2.2 (0.9, 5.2)	3.2 (1.5, 6.6)	3.2 (1.5, 6.6)	4.1 (2.0, 8.3)		
Other (12)		5	122	3.5 (1.3, 8.9)	4.9 (2.0, 11.5)				
TOTAL		285	7258						

Note Restricted to modern prostheses

Only prostheses with >50 procedures have been listed



Primary Total Shoulder Replacement

Special Clinical Assessment – Shoulder Implant Choice

The purpose of the following analyses is to inform surgeons about the outcome of specific clinical options across several shoulder prosthesis categories. There are two new special clinical analyses that evaluate prosthesis class choices for the surgical management of primary diagnoses in shoulder replacement.

The first analysis examines patients aged <60 years with osteoarthritis, comparing outcomes for hemi stemmed anatomic with a pyrocarbon humeral head, total stemmed anatomic with a modified central peg glenoid, total stemless

anatomic with a modified central peg glenoid (Table ST123 and Figure ST148).

The second assessment compares total stemmed reverse replacements for all primary diagnoses, stratified by glenoid component type – personalised (custom made medical device and patient matched medical device), augmented or standard (Table ST124 and Figure ST149).

It is important to recognise that there are patient and prosthesis factors that may further confound the results beyond that which are presented here.

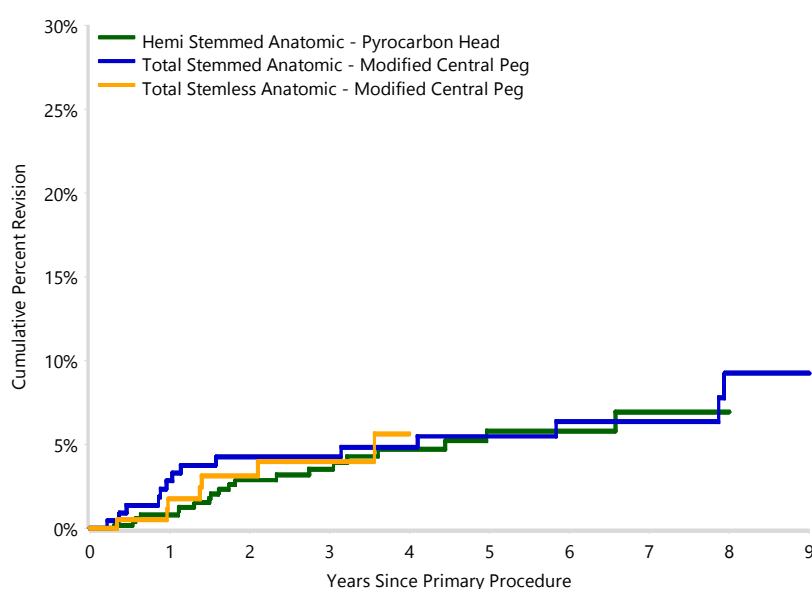
Peer reviewed journal articles that are based on AOANJRR shoulder replacement data, from the first publication to the present, are available on the AOANJRR website: <https://registry.aoa.org.au/publications-2026>

Table ST123 Cumulative Percent Revision of Primary Shoulder Replacement in Patients Aged <60 Years by Class (Primary Diagnosis OA)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Hemi Stemmed Anatomic - Pyrocarbon Head	20	564	0.8 (0.3, 2.1)	3.5 (2.1, 6.0)	5.8 (3.6, 9.2)	6.9 (4.2, 11.3)	
Total Stemmed Anatomic - Modified Central Peg	14	217	2.8 (1.3, 6.2)	4.3 (2.2, 8.1)	5.5 (3.1, 9.7)	6.4 (3.6, 11.1)	9.2 (5.2, 16.1)
Total Stemless Anatomic - Modified Central Peg	7	206	1.7 (0.6, 5.3)	4.0 (1.8, 8.8)			
TOTAL	41	987					

Note: Restricted to modern prostheses

Figure ST148 Cumulative Percent Revision of Primary Shoulder Replacement in Patients Aged <60 Years by Class (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs
Hemi Stemmed Anatomic - Pyrocarbon Head	564	429	268	158	70
Total Stemmed Anatomic - Modified Central Peg	217	204	169	127	84
Total Stemless Anatomic - Modified Central Peg	206	160	77	33	11

Note: Restricted to modern prostheses

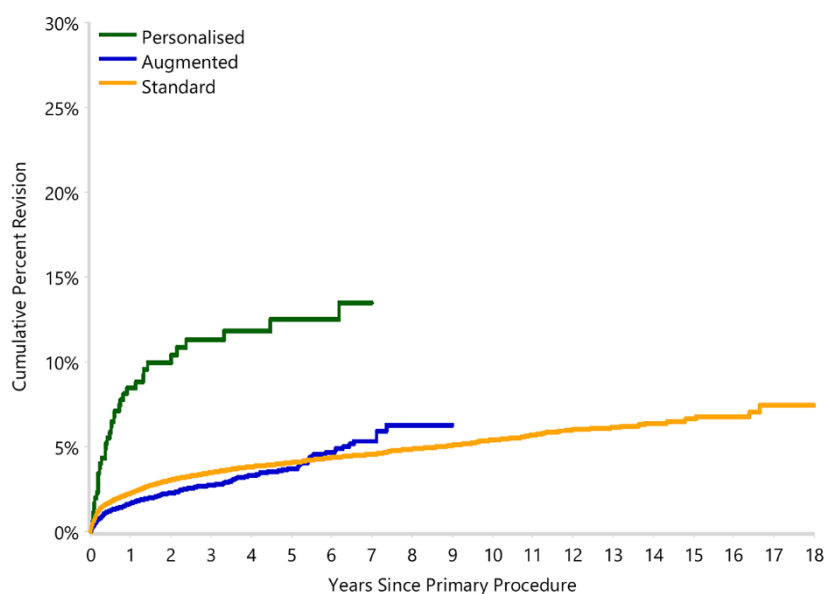
Primary Total Shoulder Replacement

Table ST124 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (All Diagnoses)

Glenoid Augmentation	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Personalised	42	355	8.5 (5.9, 12.0)	11.3 (8.2, 15.4)	12.5 (9.1, 17.0)	13.5 (9.8, 18.5)		
Augmented	334	14143	1.7 (1.5, 1.9)	2.7 (2.4, 3.1)	3.7 (3.2, 4.2)	5.3 (4.5, 6.3)		
Standard	2363	60221	2.3 (2.1, 2.4)	3.5 (3.3, 3.6)	4.1 (3.9, 4.2)	4.6 (4.4, 4.8)	5.4 (5.2, 5.7)	6.6 (6.1, 7.2)
TOTAL	2739	74719						

Note: Restricted to modern prostheses

Figure ST149 Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement by Glenoid Augmentation (All Diagnoses)



HR – adjusted for age and sex

Personalised vs Augmented

0-6Mth: HR=3.62 (95% CI 2.27, 5.87), $p<0.001$

6-9Mth: HR=6.85 (95% CI 2.96, 15.87), $p<0.001$

9Mth+: HR=1.66 (95% CI 0.98, 2.82), $p=0.059$

Personalised vs Standard

Entire Period: HR=2.40 (95% CI 1.76, 3.29), $p<0.001$

Standard vs Augmented

0-3Mth: HR=1.84 (95% CI 1.51, 2.24), $p<0.001$

3-6Mth: HR=0.91 (95% CI 0.68, 1.21), $p=0.505$

6Mth – 1.5Yr: HR=1.36 (95% CI 1.07, 1.72), $p=0.010$

1.5Yr – 2Yr: HR=1.28 (95% CI 0.81, 2.03), $p=0.283$

2Yr – 2.5Yr: HR=0.78 (95% CI 0.48, 1.26), $p=0.305$

2.5Yr – 3.5Yr: HR=1.06 (95% CI 0.66, 1.71), $p=0.816$

3.5Yr+: HR=0.47 (95% CI 0.34, 0.66), $p<0.001$

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	7 Yrs	10 Yrs	15 Yrs
Personalised	355	260	180	115	63	8	1
Augmented	14143	9605	4074	1592	371	31	0
Standard	60221	52675	38809	26826	16600	6099	638

Note: Restricted to modern prostheses



Bibliography (2021-2026)

EPIDEMIOLOGY, SURGEON

1. Miura D, Busija L, Page RS, de Steiger R, Lorimer M, Ackerman IN. Lifetime Risk of Primary Shoulder Arthroplasty From 2008 to 2017: A Population-Level Analysis Using National Registry Data. *Arthritis Care Res.* 2021;73:1511-1517. <https://doi.org/10.1002/acr.24353>.
2. Fisher C, Soh SE, Page RS, de Steiger R, Cuthbert AR, Ackerman IN. Forecasting the future burden of primary total shoulder replacement in Australia. *Osteoarthritis Cartilage.* 2023;31(12):1636-43. <https://doi.org/10.1016/j.joca.2023.08.012>.
3. Morgan SDJ, Wall CJ, de Steiger RN, Graves SE, Lorimer MF, Page RS. Obesity is associated with an increased risk of undergoing shoulder arthroplasty in Australia. *J Shoulder Elbow Surg.* 2023;32(8):1740-5. <https://doi.org/10.1016/j.jse.2023.03.012>.
4. Paltoglou NG, Gill SD, Lorimer M, Corfield S, Page RS. Does hospital setting influence shoulder replacement revision rate? A national comparison of outcomes between private and public settings. *ANZ J Surg.* 2023;93(9):2097-105. <https://doi.org/10.1111/ans.18604>.
5. Roerink AMC, Nelissen RGHH, Holder C, Graves SE, Dunbar M, Bohm E, Grimberg AW, Steinbrück A, Dale H, Fenstad AM, Blom AW, Lenguerrand E, Frampton C, Willems T, Victor J, Espallargues M, Arias-De La Torre J, Ciminello E, Torre M, Pijls BG. Sex-based differences in risk of revision for infection after hip, knee, shoulder, and ankle arthroplasty in osteoarthritis patients: a multinational registry study of 4,800,000 implants. *Acta Orthop.* 2024;95:730-6. <https://doi.org/10.2340/17453674.2024.42183>.
6. Gill DRJ, Corfield S, Du P, McAuliffe MJ. The changing effect of surgeon volume on revision rates in shoulder arthroplasty with time in Australia. *J Shoulder Elbow Surg.* 2025. <https://doi.org/10.1016/j.jse.2025.01.037>.
7. Ingoe H, Pareyon R, Jomaa M, Launay M, Italia K, Maharaj J, Gill D, Holder C, Whitehouse S, Cutbush K, Gupta A. Glenoid morphology classification and Computed Tomography Scanning prior to Total Shoulder Arthroplasty: A Population-Level Analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *JSES Internat.* 2025. <https://doi.org/10.1016/j.jseint.2024.11.025>.
8. Sandow M, Gill DR. Access to Shoulder Arthroplasty in Australia – A balance of regulation, surveillance and monitored efficacy to maximise patient outcome and optimum care. *J Shoulder Elbow Surg.* 2025;34(1):328-31. <https://doi.org/10.1016/j.jse.2024.07.042>.
9. Onggo JR, Jamieson R, Du P, Gill DRJ, Wang K. Revision rates between obese and non-obese total shoulder arthroplasty patients: An Australian registry data study. *J Shoulder Elbow Surg.* 2025. <https://doi.org/10.1016/j.jse.2025.05.036>.
10. Zhou Y, Lynskey SJ, Du P, Gill DR, Corfield S, Hirner M, Moreira B. Long-term mortality rates in patients with proximal humerus fracture managed acutely with reverse

shoulder arthroplasty and hemiarthroplasty. *Shoulder Elbow.* 2026. 18(3): p. 538-546.

<https://dx.doi.org/10.1177/17585732251359475>.

PRIMARY HEMI SHOULDER REPLACEMENT

11. McBride AP, Ross M, Hoy G, Duke P, Page R, Peng Y, Taylor F. Mid-term outcomes of pyrocarbon humeral resurfacing hemiarthroplasty compared to metal humeral resurfacing and metal stemmed hemiarthroplasty for osteoarthritis in young patients: Analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *J Shoulder Elbow Surg.* 2022;31(4):755-62. <https://doi.org/https://doi.org/10.1016/j.jse.2021.08.017>.
12. McBride A, Hurley R, Gill D, Du P, Duke P, Taylor F, Hoy G, Page R, Ross M. Outcomes of pyrolytic carbon humeral resurfacing hemiarthroplasty compared to best-in-class total shoulder arthroplasty in young patients with osteoarthritis: analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *J Shoulder Elbow Surg.* 2026. 35(5): p. 1209-1218. <https://dx.doi.org/10.1016/j.jse.2025.09.007>.

PRIMARY TOTAL ANATOMIC SHOULDER REPLACEMENT

13. McBride AP, Ross M, Duke P, Hoy G, Page R, Dyer C, Taylor F. Shoulder joint arthroplasty in young patients: Analysis of 8742 patients from the Australian Orthopaedic Association National Joint Replacement Registry. *Shoulder Elbow.* 2022;15(1 Suppl):41-52. <https://doi.org/10.1177/17585732211058717>.
14. Page RS, Alder-Price AC, Rainbird S, Graves SE, de Steiger RN, Peng Y, Holder C, Lorimer MF, Gill SD. Reduced Revision Rates in Total Shoulder Arthroplasty with Crosslinked Polyethylene: Results from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res.* 2022;480(10):1940-9. <https://doi.org/10.1097/CORR.0000000000002293>.
15. Sandow M, Page R, Hatton A, Peng Y. Total shoulder replacement stems in osteoarthritis-short, long, or reverse? An analysis of the impact of crosslinked polyethylene. *J Shoulder Elbow Surg.* 2022;31(11):2249-55. <https://doi.org/10.1016/j.jse.2022.04.015>.
16. Khoriaty AA, McBride AP, Ross M, Duke P, Hoy G, Page R, Holder C, Taylor F. Survivorship of shoulder arthroplasty in young patients with osteoarthritis: an analysis of the Australian Orthopaedic Association National Joint Replacement Registry. *J Shoulder Elbow Surg.* 2023;32(10):2105-14. <https://doi.org/10.1016/j.jse.2023.03.024>.
17. Morgan SDJ, Wall CJ, de Steiger RN, Graves SE, Lorimer MF, Page RS. Obesity is associated with an increased risk of undergoing shoulder arthroplasty in Australia. *J Shoulder Elbow Surg.* 2023;32(8):1740-5. <https://doi.org/10.1016/j.jse.2023.03.012>.
18. Gill DRJ, Corfield S, Harries D, Page RS. A comparison of revision rates for stemmed and stemless primary anatomic shoulder arthroplasty with all-polyethylene glenoid



Bibliography (2021-2026)

- components: analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *J Shoulder Elbow Surg.* 2024;33(2):281-90. <https://doi.org/10.1016/j.jse.2023.06.025>.
19. Gill DRJ, Corfield S, Harries D, Page RS. Modelling XLPE vs non-XLPE glenoid revision rates for anatomic shoulder arthroplasty in osteoarthritis including differing polyethylene glenoid fixation designs. *Semin Arthroplasty: JSES.* 2024;34(4):843-53. <https://doi.org/10.1053/j.sart.2024.06.003>.
 20. Nyring MR, Rasmussen JV, Gill DR, Harries D, Olsen BS, Page RS. Comparable low revision rates of stemmed and stemless total anatomic shoulder arthroplasties after exclusion of metal backed glenoid components: a collaboration between the Australian and Danish national shoulder arthroplasty registries. *J Shoulder Elbow Surg.* 2024;33(12):2619-28. <https://doi.org/10.1016/j.jse.2024.03.022>.
 21. Peckston D, D'Costa E, Gill DR, Harries D, Page R, Baba M. A comparative analysis of a central metaphyseal humeral fixation stemless shoulder arthroplasty to an anatomic shoulder arthroplasty in a national registry cohort. *Shoulder Elbow.* 2024;17585732241307245. <https://doi.org/10.1177/17585732241307245>.
 22. Gill DRJ, Corfield S, Du P, Harries D, Page RS. Comparative and predictive modelling of modern anatomic total shoulder arthroplasty revision rates in osteoarthritis with different polyethylene glenoid designs. *J Shoulder Elbow Surg.* 2025. <https://doi.org/10.1016/j.jse.2025.01.030>.
 23. Peckston DC, D'Costa E, Gill DR, Harries D, Page R, Baba M. A comparative analysis of a central metaphyseal humeral fixation stemless shoulder arthroplasty to an anatomic shoulder arthroplasty in a national registry cohort. *Shoulder Elbow.* 2026. 18(1): p. 47-57. <https://dx.doi.org/10.1177/17585732241307245>.
 24. Gill DRJ, Corfield S, McCaul M, Blakeney WG. The impact of glenoid polyethylene type, humeral head size and composition on revision risk following primary anatomic total shoulder arthroplasty for osteoarthritis. *J Shoulder Elbow Surg.* 2026. <https://dx.doi.org/10.1016/j.jse.2026.07.021>.
- ### PRIMARY TOTAL REVERSE SHOULDER REPLACEMENT
25. Gill DRJ, Page BRS, Graves SE, Rainbird S, Hatton A. A Comparison of Revision Rates for Osteoarthritis of Primary Reverse Total Shoulder Arthroplasty to Primary Anatomic Shoulder Arthroplasty with a Cemented All-polyethylene Glenoid: Analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *Clin Orthop Relat Res.* 2021;479(10):2216-24. <https://doi.org/10.1097/CORR.0000000000001869>.
 26. Page R, Beazley J, Graves S, Rainbird S, Peng Y. Effect of glenosphere size on reverse shoulder arthroplasty revision rate: an analysis from the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). *J Shoulder Elbow Surg.* 2022;31(6):e289-e301. <https://doi.org/10.1016/j.jse.2021.11.013>.
 27. Gill DR, Gill SD, Corfield S, Holder C, Page RS. Investigation performed at A. Primary inlay reverse shoulder arthroplasty has a higher rate of revision than onlay reverse shoulder arthroplasty: Analysis from the Australian Orthopaedic Association National Joint Replacement Registry. *Shoulder Elbow.* 2023;15(3 Suppl):75-81. <https://doi.org/10.1177/17585732221122275>.
 28. Gill DRJ, Corfield S, Harries D, Page RS. Comparing optimum prosthesis combinations of total stemmed, stemless and reverse shoulder arthroplasty revision rates for men and women with glenohumeral osteoarthritis. *J Shoulder Elbow Surg.* 2025;34(5):1173-84. <https://doi.org/10.1016/j.jse.2024.08.033>.
 29. Jomaa M, Ingøe H, Hollman F, Pareyon R, Whitehouse SL, Du P, Gill DRJ, Maharaj J, Gupta A, Cutbush K. Stemless anatomic and reverse shoulder arthroplasty in patients under 55 years of age with primary glenohumeral osteoarthritis: an analysis of the Australian Orthopaedic Association National Joint Replacement Registry at 5 years. *J Shoulder Elbow Surg.* 2025;34(4):1032-42. <https://doi.org/10.1016/j.jse.2024.07.032>.
 30. Nguyen TQ, Gill DRJ, Corfield S, McCaul M, Cass B. Revision risk of cross-linked versus non-crosslinked polyethylene in reverse shoulder arthroplasty: an analysis of 63,502 cases from the Australian Orthopaedic Association National Joint Replacement Registry. *J Shoulder Elbow Surg.* 2026. <https://dx.doi.org/10.1016/j.jse.2026.08.003>.
- ### REVISION SHOULDER REPLACEMENT
31. Gill DRJ, Page RS, Graves SE, Rainbird S, Hatton A. The rate of second revision for shoulder arthroplasty as analysed by the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) *Acta Orthop.* 2021;92:258-263. <https://doi.org/10.1080/17453674.2020.1871559>.
 32. Jomaa M, Ingøe H, Hollman F, Pareyón R, Whitehouse SL, Du P, Gill DRJ, Maharaj J, Gupta A, Cutbush K. Stemless anatomic and reverse shoulder arthroplasty in patients under 55 years of age with primary glenohumeral osteoarthritis: an analysis of the Australian Orthopaedic Association National Joint Replacement Registry at 5 years. *J Shoulder Elbow Surg.* 2026. 35(9S): p. S39-S49. <https://dx.doi.org/10.1016/j.jse.2026.05.030>.
 33. Gill DRJ, Corfield S, Du P, Bokor DJ. Does the rate of revision vary in primary total stemmed anatomic shoulder arthroplasty with short or conventional humeral stems? *JSES Int.* 2026. 10(1): p. 101378. <https://dx.doi.org/10.1016/j.jseint.2025.08.015>.
 34. Dragan Z, Campbell RJ, Tropman M, Du P, Gill DRJ, Handford C, Cass B, Young A. Revision rates following total shoulder arthroplasty in rural and urban hospitals: an Australian Orthopaedic Association National Joint Replacement Registry analysis of high-volume surgeons.



Bibliography (2021-2026)

Bone Joint Open, 2026. 7(3): p. 425-432.
<https://dx.doi.org/10.1302/2633-1462.73.BJO-2025-0299.R1>.

SURGEON ASSISTIVE TOOLS

35. Wilcox BM, Campbell RJ, Gill DRJ, Harries D, Yeoh TS, Low AK. Computer navigation in total shoulder arthroplasty: analysis from the Australian Orthopaedic Association National Joint Replacement Registry. Bone Joint J, 2026. 108-B(6): p. 799-807. <https://dx.doi.org/10.1302/0301-620X.108B6.BJJ-2025-1772.R1>.
36. Gill DR, Corfield S, Holder C, Page RS. Characteristics associated with re-revision of primary inlay and onlay reverse shoulder arthroplasty. Analysis from the Australian Orthopaedic Association National Joint Replacement Registry. Semin Arthroplast: JSES. 2024;34(2):501-508. <https://doi.org/10.1053/j.sart.2024.02.002>.

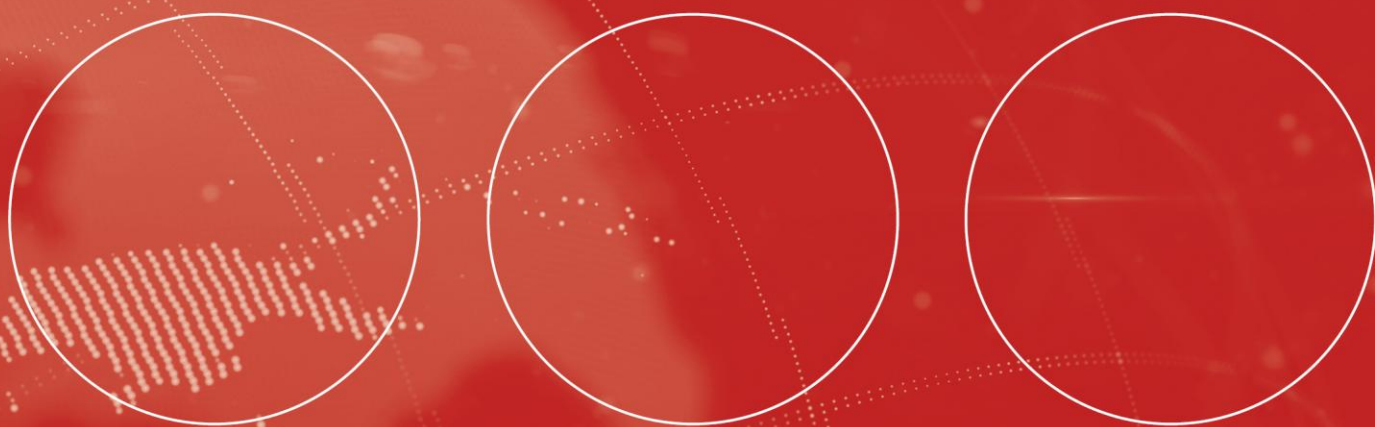
FRACTURE

37. Raubenheimer K, Atkinson M, Yan M, Perret M, Bauer S, Harries D, Gill DRJ, Blakeney WG. Cemented vs. cementless stems for reverse shoulder arthroplasty for proximal humerus fractures: a registry analysis with patient-reported outcomes from a level 1 trauma centre. JSES International. 2025;9(2):415-21. <https://doi.org/10.1016/j.jseint.2024.09.023>.
38. Xu J, Sivakumar BS, Nandapalan H, Moopanar T, Harries D, Page R, Symes M. Trends in the surgical management of proximal humerus fractures over the last 20 years from Australian registry databases. Eur J Orthop Surg Traumatol. 2025;35(1):1-8. <https://doi.org/10.1007/s00590-024-04165-5>.

PROMs

39. Fang YY, Ackerman IN, Page R, Harris IA, Cashman K, Lorimer M, Heath E, Soh SE. Measurement Properties of the Oxford Shoulder Score and Minimal Clinically Important Changes After Primary Total Shoulder Replacement Surgery. Arthritis Care Res. 2024;76(6):895-903. <https://doi.org/10.1002/acr.25304>
40. Gill SD, Page RS, Xu Q, Harris IA, Gill D, Ackerman IN. Quality of life before and during the COVID-19 pandemic for people undergoing hip, knee and shoulder arthroplasty-nationwide results from the Australian Orthopaedic Association National Joint Replacement Registry. Int Orthop, 2026. 50(4): p. 731-745. <https://dx.doi.org/10.1007/s00264-026-06778-3>.





Prostheses with Higher than Anticipated Rates of Revision

Prostheses with Higher than Anticipated Rates of Revision

Introduction

A unique and important function of registries is that they can provide population-based data on the comparative outcome of individual prostheses in a community. Outcome data are necessary to enable an evidence-based approach to prosthesis selection. For many prostheses, the only source of outcome data are Registry reports.

It is evident from Registry data that most prostheses have similar outcomes. However, a number have a rate of revision that is statistically higher than other prostheses in the same class. The Registry identifies these as 'prostheses with a higher than anticipated rate of revision'.

The Registry has developed a standardised three-stage approach to identify prostheses that are outliers with respect to rate of revision. In order to keep Registry data contemporaneous, only procedures using prostheses that have been available and used in 2024 (described as modern prostheses) are included as the comparator within the class. This is a more pragmatic approach than comparing to a select group of prostheses with the lowest rate of revision.

Stage 1

The first stage is a screening test to identify prostheses that differ significantly from the combined revisions per 100 observed component years of all other modern prostheses in the same class. The analysis is automated and identifies prostheses based on set criteria. These include:

The revision rate (per 100 component years) exceeds twice that for the group,
and

The Poisson probability of observing that number of revisions, given the rate of the group is significant ($p < 0.05$),
and either:

There are at least 10 primary procedures for that component,
or

The proportion revised is at least 75% and there have been at least two revisions.

The Registry has the capacity to assess the outcome of individual prostheses or combinations of prostheses used in a procedure. It is apparent from previous reports that individual prostheses that perform well in one combination, may not perform well in another.

Therefore, the outcome of an individual prosthesis is partly dependent on the combination of the different prostheses used.

Consequently, the Registry undertakes two different analyses in Stage 1. The first assesses the outcome of all combinations. The second assesses all individual prostheses regardless of the combination. Both analyses are reviewed to determine if a higher revision rate is identified with a single combination,

multiple combinations, or uniformly with all combinations. If prostheses are identified in a single combination, that combination progresses to Stage 2. An individual prosthesis progresses to Stage 2 if it is identified in multiple combinations or uniformly across all combinations.

If a prosthesis is identified in more than two combinations with 10 or more procedures in Stage 1, an additional analysis of the individual prosthesis is undertaken for review at Stage 2, regardless of whether the individual prosthesis was identified in Stage 1. The purpose of this is to simplify the reporting of an individual prosthesis and to avoid identifying the same prosthesis in multiple combinations when it may be more appropriate to identify it individually.

A prosthesis or combination may also be brought to the attention of the Registry by the Therapeutic Goods Administration (TGA) or a member of the AOA. A further investigation may then be undertaken as outlined in Stage 2.

It has been apparent that the revision rates for total stemmed anatomic shoulder replacements have been confounded by the higher than anticipated rate of revision of modular metal backed glenoid prostheses in this class. The Clinical Directors have decided to re-analyse Stage 1 for total stemmed anatomic combinations in comparison to the total stemmed anatomic class excluding modular metal backed glenoids. The new comparator only applied to Newly Identified prostheses. Re-identified and Still Used and Identified and no longer used are compared to all other procedures in this class. The new comparator will apply to all sections in subsequent reports.

Stage 2

In Stage 2, the AOANJRR Clinical Director, Deputy Clinical Directors, and Assistant Deputy Clinical Directors in conjunction with SAHMRI staff, review the identified prostheses and undertake further investigation. This includes examining the impact of confounders and calculating age and gender adjusted hazard ratios. In addition, all prostheses identified in previous reports are re-analysed as part of the Stage 2 analysis. This is not dependent on re-identification in Stage 1. If there is a significant difference compared to the combined hazard rate of all other modern prostheses in the same class, then the prosthesis or prosthesis combination progresses to Stage 3. The possible exception to this is the presence of confounding factors, such as use in complex primary procedures.

Stage 3

The final stage involves review by a panel of independent orthopaedic surgeons from the AOA and the Arthroplasty Society of Australia or the Shoulder and Elbow Society. The panel meets with Registry staff at joint specific workshops to review the Stage 2 analysis and determine which prostheses will be identified in the Annual Report.



Prostheses with Higher than Anticipated Rates of Revision

Identified Prostheses

Identified prostheses are listed in one of three groups. The first group ‘Newly Identified’, lists prostheses that are identified for the first time and are still used.

The second group is ‘Re-Identified and Still Used’. This listing identifies prostheses that continue to have a higher than anticipated rate of revision and provides information on their continued use. Most identified or re-identified prostheses decline in use. This is usually evident only after the first year because almost a full year of use has occurred prior to identification in the Annual Report.

Prostheses that have a higher rate of revision but are no longer used in Australia make up the third group: ‘Identified and No Longer Used’. These are listed to provide ongoing information on the rate of revision. This also enables comparison of other prostheses to the discontinued group. This group may include prostheses that are no longer used in Australia that are identified for the first time.

The Registry does not make a recommendation or otherwise on the continued use of identified prostheses. Identification is made to ensure that prostheses with a higher rate of revision, compared to others in the same class, are highlighted.

On occasion, a prosthesis previously identified no longer meets the criteria for inclusion. In this situation, the prosthesis

is not subsequently re-identified. The Registry monitors the continual real-time performance of prostheses within a community and the Annual Report provides the outcome at a particular time. It is necessary to appreciate that outcomes are continually changing and that many factors may influence that change, including identification in the Annual Report.

The current approach used by the Registry is most effective at identifying the relative performance of recently introduced prostheses. As the Registry’s follow-up period increases, it is becoming evident that prostheses with a delayed onset of higher rates of revision are not as readily identified by this approach. The Registry will develop further strategies in the future to identify these prostheses.

Prior to publication, three workshops were held to review, comment, and provide advice on all sections of the report. Members of the AOA, Arthroplasty Society of Australia, and Shoulder and Elbow Society are invited to attend these surgeon workshops.

The hip, knee and shoulder surgeon workshops were held in Adelaide on the weekend of the 29 and 30 August 2026. In addition to AOANJRR and SAHMRI staff, 30 hip, knee and shoulder arthroplasty specialists from the AOA membership attended the workshops.

Investigations of prostheses identified as having a higher than anticipated rate of revision are available on the Registry website:
<https://registry.aoa.org.au/annual-reports-2026/prostheses-investigations>

Primary Partial Hip Replacement

UNIPOLAR MODULAR

There are no newly identified unipolar modular hip prostheses.

Table IP1 Revision Rate of Unipolar Modular Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Head/Femoral Stem	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used					
**Avenir	8	71	263	3.05	Entire Period: HR=2.78 (95% CI 1.39, 5.56), p=0.003
Identified and No Longer Used					
Unipolar Head (JRI)/Furlong LOL	11	132	565	1.95	Entire Period: HR=2.12 (95% CI 1.17, 3.82), p=0.013

Note: Components have been compared to all other modern unipolar modular hip components. Note: **Femoral Stem Component



Prostheses with Higher than Anticipated Rates of Revision

Table IP2 Cumulative Percent Revision of Unipolar Modular Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs
Re-Identified and Still Used			
**Avenir	7.4 (3.1, 16.8)	9.5 (4.3, 20.1)	12.6 (5.9, 25.7)
Identified and No Longer Used			
Unipolar Head (JRI)/Furlong LOL	6.4 (3.1, 13.0)	9.8 (5.3, 17.5)	11.2 (6.3, 19.6)

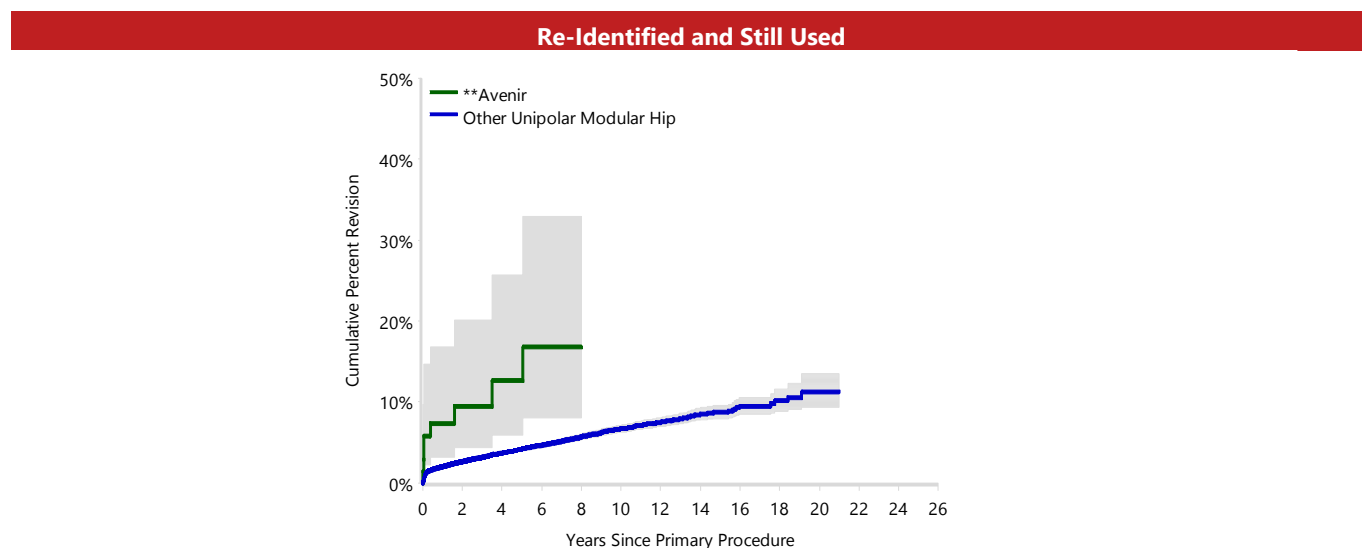
Note: **Femoral Stem Component

Table IP3 Yearly Usage of Unipolar Modular Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Avenir	.	.	8	8	5	7	3	6	8	10	.	1	3	3	5	2	2
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Unipolar Head (JRI)/Furlong LOL	40	13	10	8	7	34	16	4	.	.	.	.	.	.	.	.	.

Note: **Femoral Stem Component

Figure IP1 Cumulative Percent Revision of Re-Identified and Still Used Unipolar Modular Hip Prostheses





Prostheses with Higher than Anticipated Rates of Revision

BIPOLAR

There are no newly identified bipolar hip prostheses.

Table IP4 Revision Rate of Bipolar Hip Prostheses identified as having a Higher than Anticipated Rate of Revision

Bipolar/Femoral Stem	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
**Quadra-H	7	88	257	2.73	Entire Period: HR=2.91 (95% CI 1.38, 6.12), p=0.004
Identified and No Longer Used	.	.	.	.	
UHR/ABGII	23	177	1028	2.24	0 - 2Wk: HR=4.27 (95% CI 1.06, 17.30), p=0.041 2Wk - 9Mth: HR=0.85 (95% CI 0.27, 2.63), p=0.775 9Mth - 3.5Yr: HR=2.10 (95% CI 0.78, 5.63), p=0.140 3.5Yr+: HR=8.51 (95% CI 4.90, 14.80), p<0.001
UHR/Omnifit (cless)	8	40	291	2.75	Entire Period: HR=3.75 (95% CI 1.87, 7.52), p<0.001
**Basis	18	156	893	2.01	0 - 1Yr: HR=0.47 (95% CI 0.12, 1.87), p=0.281 1Yr+: HR=4.92 (95% CI 2.97, 8.14), p<0.001
**Synergy	9	55	468	1.92	Entire Period: HR=2.59 (95% CI 1.34, 5.01), p=0.004

Note: Components have been compared to all other modern bipolar hip components

**Femoral Stem Component

Table IP5 Cumulative Percent Revision of Bipolar Hip Prostheses identified as having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Re-Identified and Still Used					
**Quadra-H	6.0 (2.3, 15.3)	10.4 (4.7, 22.0)	13.4 (6.4, 26.8)		
Identified and No Longer Used					
UHR/ABGII	4.3 (2.1, 8.9)	5.1 (2.6, 10.0)	10.8 (6.5, 17.9)		
UHR/Omnifit (cless)	18.3 (9.1, 34.6)	18.3 (9.1, 34.6)	18.3 (9.1, 34.6)	18.3 (9.1, 34.6)	26.4 (12.5, 50.6)
**Basis	1.5 (0.4, 5.8)	10.1 (5.9, 17.2)	12.6 (7.6, 20.6)		
**Synergy	7.3 (2.8, 18.4)	9.5 (4.1, 21.4)	12.2 (5.6, 25.4)	18.0 (9.2, 33.4)	22.1 (11.7, 39.5)

Note: **Femoral Stem Component

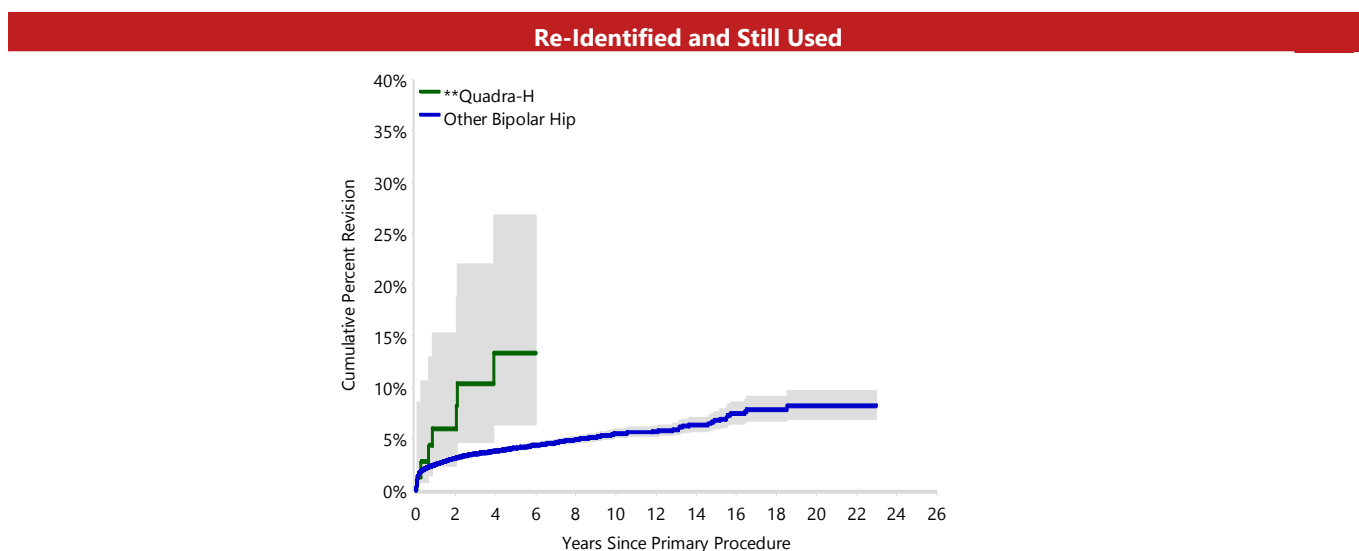
Prostheses with Higher than Anticipated Rates of Revision

Table IP6 Yearly Usage of Bipolar Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Quadra-H	11	7	5	6	4	11	9	7	4	7	5	7	1	.	.	3	1
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UHR/ABGII	172	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
UHR/Omnifit (cless)	40	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Basis	89	7	8	21	24	6	1	.	.	.	.	.	.	.	.	.	.
**Synergy	51	.	1	.	2	.	.	.	1	.	.	.	.	.	.	.	.

Note: **Femoral Stem Component

Figure IP2 Cumulative Percent Revision of Re-Identified and Still Used Bipolar Hip Prostheses





Prostheses with Higher than Anticipated Rates of Revision

Primary Total Hip Replacement

TOTAL CONVENTIONAL

There are five newly identified total conventional hip replacement prostheses or combinations that are still used.

The Everglade femoral stem is identified as having a higher than anticipated rate of revision. It has been used since 2017 for 342 procedures of which 17 have been revised. The cumulative percent revision is 7.2 % at 4 years. There are 6 revisions for fracture, 6 for dislocation/instability and 3 for loosening. In 8 of the 9 major revisions the femoral stem was revised. When an analysis was restricted to procedures for osteoarthritis there is also a higher rate of revision for the Everglade femoral component.

The Arcos femoral stem is a modular design with body and stem extension components more commonly used for revision procedures. When used for primary total conventional hip replacement the Arcos stem has a higher rate of revision compared to other primary total conventional hip procedures. There are 472 primary procedures using the Arcos stem with 37 revised. When compared to other revision stem designs used in primary procedures it also has a higher rate of revision. When further studied, it is noted that the "cone body" group of components is used for 34 of the procedures revised. The Arcos (cone body) prosthesis has been used since 2011 in 413 primary procedures with a cumulative percent revision of 10.1% at 8 years. There are 13 revisions for infection, 11 for dislocation/instability, 3 for loosening, 2 for fracture, with 1 for stem breakage and another for metal related pathology. There are 21 major revisions of which 17 involved stem revision.

The Trident II Tritanium (shell) has been used since 2020 in 16150 procedures with 317 revised. This acetabular component has a higher rate of revision compared to other total conventional hip replacement procedures. It is noted that this prosthesis is more often used for diagnoses other than osteoarthritis. When investigated, the Trident II Tritanium (shell) used with dual mobility components has a higher rate of revision compared to other dual mobility procedures, while the Trident II Tritanium (shell) without dual mobility components is not different to other total conventional hip procedures. When used for osteoarthritis the Trident II Tritanium (shell) with dual mobility components also

has a higher rate of revision compared to other dual mobility procedures for osteoarthritis. There are 3712 procedures of the Trident II Tritanium (shell) with dual mobility components of which 96 have been revised. The cumulative percent revision at 3 years is 3.7%. There are 37 revisions for infection, 23 for fracture, 22 for dislocation/instability and 5 for loosening. Of the 96 revisions 46 are major revisions while 47 are revisions of the head/insert.

The BI-MENTUM is also a dual mobility acetabular prosthesis. It has been used since 2021 in 1289 procedures of which 39 have been revised. This prosthesis has a higher rate of revision compared to other total conventional hip replacements, and also when the cemented subset is compared to other dual mobility procedures. The BI-MENTUM (cemented) acetabular components have been used in 75 procedures of which 11 have been revised. The cumulative percent revision at 3 years is 17.1%. There are 7 revisions for infection, 2 for fracture and 2 for loosening. 9 of the 11 revisions are major revisions, and in 9 of these, the acetabular component was revised.

The CPCS/Polarcup combination has been used since 2006 in 497 procedures of which 23 have been revised. This combination has a higher rate of revision compared to other total conventional hip replacements after 3 months. As the Polarcup used in this combination is a dual mobility prosthesis, the CPCS/Polarcup combination is compared to other dual mobility procedures, and a higher rate of revision after 3 months is found. Further analyses revealed specifically the CPCS/Polarcup (cemented metal shell) range has a higher rate of revision compared to other dual mobility procedures. This subgroup has been used in 132 procedures with 13 revisions. The cumulative percent revision is 10.7% at 5 years, with 10 major revisions. There are 5 revisions for infection, 4 for loosening and 3 for fracture. The CPCS femoral component has previously been identified in combination with the Reflection non XLPE cup.

The Anca-Fit femoral stem is identified for the first time but has not been used since 2011.

The Versafit DM acetabular prosthesis is no longer identified.



Prostheses with Higher than Anticipated Rates of Revision

Table IP7 Revision Rate of Total Conventional Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Newly Identified	.	.	.	.	
CPCS/Polarcup (ctd metal)	13	132	478	2.72	Entire Period: HR=4.09 (95% CI 2.37, 7.04), p<0.001
*Arcos (cone body)	34	413	1412	2.41	Entire Period: HR=3.49 (95% CI 2.49, 4.88), p<0.001
*Everglade	17	342	737	2.31	Entire Period: HR=2.41 (95% CI 1.50, 3.87), p<0.001
**BI-MENTUM (cemented cup)	11	75	128	8.58	Entire Period: HR=8.06 (95% CI 4.47, 14.53), p<0.001
**Trident II Tritanium (Shell) (dm)	317	16150	20370	1.56	Entire Period: HR=1.13 (95% CI 1.01, 1.26), p=0.037
Re-Identified and Still Used	.	.	.	.	
Accolade II/Trident Tritanium (Shell)	177	4417	23312	0.76	Entire Period: HR=1.27 (95% CI 1.09, 1.47), p=0.001
CORAIL/Trabecular Metal (Shell)	11	100	917	1.20	Entire Period: HR=2.52 (95% CI 1.40, 4.54), p=0.002
*CPT	1433	26053	205266	0.70	Entire Period: HR=1.44 (95% CI 1.37, 1.52), p<0.001
*Echelon	37	480	2563	1.44	Entire Period: HR=2.54 (95% CI 1.84, 3.51), p<0.001
*Excia (cless)	32	486	4204	0.76	0 - 3Mth: HR=2.62 (95% CI 1.59, 4.34), p<0.001 3Mth+: HR=1.19 (95% CI 0.74, 1.91), p=0.474
*HACTIV	145	3402	17846	0.81	Entire Period: HR=1.39 (95% CI 1.18, 1.64), p<0.001
*Revision Hip	14	123	709	1.97	Entire Period: HR=3.49 (95% CI 2.07, 5.88), p<0.001
*Taper Fit	258	8152	34567	0.75	0 - 6Mth: HR=0.98 (95% CI 0.81, 1.18), p=0.800 6Mth - 9Mth: HR=1.74 (95% CI 1.12, 2.72), p=0.014 9Mth - 3.5Yr: HR=1.03 (95% CI 0.80, 1.33), p=0.799 3.5Yr+: HR=1.87 (95% CI 1.48, 2.38), p<0.001
**Atlas (Shell)	67	628	5430	1.23	Entire Period: HR=2.50 (95% CI 1.97, 3.18), p<0.001
**Continuum	702	14078	127376	0.55	0 - 1Mth: HR=1.82 (95% CI 1.56, 2.11), p<0.001 1Mth - 1.5Yr: HR=1.29 (95% CI 1.13, 1.47), p<0.001 1.5Yr - 2Yr: HR=1.46 (95% CI 1.06, 2.03), p=0.021 2Yr+: HR=0.85 (95% CI 0.75, 0.96), p=0.009
**Delta-One-TT	21	221	1394	1.51	Entire Period: HR=2.75 (95% CI 1.79, 4.22), p<0.001
**Fin II	202	2646	26054	0.78	Entire Period: HR=1.64 (95% CI 1.42, 1.88), p<0.001
**Fixa	90	1675	11011	0.82	Entire Period: HR=1.54 (95% CI 1.26, 1.90), p<0.001
**G7 Multihole	103	1897	5264	1.96	0 - 3Mth: HR=2.78 (95% CI 2.16, 3.58), p<0.001 3Mth - 6Mth: HR=4.32 (95% CI 2.68, 6.97), p<0.001 6Mth+: HR=1.48 (95% CI 1.00, 2.19), p=0.049
Identified and No Longer Used	.	.	.	.	
+*Anca-Fit	31	207	2768	1.12	Entire Period: HR=2.46 (95% CI 1.73, 3.50), p<0.001
Anatomic II/Duraloc Option	13	60	816	1.59	Entire Period: HR=3.57 (95% CI 2.08, 6.13), p<0.001
Anca-Fit/PINNACLE	16	101	1152	1.39	Entire Period: HR=3.07 (95% CI 1.88, 5.01), p<0.001
Avenir/Fitmore	21	373	2077	1.01	0 - 1Mth: HR=5.05 (95% CI 2.94, 8.69), p<0.001 1Mth+: HR=0.86 (95% CI 0.43, 1.73), p=0.677
CPCS/Reflection (Non XLPE Cup)	79	407	4834	1.63	0 - 2Yr: HR=0.71 (95% CI 0.32, 1.58), p=0.403 2Yr - 3Yr: HR=4.17 (95% CI 1.73, 10.03), p=0.001 3Yr - 7Yr: HR=1.97 (95% CI 0.94, 4.12), p=0.074 7Yr+: HR=7.40 (95% CI 5.74, 9.53), p<0.001
Esop/Delta-PF	12	59	821	1.46	0 - 4Yr: HR=1.20 (95% CI 0.30, 4.81), p=0.793 4Yr+: HR=4.87 (95% CI 2.62, 9.05), p<0.001



Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Evolve/Acetabular Shell (Global)	10	139	935	1.07	Entire Period: HR=2.16 (95% CI 1.16, 4.02), p=0.014
F2L/Delta-PF	20	107	1426	1.40	Entire Period: HR=3.13 (95% CI 2.02, 4.86), p<0.001
Friendly Hip/Cup (Exactech)	18	97	1177	1.53	Entire Period: HR=3.47 (95% CI 2.19, 5.51), p<0.001
M-Cor/Equator+ Cup	12	77	1007	1.19	Entire Period: HR=2.65 (95% CI 1.51, 4.67), p<0.001
Meridian/ABGII	22	143	1871	1.18	Entire Period: HR=2.58 (95% CI 1.70, 3.92), p<0.001
Omnifit/Vitalock	15	66	924	1.62	Entire Period: HR=3.59 (95% CI 2.17, 5.94), p<0.001
Secur-Fit Plus HA/Secur-Fit	35	197	2838	1.23	Entire Period: HR=2.74 (95% CI 1.97, 3.83), p<0.001
Taperloc/M2a ^{MoM}	77	515	7528	1.02	Entire Period: HR=2.30 (95% CI 1.84, 2.88), p<0.001
*ABGII (exch neck)	112	246	2335	4.80	0 - 1Mth: HR=4.13 (95% CI 1.97, 8.67), p<0.001 1Mth - 1Yr: HR=1.63 (95% CI 0.61, 4.34), p=0.328 1Yr - 2.5Yr: HR=8.14 (95% CI 4.51, 14.71), p<0.001 2.5Yr - 4Yr: HR=14.26 (95% CI 8.26, 24.60), p<0.001 4Yr - 4.5Yr: HR=44.71 (95% CI 24.58, 81.34), p<0.001 4.5Yr - 5Yr: HR=11.69 (95% CI 3.76, 36.38), p<0.001 5Yr - 6Yr: HR=37.28 (95% CI 23.36, 59.47), p<0.001 6Yr+: HR=12.48 (95% CI 9.30, 16.75), p<0.001
*Adapter (cless)	162	744	8077	2.01	0 - 2Wk: HR=4.00 (95% CI 1.99, 8.00), p<0.001 2Wk - 1Mth: HR=1.57 (95% CI 0.65, 3.78), p=0.312 1Mth - 6Mth: HR=0.73 (95% CI 0.27, 1.94), p=0.525 6Mth+: HR=5.45 (95% CI 4.63, 6.43), p<0.001
*Adapter (ctd)	34	148	1361	2.50	0 - 6Mth: HR=1.93 (95% CI 0.73, 5.15), p=0.187 6Mth+: HR=7.01 (95% CI 4.90, 10.03), p<0.001
*Apex	214	2591	29790	0.72	Entire Period: HR=1.58 (95% CI 1.38, 1.80), p<0.001
*BMHR VST	46	260	3432	1.34	0 - 3Mth: HR=0.85 (95% CI 0.28, 2.65), p=0.783 3Mth+: HR=3.27 (95% CI 2.42, 4.42), p<0.001
*CBC Stem	50	290	4403	1.14	Entire Period: HR=2.53 (95% CI 1.92, 3.35), p<0.001
*CBH Stem	44	274	3014	1.46	Entire Period: HR=3.19 (95% CI 2.37, 4.28), p<0.001
*Custom Made (MSA)	45	224	2547	1.77	Entire Period: HR=3.69 (95% CI 2.75, 4.94), p<0.001
*Edinburgh	19	138	1156	1.64	Entire Period: HR=3.53 (95% CI 2.25, 5.53), p<0.001
*Elite Plus	281	2841	34107	0.82	0 - 3Mth: HR=0.45 (95% CI 0.27, 0.75), p=0.002 3Mth+: HR=2.26 (95% CI 2.00, 2.56), p<0.001
*Emperion	62	507	5959	1.04	Entire Period: HR=2.23 (95% CI 1.74, 2.86), p<0.001
*Furlong Evolution	43	521	3391	1.27	Entire Period: HR=2.36 (95% CI 1.75, 3.18), p<0.001
*GHE	13	114	1107	1.17	Entire Period: HR=2.58 (95% CI 1.50, 4.43), p<0.001
*K2	93	601	7166	1.30	Entire Period: HR=2.87 (95% CI 2.34, 3.52), p<0.001
*LYDERIC II	16	164	1547	1.03	Entire Period: HR=2.25 (95% CI 1.38, 3.67), p=0.001
*Linear	24	290	2619	0.92	Entire Period: HR=1.95 (95% CI 1.31, 2.91), p=0.001
*MBA (exch neck)	81	567	6994	1.16	0 - 1Mth: HR=1.77 (95% CI 0.84, 3.72), p=0.131 1Mth - 2.5Yr: HR=1.00 (95% CI 0.52, 1.91), p=0.988 2.5Yr+: HR=3.53 (95% CI 2.77, 4.51), p<0.001
*ML Taper Kinectiv	226	3532	39037	0.58	Entire Period: HR=1.28 (95% CI 1.12, 1.46), p<0.001
*Margron	127	688	9968	1.27	Entire Period: HR=2.83 (95% CI 2.37, 3.37), p<0.001
*Mayo	20	168	2231	0.90	Entire Period: HR=2.02 (95% CI 1.30, 3.13), p=0.001
*Metha (exch neck)	17	88	1114	1.53	Entire Period: HR=3.31 (95% CI 2.06, 5.31), p<0.001



Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
*MiniMax	23	417	2651	0.87	0 - 2Wk: HR=6.11 (95% CI 2.91, 12.83), p<0.001 2Wk - 3Mth: HR=2.03 (95% CI 1.01, 4.06), p=0.045 3Mth - 1.5Yr: HR=1.94 (95% CI 0.87, 4.31), p=0.106 1.5Yr+: HR=0.32 (95% CI 0.08, 1.28), p=0.106
*Novation	100	1423	12715	0.79	0 - 3Mth: HR=2.28 (95% CI 1.67, 3.13), p<0.001 3Mth+: HR=1.42 (95% CI 1.10, 1.82), p=0.006
*Profemur Z	34	186	2307	1.47	Entire Period: HR=3.26 (95% CI 2.33, 4.56), p<0.001
*Proxima	16	51	946	1.69	Entire Period: HR=3.62 (95% CI 2.21, 5.92), p<0.001
*Silent	13	74	967	1.34	Entire Period: HR=2.79 (95% CI 1.62, 4.81), p<0.001
*Trabecular Metal	134	1904	21857	0.61	0 - 1Mth: HR=2.58 (95% CI 1.85, 3.60), p<0.001 1Mth - 1.5Yr: HR=1.75 (95% CI 1.29, 2.37), p<0.001 1.5Yr - 2Yr: HR=0.84 (95% CI 0.27, 2.62), p=0.768 2Yr - 3Yr: HR=1.65 (95% CI 0.88, 3.07), p=0.115 3Yr - 3.5Yr: HR=0.77 (95% CI 0.19, 3.09), p=0.712 3.5Yr - 4Yr: HR=2.07 (95% CI 0.86, 5.00), p=0.105 4Yr - 7Yr: HR=1.37 (95% CI 0.87, 2.16), p=0.168 7Yr+: HR=0.53 (95% CI 0.34, 0.85), p=0.007
*Tri-Fit	17	58	687	2.47	Entire Period: HR=5.44 (95% CI 3.38, 8.75), p<0.001
*UniSyn	75	466	5643	1.33	Entire Period: HR=2.90 (95% CI 2.31, 3.64), p<0.001
**2000 Plus	20	135	1438	1.39	Entire Period: HR=3.01 (95% CI 1.94, 4.67), p<0.001
**ASR	2120	4421	44193	4.80	0 - 2Wk: HR=1.31 (95% CI 0.80, 2.14), p=0.289 2Wk - 1Mth: HR=0.20 (95% CI 0.08, 0.55), p=0.001 1Mth - 3Mth: HR=0.73 (95% CI 0.46, 1.18), p=0.204 3Mth - 6Mth: HR=1.02 (95% CI 0.56, 1.84), p=0.954 6Mth - 9Mth: HR=1.92 (95% CI 1.13, 3.25), p=0.015 9Mth - 1.5Yr: HR=4.42 (95% CI 3.47, 5.62), p<0.001 1.5Yr - 2Yr: HR=7.65 (95% CI 5.94, 9.86), p<0.001 2Yr - 2.5Yr: HR=13.48 (95% CI 10.97, 16.57), p<0.001 2.5Yr - 3Yr: HR=18.94 (95% CI 15.57, 23.04), p<0.001 3Yr - 4Yr: HR=30.64 (95% CI 27.05, 34.71), p<0.001 4Yr - 5Yr: HR=33.57 (95% CI 29.44, 38.28), p<0.001 5Yr - 6Yr: HR=36.97 (95% CI 32.45, 42.11), p<0.001 6Yr - 7Yr: HR=26.63 (95% CI 22.60, 31.39), p<0.001 7Yr - 8.5Yr: HR=19.27 (95% CI 16.48, 22.55), p<0.001 8.5Yr - 10Yr: HR=12.02 (95% CI 9.88, 14.63), p<0.001 10Yr - 10.5Yr: HR=9.67 (95% CI 6.39, 14.62), p<0.001 10.5Yr - 12Yr: HR=7.19 (95% CI 5.67, 9.11), p<0.001 12Yr - 12.5Yr: HR=4.71 (95% CI 2.71, 8.17), p<0.001 12.5Yr - 13.5Yr: HR=7.08 (95% CI 5.16, 9.73), p<0.001 13.5Yr+: HR=3.85 (95% CI 3.13, 4.74), p<0.001
**Adept	28	121	1524	1.84	Entire Period: HR=3.87 (95% CI 2.67, 5.61), p<0.001
**Arttek	77	179	2569	3.00	0 - 1Yr: HR=1.54 (95% CI 0.64, 3.71), p=0.331 1Yr - 1.5Yr: HR=4.96 (95% CI 1.24, 19.85), p=0.023 1.5Yr - 2.5Yr: HR=6.18 (95% CI 2.32, 16.47), p<0.001



Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
	.	.	.	.	2.5Yr - 4Yr: HR=15.25 (95% CI 8.43, 27.59), p<0.001
	.	.	.	.	4Yr - 4.5Yr: HR=4.99 (95% CI 0.70, 35.48), p=0.108
	.	.	.	.	4.5Yr - 6Yr: HR=19.34 (95% CI 10.95, 34.16), p<0.001
	.	.	.	.	6Yr+: HR=6.80 (95% CI 4.98, 9.27), p<0.001
**BHR	614	2988	39260	1.56	0 - 2Wk: HR=0.84 (95% CI 0.40, 1.76), p=0.642
	.	.	.	.	2Wk - 1Mth: HR=0.15 (95% CI 0.04, 0.60), p=0.007
	.	.	.	.	1Mth - 3Mth: HR=1.02 (95% CI 0.62, 1.66), p=0.949
	.	.	.	.	3Mth - 1Yr: HR=0.56 (95% CI 0.29, 1.07), p=0.078
	.	.	.	.	1Yr - 1.5Yr: HR=1.76 (95% CI 1.00, 3.11), p=0.051
	.	.	.	.	1.5Yr+: HR=4.77 (95% CI 4.38, 5.20), p<0.001
**Bionik	160	608	6516	2.46	0 - 2Wk: HR=3.07 (95% CI 1.28, 7.37), p=0.012
	.	.	.	.	2Wk - 3Mth: HR=1.06 (95% CI 0.48, 2.36), p=0.890
	.	.	.	.	3Mth+: HR=6.52 (95% CI 5.55, 7.67), p<0.001
**Conserve Plus	25	135	1892	1.32	0 - 1Yr: HR=0.83 (95% CI 0.21, 3.31), p=0.788
	.	.	.	.	1Yr+: HR=3.74 (95% CI 2.48, 5.63), p<0.001
**Cormet	167	803	10603	1.58	0 - 3Mth: HR=0.60 (95% CI 0.27, 1.34), p=0.210
	.	.	.	.	3Mth - 1.5Yr: HR=1.94 (95% CI 1.10, 3.42), p=0.021
	.	.	.	.	1.5Yr+: HR=4.61 (95% CI 3.92, 5.42), p<0.001
**DeltaLox	31	222	2186	1.42	Entire Period: HR=3.09 (95% CI 2.17, 4.40), p<0.001
**Duraloc	688	5354	69190	0.99	0 - 3Mth: HR=0.77 (95% CI 0.58, 1.02), p=0.067
	.	.	.	.	3Mth - 9Mth: HR=1.44 (95% CI 1.00, 2.06), p=0.049
	.	.	.	.	9Mth - 2Yr: HR=1.98 (95% CI 1.52, 2.59), p<0.001
	.	.	.	.	2Yr - 2.5Yr: HR=0.90 (95% CI 0.45, 1.81), p=0.766
	.	.	.	.	2.5Yr - 5.5Yr: HR=2.00 (95% CI 1.60, 2.50), p<0.001
	.	.	.	.	5.5Yr+: HR=3.23 (95% CI 2.93, 3.57), p<0.001
**Durom	223	1245	17499	1.27	0 - 1.5Yr: HR=0.75 (95% CI 0.48, 1.17), p=0.204
	.	.	.	.	1.5Yr - 2Yr: HR=4.54 (95% CI 2.51, 8.23), p<0.001
	.	.	.	.	2Yr - 6Yr: HR=3.64 (95% CI 2.75, 4.81), p<0.001
	.	.	.	.	6Yr - 7.5Yr: HR=8.96 (95% CI 6.50, 12.35), p<0.001
	.	.	.	.	7.5Yr - 11Yr: HR=5.18 (95% CI 3.94, 6.81), p<0.001
	.	.	.	.	11Yr - 12Yr: HR=3.08 (95% CI 1.69, 5.61), p<0.001
	.	.	.	.	12Yr - 13.5Yr: HR=2.33 (95% CI 1.28, 4.24), p=0.005
	.	.	.	.	13.5Yr - 14Yr: HR=4.02 (95% CI 1.76, 9.16), p<0.001
	.	.	.	.	14Yr+: HR=1.61 (95% CI 1.06, 2.44), p=0.025
**Dynasty	123	2127	16103	0.76	0 - 3Mth: HR=1.89 (95% CI 1.43, 2.51), p<0.001
	.	.	.	.	3Mth - 6Mth: HR=1.38 (95% CI 0.66, 2.91), p=0.391
	.	.	.	.	6Mth - 1.5Yr: HR=1.86 (95% CI 1.20, 2.88), p=0.005
	.	.	.	.	1.5Yr - 2.5Yr: HR=1.30 (95% CI 0.70, 2.43), p=0.402
	.	.	.	.	2.5Yr+: HR=1.16 (95% CI 0.84, 1.61), p=0.362
**ExpanSys	15	71	914	1.64	Entire Period: HR=3.72 (95% CI 2.25, 6.15), p<0.001
**Furlong	74	970	8685	0.85	0 - 3Mth: HR=1.96 (95% CI 1.30, 2.94), p=0.001
	.	.	.	.	3Mth - 1.5Yr: HR=3.63 (95% CI 2.47, 5.34), p<0.001
	.	.	.	.	1.5Yr+: HR=1.09 (95% CI 0.73, 1.61), p=0.681
**Hedrocel	13	46	647	2.01	Entire Period: HR=4.35 (95% CI 2.53, 7.50), p<0.001



Prostheses with Higher than Anticipated Rates of Revision

Femoral Stem/Acetabular	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
**Icon	119	401	4749	2.51	0 - 2.5Yr: HR=2.56 (95% CI 1.71, 3.82), p<0.001 2.5Yr - 3Yr: HR=10.55 (95% CI 4.72, 23.56), p<0.001 3Yr - 3.5Yr: HR=3.81 (95% CI 0.95, 15.27), p=0.059 3.5Yr - 9Yr: HR=10.54 (95% CI 7.97, 13.93), p<0.001 9Yr - 9.5Yr: HR=2.55 (95% CI 0.36, 18.21), p=0.349 9.5Yr - 10.5Yr: HR=16.50 (95% CI 9.28, 29.32), p<0.001 10.5Yr+: HR=3.97 (95% CI 2.65, 5.94), p<0.001
**Inter-Op	9	33	387	2.33	Entire Period: HR=5.17 (95% CI 2.69, 9.92), p<0.001
**MBA	18	124	1155	1.56	Entire Period: HR=3.39 (95% CI 2.14, 5.38), p<0.001
**Mitch TRH	191	731	9267	2.06	0 - 3Mth: HR=0.55 (95% CI 0.23, 1.32), p=0.182 3Mth - 2Yr: HR=2.59 (95% CI 1.63, 4.11), p<0.001 2Yr+: HR=6.40 (95% CI 5.49, 7.46), p<0.001
**Mueller	12	63	565	2.12	Entire Period: HR=4.41 (95% CI 2.50, 7.77), p<0.001
**Plasmacup	43	482	5673	0.76	Entire Period: HR=1.69 (95% CI 1.25, 2.28), p<0.001
**SPH-Blind	139	952	14127	0.98	Entire Period: HR=2.20 (95% CI 1.86, 2.60), p<0.001
**Total Hip Replacement (Lima)	16	129	1491	1.07	0 - 5.5Yr: HR=1.16 (95% CI 0.48, 2.80), p=0.733 5.5Yr - 6Yr: HR=12.06 (95% CI 3.01, 48.37), p<0.001 6Yr+: HR=3.64 (95% CI 1.89, 7.00), p<0.001
**Universal	23	167	2018	1.14	Entire Period: HR=2.57 (95% CI 1.71, 3.86), p<0.001
**seleXys (excluding seleXys PC)	55	391	4311	1.28	Entire Period: HR=2.78 (95% CI 2.13, 3.62), p<0.001

Note: Components have been compared to all other modern total conventional hip components

*Femoral Stem Component

**Acetabular Component

+ Newly identified and no longer used



Prostheses with Higher than Anticipated Rates of Revision

Table IP8 Cumulative Percent Revision of Total Conventional Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Newly Identified					
CPCS/Polarcup (ctd metal)	4.0 (1.7, 9.4)	9.0 (4.7, 16.9)	10.7 (5.8, 19.6)		
*Arcos (cone body)	6.4 (4.4, 9.4)	9.1 (6.4, 12.7)	9.1 (6.4, 12.7)		
*Everglade	3.3 (1.9, 5.9)	7.2 (4.3, 11.9)			
**BI-MENTUM (cemented cup)	14.6 (8.1, 25.5)	17.1 (9.7, 29.1)			
**Trident II Tritanium (Shell) (dm)	1.9 (1.7, 2.2)	2.7 (2.4, 3.2)			
Re-Identified and Still Used					
Accolade II/Trident Tritanium (Shell)	2.3 (1.9, 2.8)	3.4 (2.9, 4.0)	3.9 (3.4, 4.6)	4.8 (4.1, 5.7)	
CORAIL/Trabecular Metal (Shell)	6.0 (2.8, 13.0)	9.4 (5.0, 17.3)	11.8 (6.7, 20.3)	11.8 (6.7, 20.3)	
*CPT	2.3 (2.2, 2.5)	3.4 (3.1, 3.6)	4.3 (4.0, 4.6)	6.3 (6.0, 6.7)	9.8 (9.0, 10.6)
*Echelon	5.2 (3.5, 7.7)	8.0 (5.8, 11.2)	8.4 (6.0, 11.6)	9.9 (7.2, 13.6)	
*Excia (cless)	4.2 (2.7, 6.4)	5.3 (3.6, 7.7)	5.8 (4.0, 8.3)	7.1 (5.0, 10.0)	
*HACTIV	2.5 (2.0, 3.1)	3.5 (2.9, 4.2)	4.1 (3.4, 4.8)	6.3 (5.1, 7.8)	
*Revision Hip	4.3 (1.8, 10.1)	9.9 (5.4, 17.7)	13.2 (7.5, 22.6)		
*Taper Fit	1.7 (1.4, 2.0)	2.5 (2.2, 2.9)	3.3 (2.9, 3.8)	5.6 (4.6, 6.8)	
**Atlas (Shell)	3.4 (2.2, 5.1)	4.1 (2.8, 6.0)	5.0 (3.5, 7.1)	9.4 (6.9, 12.6)	
**Continuum	2.6 (2.4, 2.9)	3.5 (3.2, 3.8)	4.0 (3.6, 4.3)	5.2 (4.8, 5.6)	
**Delta-One-TT	4.1 (2.2, 7.8)	6.7 (4.0, 11.1)	8.5 (5.4, 13.5)	11.9 (7.5, 18.6)	
**Fin II	2.6 (2.1, 3.3)	3.4 (2.8, 4.2)	4.5 (3.7, 5.4)	7.6 (6.5, 8.8)	
**Fixa	3.2 (2.4, 4.1)	4.2 (3.3, 5.3)	4.7 (3.7, 5.8)	6.5 (5.2, 8.1)	
**G7 Multihole	4.8 (3.9, 5.9)	5.9 (4.9, 7.2)	6.5 (5.3, 7.9)		
Identified and No Longer Used					
+*Anca-Fit	3.4 (1.6, 7.0)	5.4 (3.0, 9.5)	7.4 (4.5, 11.9)	12.7 (8.7, 18.4)	
Anatomic II/Duraloc Option	1.7 (0.2, 11.2)	6.7 (2.6, 16.8)	10.1 (4.7, 21.1)	14.2 (7.3, 26.5)	
Anca-Fit/PINNACLE	6.0 (2.7, 12.8)	8.0 (4.1, 15.4)	11.1 (6.3, 19.2)	16.4 (10.1, 25.8)	
Avenir/Fitmore	5.1 (3.3, 7.9)	5.4 (3.5, 8.2)	5.7 (3.7, 8.6)		
CPCS/Reflection (Non XLPE Cup)	1.0 (0.4, 2.7)	2.9 (1.6, 5.1)	3.4 (2.0, 5.8)	10.0 (7.2, 13.8)	33.7 (27.3, 41.1)
Esop/Delta-PF	0.0 (0.0, 0.0)	1.8 (0.3, 12.0)	5.6 (1.8, 16.3)	7.8 (3.0, 19.4)	
Evolve/Acetabular Shell (Global)	2.9 (1.1, 7.5)	3.7 (1.5, 8.6)	6.2 (3.1, 12.1)		
F2L/Delta-PF	5.6 (2.6, 12.1)	10.3 (5.9, 17.9)	12.3 (7.3, 20.2)	16.5 (10.6, 25.3)	
Friendly Hip/Cup (Exactech)	2.1 (0.5, 8.0)	3.2 (1.0, 9.5)	6.5 (3.0, 14.0)	14.1 (8.2, 23.6)	24.1 (15.3, 36.7)
M-Cor/Equator+ Cup	0.0 (0.0, 0.0)	2.7 (0.7, 10.4)	4.1 (1.3, 12.1)	11.6 (6.0, 21.9)	
Meridian/ABGII	2.1 (0.7, 6.4)	5.0 (2.4, 10.1)	6.4 (3.4, 12.0)	8.3 (4.6, 14.5)	
Omnifit/Vitalock	1.5 (0.2, 10.3)	6.2 (2.4, 15.8)	6.2 (2.4, 15.8)	14.8 (8.0, 26.7)	28.6 (18.0, 43.6)
Secur-Fit Plus HA/Secur-Fit	3.1 (1.4, 6.7)	7.3 (4.4, 11.9)	7.8 (4.8, 12.6)	10.1 (6.5, 15.3)	19.4 (13.9, 26.8)
Taperloc/M2a ^{MoM}	1.8 (0.9, 3.3)	4.3 (2.9, 6.5)	7.4 (5.4, 10.0)	12.4 (9.7, 15.6)	17.0 (13.7, 21.0)
*ABGII (exch neck)	4.5 (2.5, 8.0)	11.1 (7.8, 15.8)	20.5 (15.9, 26.2)	37.2 (31.2, 43.9)	
*Adapter (cless)	3.2 (2.2, 4.8)	6.9 (5.2, 8.9)	11.7 (9.5, 14.3)	20.1 (17.2, 23.3)	
*Adapter (ctd)	4.1 (1.9, 8.9)	9.2 (5.4, 15.3)	16.3 (11.0, 23.7)	23.8 (17.1, 32.4)	
*Apex	2.2 (1.7, 2.9)	3.3 (2.7, 4.0)	4.5 (3.8, 5.4)	7.2 (6.3, 8.4)	
*BMHR VST	1.9 (0.8, 4.6)	4.6 (2.7, 8.0)	7.0 (4.5, 10.8)	12.1 (8.7, 16.8)	
*CBC Stem	2.4 (1.2, 5.0)	4.6 (2.7, 7.7)	6.4 (4.1, 10.0)	10.0 (6.9, 14.2)	20.2 (15.5, 26.2)
*CBH Stem	4.0 (2.3, 7.2)	7.4 (4.9, 11.3)	9.8 (6.8, 14.1)	15.0 (11.1, 20.1)	



Prostheses with Higher than Anticipated Rates of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
*Custom Made (MSA)	5.8 (3.4, 9.8)	9.5 (6.3, 14.1)	11.3 (7.8, 16.3)	17.8 (13.3, 23.6)	
*Edinburgh	6.0 (3.1, 11.7)	9.6 (5.6, 16.4)	12.5 (7.7, 20.0)	16.8 (10.7, 25.8)	
*Elite Plus	1.5 (1.1, 2.0)	2.8 (2.3, 3.5)	4.2 (3.5, 5.1)	7.8 (6.8, 9.0)	15.3 (13.5, 17.3)
*Emperion	4.8 (3.2, 7.0)	6.0 (4.2, 8.4)	7.2 (5.2, 9.8)	10.7 (8.3, 13.8)	
*Furlong Evolution	5.2 (3.6, 7.5)	7.3 (5.4, 9.9)	8.4 (6.3, 11.1)	8.4 (6.3, 11.1)	
*GHE	2.6 (0.9, 8.0)	5.3 (2.4, 11.5)	8.2 (4.3, 15.2)	12.6 (7.5, 20.8)	
*K2	5.2 (3.7, 7.3)	7.5 (5.7, 10.0)	9.8 (7.7, 12.6)	13.8 (11.2, 17.0)	
*LYDERIC II	3.1 (1.3, 7.2)	5.7 (3.0, 10.6)	7.1 (4.0, 12.5)	12.2 (7.2, 20.1)	
*Linear	2.8 (1.4, 5.4)	5.9 (3.7, 9.3)	7.0 (4.6, 10.6)	8.7 (5.9, 12.8)	
*MBA (exch neck)	2.1 (1.2, 3.7)	3.9 (2.6, 5.9)	6.2 (4.5, 8.6)	11.0 (8.6, 14.1)	21.3 (16.7, 27.1)
*ML Taper Kinectiv	2.4 (2.0, 3.0)	3.5 (3.0, 4.2)	4.3 (3.7, 5.0)	6.0 (5.2, 6.9)	
*Margron	5.8 (4.3, 7.9)	8.6 (6.7, 10.9)	10.6 (8.5, 13.1)	15.7 (13.1, 18.8)	20.4 (17.4, 23.9)
*Mayo	3.0 (1.3, 7.0)	6.6 (3.7, 11.6)	6.6 (3.7, 11.6)	8.6 (5.2, 14.2)	
*Metha (exch neck)	12.5 (7.1, 21.4)	13.6 (8.0, 22.8)	13.6 (8.0, 22.8)	16.0 (9.8, 25.5)	
*MiniMax	4.6 (2.9, 7.1)	5.5 (3.7, 8.2)	5.5 (3.7, 8.2)		
*Novation	3.7 (2.9, 4.9)	4.4 (3.5, 5.7)	5.2 (4.1, 6.5)	7.5 (6.1, 9.1)	
*Profemur Z	6.0 (3.4, 10.5)	10.4 (6.8, 15.8)	11.0 (7.2, 16.5)	12.2 (8.2, 18.0)	
*Proxima	3.9 (1.0, 14.8)	3.9 (1.0, 14.8)	3.9 (1.0, 14.8)	12.0 (5.6, 24.7)	25.2 (15.1, 40.3)
*Silent	2.7 (0.7, 10.4)	4.1 (1.3, 12.0)	9.5 (4.6, 18.8)	16.2 (9.6, 26.8)	
*Trabecular Metal	3.5 (2.8, 4.5)	4.8 (3.9, 5.8)	5.4 (4.5, 6.6)	6.8 (5.7, 8.0)	
*Tri-Fit	3.4 (0.9, 13.1)	3.4 (0.9, 13.1)	5.3 (1.7, 15.5)	23.6 (14.1, 38.0)	
*UniSyn	3.2 (2.0, 5.3)	5.9 (4.1, 8.5)	6.6 (4.7, 9.3)	12.7 (9.9, 16.3)	22.0 (17.6, 27.4)
**2000 Plus	3.0 (1.1, 7.8)	6.8 (3.6, 12.7)	9.2 (5.3, 15.7)	14.1 (9.0, 21.8)	
**ASR	1.9 (1.5, 2.3)	9.6 (8.8, 10.5)	24.5 (23.3, 25.9)	45.2 (43.6, 46.7)	54.9 (53.1, 56.6)
**Adept	4.1 (1.7, 9.6)	8.4 (4.6, 15.0)	9.3 (5.3, 16.2)	15.9 (10.3, 24.0)	
**Artek	2.8 (1.2, 6.7)	8.0 (4.8, 13.1)	16.1 (11.4, 22.5)	27.1 (21.0, 34.4)	44.2 (36.8, 52.4)
**BHR	1.1 (0.8, 1.6)	3.2 (2.6, 3.9)	6.1 (5.3, 7.0)	14.3 (13.0, 15.7)	26.6 (24.6, 28.7)
**Bionik	3.6 (2.4, 5.5)	7.7 (5.8, 10.2)	14.3 (11.7, 17.5)	24.3 (20.9, 28.2)	
**Conserve Plus	1.5 (0.4, 5.8)	3.0 (1.1, 7.8)	3.8 (1.6, 8.8)	11.6 (7.0, 18.8)	
**Cormet	1.5 (0.9, 2.6)	3.5 (2.4, 5.1)	5.2 (3.9, 7.0)	13.7 (11.4, 16.5)	28.1 (24.2, 32.3)
**DeltaLox	5.9 (3.5, 9.9)	8.7 (5.6, 13.3)	10.1 (6.8, 15.0)	14.2 (10.1, 19.9)	
**Duraloc	1.8 (1.5, 2.2)	3.0 (2.6, 3.5)	4.1 (3.6, 4.7)	8.4 (7.6, 9.2)	19.3 (17.9, 20.8)
**Durom	1.1 (0.7, 1.9)	3.6 (2.7, 4.8)	5.5 (4.3, 6.9)	13.6 (11.7, 15.7)	21.0 (18.6, 23.6)
**Dynasty	3.3 (2.7, 4.2)	4.4 (3.6, 5.4)	5.0 (4.1, 6.0)	6.2 (5.2, 7.5)	
**ExpanSys	2.8 (0.7, 10.8)	5.7 (2.2, 14.5)	10.3 (5.0, 20.3)	16.8 (9.7, 28.4)	26.5 (16.5, 40.9)
**Furlong	4.2 (3.1, 5.7)	6.1 (4.8, 7.8)	6.8 (5.4, 8.6)	7.5 (5.9, 9.4)	
**Hedrocel	4.3 (1.1, 16.3)	6.6 (2.2, 19.2)	6.6 (2.2, 19.2)	23.4 (12.8, 40.4)	36.3 (22.6, 54.7)
**Icon	3.0 (1.7, 5.3)	7.8 (5.5, 10.9)	12.7 (9.7, 16.5)	24.5 (20.4, 29.4)	
**Inter-Op	12.1 (4.7, 29.1)	15.2 (6.6, 32.6)	21.4 (10.8, 39.8)	28.3 (15.8, 47.4)	28.3 (15.8, 47.4)
**MBA	4.0 (1.7, 9.4)	8.2 (4.5, 14.8)	10.2 (5.9, 17.2)	16.0 (9.9, 25.5)	
**Mitch TRH	1.5 (0.8, 2.7)	4.6 (3.3, 6.4)	7.7 (6.0, 10.0)	15.6 (13.1, 18.6)	
**Mueller	1.6 (0.2, 10.9)	11.6 (5.4, 24.2)	13.8 (6.8, 26.9)	22.7 (12.6, 38.8)	
**Plasmacup	4.4 (2.9, 6.6)	5.6 (3.9, 8.1)	5.8 (4.1, 8.3)	8.1 (5.9, 10.9)	
**SPH-Blind	3.8 (2.8, 5.2)	5.8 (4.5, 7.5)	7.3 (5.8, 9.2)	10.4 (8.6, 12.6)	16.6 (14.1, 19.5)
**Total Hip Replacement (Lima)	0.0 (0.0, 0.0)	2.4 (0.8, 7.1)	2.4 (0.8, 7.1)	8.0 (4.4, 14.4)	



Prostheses with Higher than Anticipated Rates of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
**Universal	4.8 (2.4, 9.4)	4.8 (2.4, 9.4)	5.4 (2.9, 10.2)	11.6 (7.3, 18.2)	
**seleXys (excluding seleXys PC)	4.6 (2.9, 7.2)	7.8 (5.5, 11.0)	10.6 (7.9, 14.1)	13.3 (10.2, 17.2)	

Note: Components have been compared to all other total conventional hip components
Note: *Femoral Stem Component
Note: **Acetabular Component
Note: + Newly identified and no longer used



Prostheses with Higher than Anticipated Rates of Revision

Table IP9 Yearly Usage of Total Conventional Hip Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Newly Identified	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CPCS/Polarcup (ctd metal)	9	5	10	8	1	7	6	8	5	5	8	9	7	6	13	11	14
*Arcos (cone body)	.	.	9	14	14	12	9	15	26	34	17	32	25	45	46	59	56
*Everglade	.	.	.	.	.	.	.	.	14	2	.	14	27	34	53	114	84
**BI-MENTUM (cemented cup)	.	.	.	.	.	.	.	.	.	.	.	.	8	14	23	21	9
**Trident II Tritanium (Shell) (dm)	.	.	.	.	.	.	.	.	.	.	.	20	61	786	3045	4811	7427
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Accolade II/Trident Tritanium (Shell)	.	.	.	1	1	30	119	258	484	402	510	584	811	670	348	150	49
CORAIL/Trabecular Metal (Shell)	32	20	9	8	8	6	1	6	2	4	1	1	.	.	.	1	1
*CPT	5931	1196	1241	1295	1462	1566	1303	1233	1240	1159	1275	1339	1409	1333	1567	1043	461
*Echelon	143	30	21	40	31	30	32	47	43	41	10	3	3	2	1	2	1
*Excia (cless)	40	8	47	58	38	17	42	35	65	66	10	.	.	18	6	13	23
*HACTIV	.	2	19	63	61	117	146	96	240	452	388	418	406	194	225	225	350
*Revision Hip	27	3	3	7	6	13	6	5	10	4	5	2	2	11	12	2	5
*Taper Fit	295	8	17	55	45	110	161	227	315	592	790	789	798	853	1207	947	943
**Atlas (Shell)	263	6	7	4	8	28	23	13	27	26	26	35	23	27	29	50	33
**Continuum	175	1117	1245	1331	1505	1492	1359	1327	1293	1197	850	513	294	182	156	28	14
**Delta-One-TT	.	4	7	7	15	37	13	12	14	14	23	15	14	13	11	9	13
**Fin II	862	318	286	205	247	101	6	.	.	9	76	94	96	88	95	97	66
**Fixa	.	.	44	161	153	99	134	100	91	78	84	95	134	162	133	87	120
**G7 Multihole	.	.	.	.	.	.	.	.	15	49	169	222	244	236	335	322	305
Identified and no longer used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
+*Anca-Fit	196	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anatomic II/Duraloc Option	60	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anca-Fit/PINNACLE	101	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Avenir/Fitmore	.	.	.	.	2	7	5	46	44	42	56	41	55	41	34	.	.
CPCS/Reflection (Non XLPE Cup)	405	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Esop/Delta-PF	59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Evolve/Acetabular Shell (Global)	.	.	.	.	.	1	13	43	32	15	11	10	12	2	.	.	.
F2L/Delta-PF	107	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Friendly Hip/Cup (Exactech)	97	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
M-Cor/Equator+ Cup	77	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Meridian/ABGII	143	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Omnifit/Vitalock	66	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Secur-Fit Plus HA/Secur-Fit	197	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Taperloc/M2a ^{MoM}	490	23	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*ABGII (exch neck)	118	58	63	7	.	.	.	.	.	.	.	.	.	.	.	.	.
*Adapter (cless)	570	115	58	.	1	.	.	.	.	.	.	.	.	.	.	.	.



Prostheses with Higher than Anticipated Rates of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
*Adapter (ctd)	141	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Apex	1007	169	190	219	246	188	193	168	88	61	44	18	.	.	.	.	.
*BMHR VST	67	81	71	22	13	5	1	.	.	.	.	.	.	.	.	.	.
*CBC Stem	288	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*CBH Stem	125	45	53	43	7	.	1	.	.	.	.	.	.	.	.	.	.
*Custom Made (MSA)	16	57	77	46	21	7	.	.	.	.	.	.	.	.	.	.	.
*Edinburgh	127	10	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Elite Plus	2840	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Emperion	126	87	72	44	53	38	41	34	12	.	.	.	.	.	.	.	.
*Furlong Evolution	.	.	.	.	29	25	32	11	54	102	106	83	75	4	.	.	.
*GHE	.	9	4	47	28	14	12	.	.	.	.	.	.	.	.	.	.
*K2	275	204	122	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*LYDERIC II	164	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Linear	.	.	.	23	31	31	88	70	27	12	5	3	.	.	.	.	.
*MBA (exch neck)	398	43	46	36	44	.	.	.	.	.	.	.	.	.	.	.	.
*ML Taper Kinectiv	377	647	576	515	384	345	256	199	159	74	.	.	.	.	.	.	.
*Margron	688	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Mayo	166	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Metha (exch neck)	20	53	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*MiniMax	.	.	.	.	.	.	.	4	43	170	133	41	19	5	.	2	.
*Novation	4	32	53	130	137	226	266	148	90	101	145	51	19	21	.	.	.
*Profemur Z	185	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Proxima	51	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Silent	19	21	21	3	6	4	.	.	.	.	.	.	.	.	.	.	.
*Trabecular Metal	453	242	272	276	186	220	112	106	32	5	.	.	.	.	.	.	.
*Tri-Fit	58	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*UniSyn	294	36	22	19	23	27	23	17	5	.	.	.	.	.	.	.	.
**2000 Plus	108	25	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**ASR	4421	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Adept	98	11	12	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Artek	179	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**BHR	2532	276	134	27	13	5	1	.	.	.	.	.	.	.	.	.	.
**Bionik	566	38	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Conserve Plus	134	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Cormet	679	93	26	4	1	.	.	.	.	.	.	.	.	.	.	.	.
**DeltaLox	.	34	84	72	24	8	.	.	.	.	.	.	.	.	.	.	.
**Duraloc	5167	82	84	18	3	.	.	.	.	.	.	.	.	.	.	.	.
**Durom	1231	13	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Dynasty	.	.	40	31	49	178	298	317	306	307	272	241	39	32	17	.	.
**ExpanSys	71	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Furlong	103	90	85	73	76	64	66	12	55	100	82	65	71	21	7	.	.
**Hedrocel	46	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Icon	353	37	11	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Inter-Op	33	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**MBA	124	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.



Prostheses with Higher than Anticipated Rates of Revision

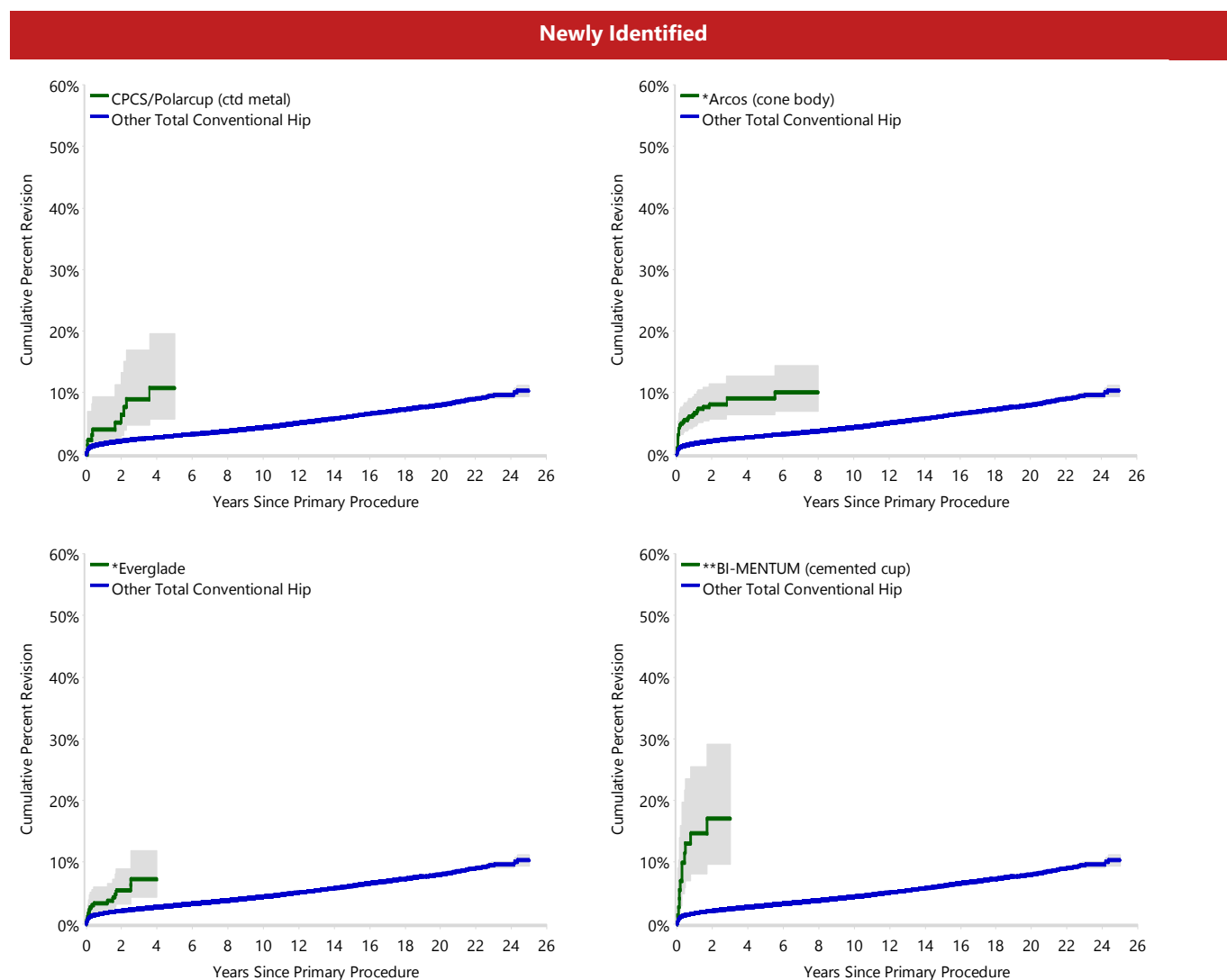
Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
**Mitch TRH	612	82	37	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Mueller	50	.	.	1	.	1	1	.	1	1	3	.	.	1	3	1	.
**Plasmacup	100	60	59	77	70	44	51	21	.	.	.	.	.	.	.	.	.
**SPH-Blind	952	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**Total Hip Replacement (Lima)	.	.	18	37	41	28	3	2	.	.	.	.	.	.	.	.	.
**Universal	156	7	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
**seleXys (excluding seleXys PC)	109	53	70	89	57	13	.	.	.	.	.	.	.	.	.	.	.

Note: *Femoral Stem Component

**Acetabular Component

+ Newly identified and no longer used

Figure IP3 Cumulative Percent Revision of Newly Identified Total Conventional Hip Prostheses





Prostheses with Higher than Anticipated Rates of Revision

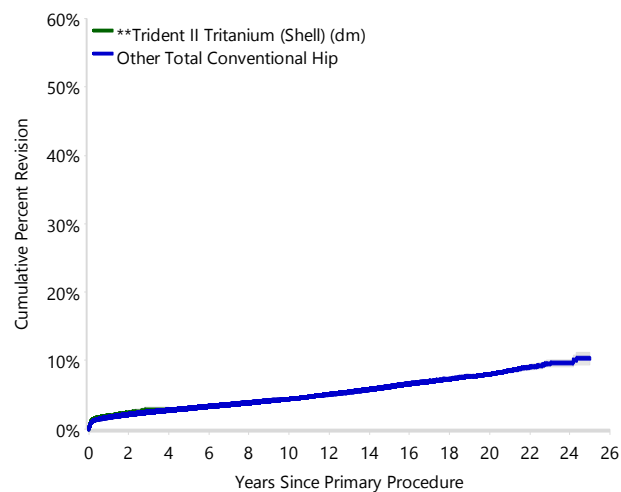
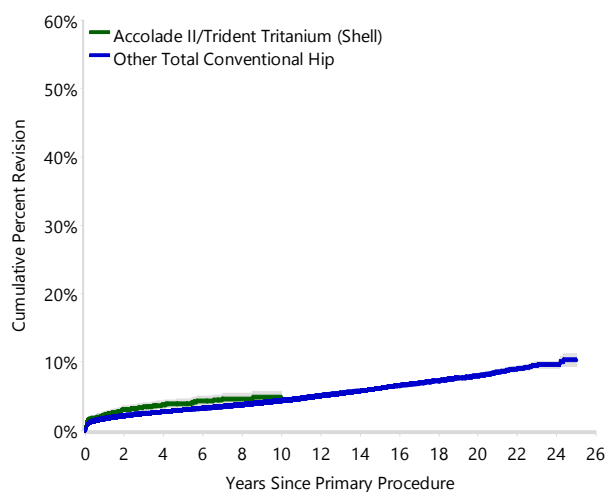
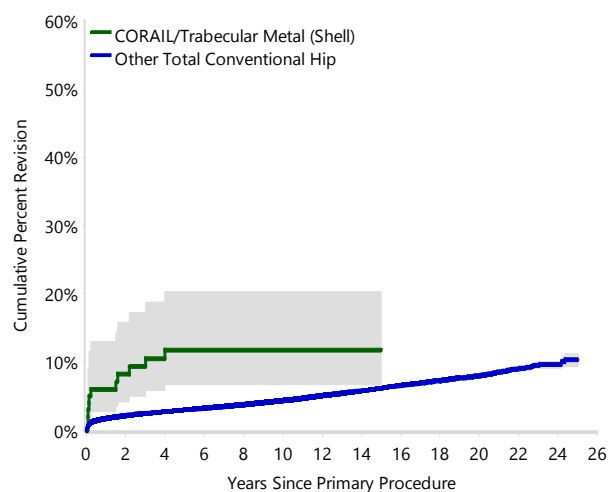
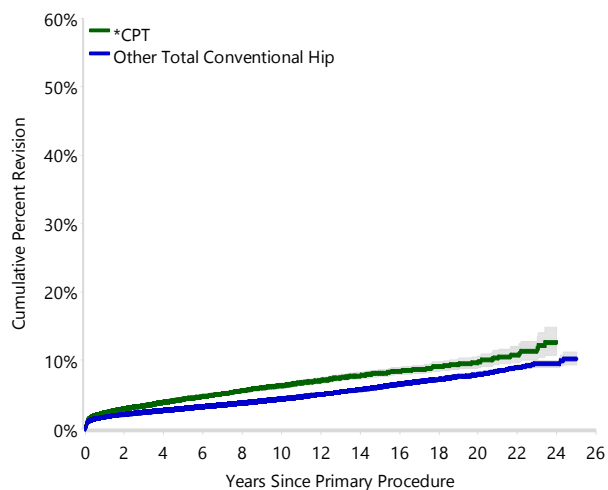
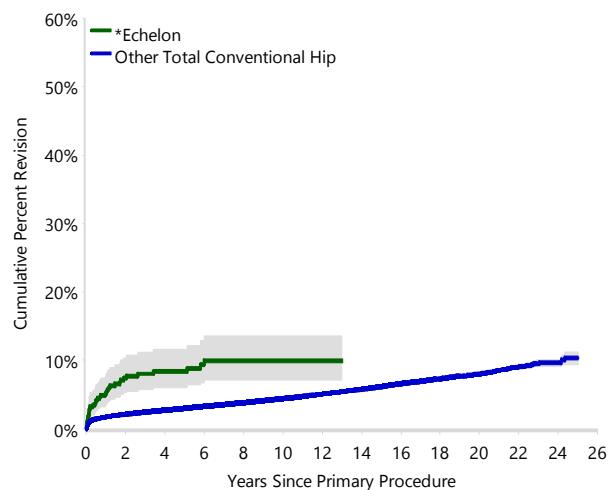


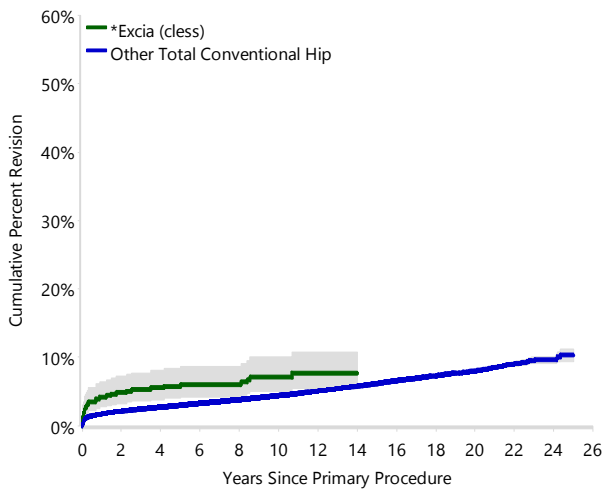
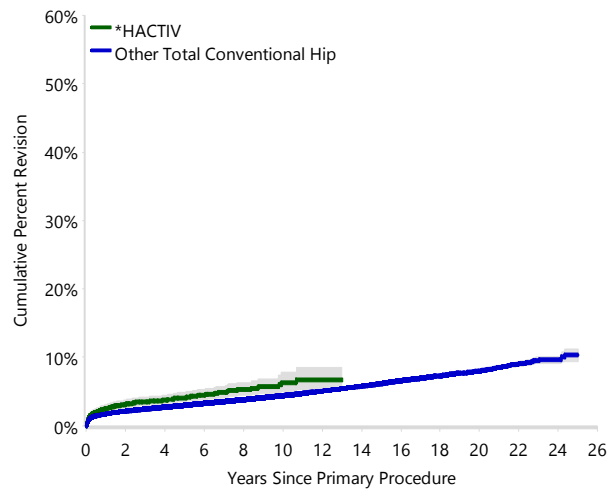
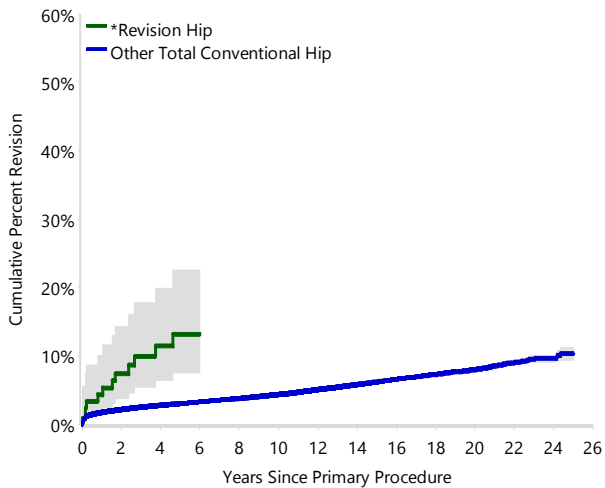
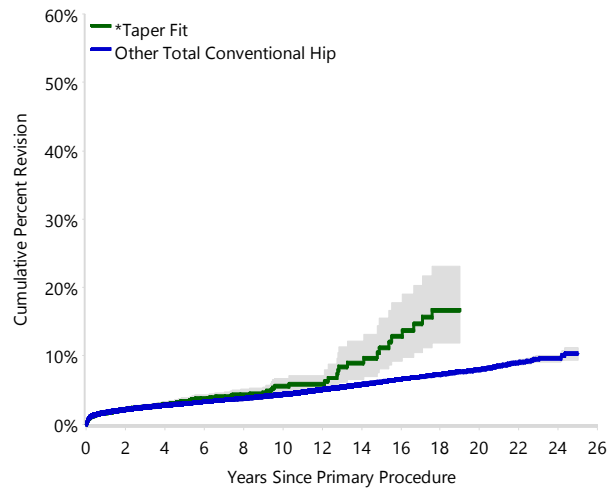
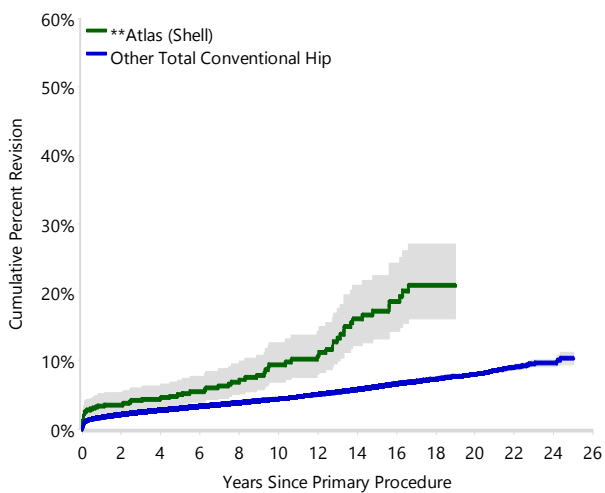
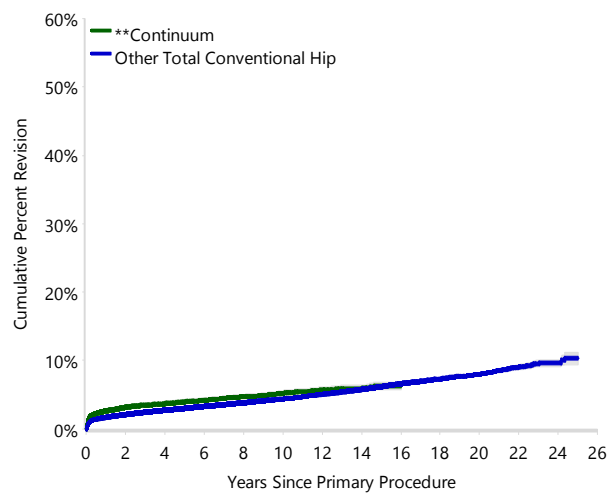
Figure IP4 Cumulative Percent Revision of Re-Identified and Still Used Total Conventional Hip Prostheses

Re-Identified and Still Used



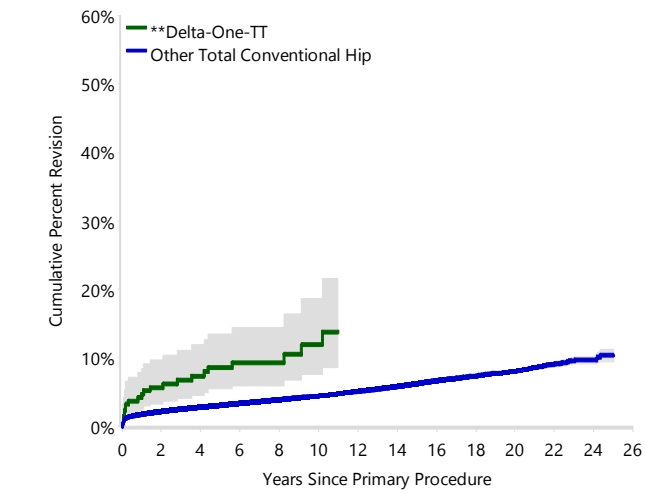
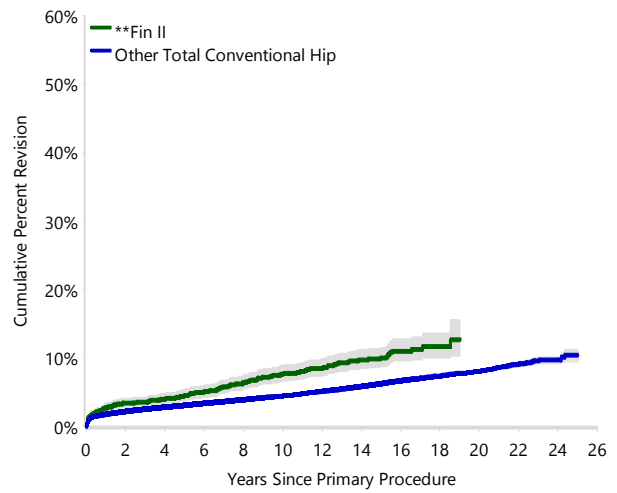
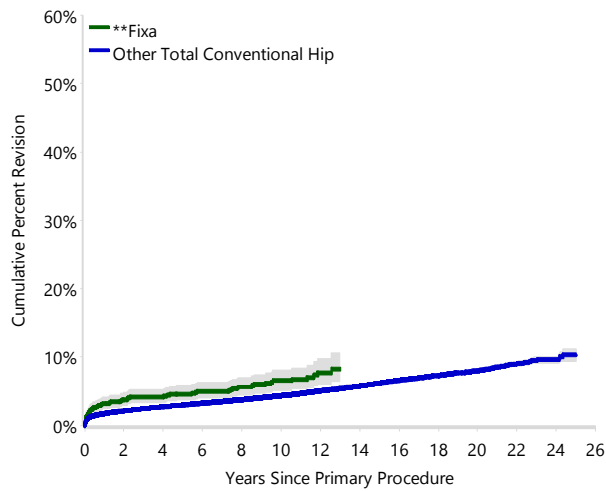
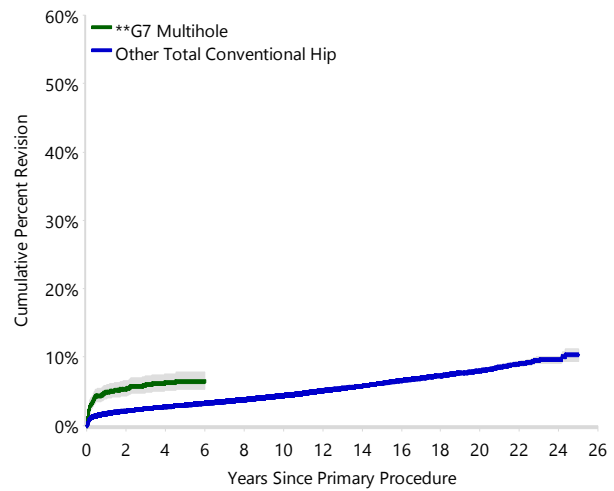


Prostheses with Higher than Anticipated Rates of Revision





Prostheses with Higher than Anticipated Rates of Revision





Prostheses with Higher than Anticipated Rates of Revision

TOTAL RESURFACING

There are no newly identified total resurfacing hip prostheses.

Table IP10 Revision Rate of Total Resurfacing Hip Prostheses Identified as having a Higher than Anticipated Rate of Revision

Head/Acetabular	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Identified and No Longer Used	.	.	.	.	.
ASR/ASR	429	1168	16469	2.60	Entire Period: HR=4.05 (95% CI 3.64, 4.52), p<0.001
Bionik/Bionik	66	200	2647	2.49	Entire Period: HR=4.21 (95% CI 3.29, 5.40), p<0.001
Conserve Plus/Conserve Plus	17	63	1047	1.62	Entire Period: HR=2.23 (95% CI 1.38, 3.60), p=0.001
Cormet/Cormet	160	626	9476	1.69	Entire Period: HR=2.61 (95% CI 2.21, 3.07), p<0.001
Durom/Durom	129	847	14140	0.91	0 - 4.5Yr: HR=2.48 (95% CI 1.91, 3.23), p<0.001 4.5Yr+: HR=1.14 (95% CI 0.89, 1.47), p=0.289
Recap/Recap	33	196	2946	1.12	0 - 6Mth: HR=2.75 (95% CI 1.22, 6.21), p=0.014 6Mth - 1.5Yr: HR=6.77 (95% CI 3.29, 13.90), p<0.001 1.5Yr+: HR=1.31 (95% CI 0.83, 2.06), p=0.244
*Cormet 2000 HAP	31	95	1584	1.96	Entire Period: HR=3.48 (95% CI 2.44, 4.96), p<0.001

Note: Components have been compared to all other total resurfacing hip components

*Head Component

Table IP11 Cumulative Percent Revision of Total Resurfacing Hip Prostheses Identified as having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Identified and No Longer Used	.	.	.	.	.
ASR/ASR	3.4 (2.5, 4.6)	7.2 (5.9, 8.8)	15.5 (13.5, 17.7)	29.9 (27.4, 32.7)	37.9 (35.1, 40.9)
Bionik/Bionik	3.5 (1.7, 7.2)	12.5 (8.7, 18.0)	18.6 (13.8, 24.7)	27.8 (22.1, 34.6)	
Conserve Plus/Conserve Plus	4.8 (1.6, 14.0)	6.4 (2.4, 16.1)	9.6 (4.4, 20.1)	14.4 (7.8, 25.9)	27.9 (18.3, 41.0)
Cormet/Cormet	2.1 (1.2, 3.6)	5.9 (4.3, 8.1)	10.0 (7.9, 12.6)	17.4 (14.6, 20.7)	28.7 (24.8, 33.0)
Durom/Durom	3.3 (2.3, 4.8)	5.6 (4.2, 7.3)	7.7 (6.1, 9.7)	11.0 (9.0, 13.3)	15.9 (13.5, 18.7)
Recap/Recap	5.1 (2.8, 9.3)	8.7 (5.5, 13.6)	10.2 (6.7, 15.4)	14.5 (10.2, 20.3)	
*Cormet 2000 HAP	6.3 (2.9, 13.5)	8.4 (4.3, 16.1)	9.5 (5.0, 17.4)	21.1 (14.2, 30.7)	32.6 (24.0, 43.2)

Note: Components have been compared to all other total resurfacing hip components

*Head Component

Table IP12 Yearly Usage of Total Resurfacing Hip Prostheses Identified as having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ASR/ASR	1168	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bionik/Bionik	178	20	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Conserve Plus/Conserve Plus	63	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cormet/Cormet	558	50	10	4	4	.	.	.	.	.	.	.	.	.	.	.	.
Durom/Durom	813	24	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Recap/Recap	177	16	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*Cormet 2000 HAP	95	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: Components have been compared to all other total resurfacing hip components

*Head Component



Prostheses with Higher than Anticipated Rates of Revision

Primary Partial Knee Replacement

PATELLA/TROCHLEA

There are no newly identified patella/trochlea prostheses.

Table IP13 Revision Rate of Patella-Trochlear Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Patella/Trochlear	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Identified and No Longer Used					
Lubinus/Lubinus	24	39	416	5.77	Entire Period: HR=1.89 (95% CI 1.21, 2.95), p=0.005
PFC Sigma/Sigma HP	51	117	1062	4.80	Entire Period: HR=1.67 (95% CI 1.24, 2.26), p<0.001
**LCS	233	413	4525	5.15	Entire Period: HR=1.76 (95% CI 1.47, 2.12), p<0.001

Note: Components have been compared to all other modern patella-trochlear knee components

**Trochlear Component

Table IP14 Cumulative Percent Revision of Patella-Trochlear Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs
Identified and No Longer Used				
Lubinus/Lubinus	5.1 (1.3, 19.0)	18.1 (9.1, 34.3)	20.9 (11.0, 37.6)	35.0 (22.0, 52.7)
PFC Sigma/Sigma HP	4.3 (1.8, 10.0)	14.7 (9.4, 22.6)	20.9 (14.5, 29.6)	37.7 (29.3, 47.4)
**LCS	3.9 (2.4, 6.2)	11.9 (9.1, 15.4)	20.7 (17.1, 25.0)	40.9 (36.2, 46.0)

Note: **Trochlear Component

Table IP15 Yearly Usage of Patella-Trochlear Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lubinus/Lubinus	39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PFC Sigma/Sigma HP	25	16	15	12	20	7	7	7	8	.	.	.	.	.	.	.	.
**LCS	413	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: **Trochlear Component



Prostheses with Higher than Anticipated Rates of Revision

UNICOMPARTMENTAL

There are no newly identified unicompartmental prostheses.

Table IP16 Revision Rate of Unicompartmental Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Identified and No Longer Used	.	.	.	.	
Advance/Advance	16	37	366	4.37	0 - 2Yr: HR=6.10 (95% CI 2.90, 12.81), p<0.001 2Yr - 4.5Yr: HR=6.54 (95% CI 2.45, 17.45), p<0.001 4.5Yr+: HR=1.56 (95% CI 0.65, 3.76), p=0.318
BalanSys Uni/BalanSys Uni Convex	22	54	651	3.38	Entire Period: HR=2.21 (95% CI 1.45, 3.36), p<0.001
BalanSys Uni/BalanSys Uni Mobile	72	199	2680	2.69	0 - 2Yr: HR=3.20 (95% CI 2.10, 4.86), p<0.001 2Yr+: HR=1.50 (95% CI 1.13, 1.98), p=0.004
Eius/Eius	56	142	1957	2.86	0 - 2Yr: HR=1.99 (95% CI 1.13, 3.51), p=0.017 2Yr - 2.5Yr: HR=5.73 (95% CI 2.36, 13.88), p<0.001 2.5Yr+: HR=1.36 (95% CI 0.99, 1.87), p=0.054
Freedom PKR Active/Freedom PKR Active	549	1505	17813	3.08	0 - 6Mth: HR=0.48 (95% CI 0.23, 1.02), p=0.055 6Mth - 9Mth: HR=1.16 (95% CI 0.60, 2.26), p=0.653 9Mth - 1Yr: HR=1.69 (95% CI 0.95, 3.02), p=0.075 1Yr - 1.5Yr: HR=2.45 (95% CI 1.71, 3.51), p<0.001 1.5Yr - 2Yr: HR=1.71 (95% CI 1.05, 2.79), p=0.031 2Yr - 3.5Yr: HR=2.53 (95% CI 1.91, 3.35), p<0.001 3.5Yr - 7Yr: HR=3.44 (95% CI 2.90, 4.09), p<0.001 7Yr - 8.5Yr: HR=2.24 (95% CI 1.63, 3.09), p<0.001 8.5Yr - 9Yr: HR=4.47 (95% CI 2.99, 6.69), p<0.001 9Yr - 10Yr: HR=3.42 (95% CI 2.45, 4.78), p<0.001 10Yr - 13.5Yr: HR=2.16 (95% CI 1.73, 2.68), p<0.001 13.5Yr - 14.5Yr: HR=1.12 (95% CI 0.64, 1.97), p=0.687 14.5Yr - 15Yr: HR=4.49 (95% CI 2.61, 7.70), p<0.001 15Yr+: HR=1.19 (95% CI 0.87, 1.65), p=0.280
GMK-UNI/GMK-UNI	51	168	1332	3.83	0 - 2Yr: HR=3.06 (95% CI 1.97, 4.75), p<0.001 2Yr - 2.5Yr: HR=7.50 (95% CI 3.53, 15.90), p<0.001 2.5Yr - 4.5Yr: HR=4.62 (95% CI 2.72, 7.85), p<0.001 4.5Yr - 5.5Yr: HR=1.75 (95% CI 0.43, 7.02), p=0.432 5.5Yr+: HR=1.08 (95% CI 0.54, 2.17), p=0.818
Uniglide/Uniglide	214	756	9782	2.19	0 - 2Yr: HR=2.23 (95% CI 1.72, 2.89), p<0.001 2Yr - 2.5Yr: HR=3.27 (95% CI 1.87, 5.71), p<0.001 2.5Yr+: HR=1.21 (95% CI 1.02, 1.43), p=0.029
**Preservation Mobile	171	400	5552	3.08	0 - 1.5Yr: HR=2.74 (95% CI 1.96, 3.84), p<0.001 1.5Yr - 3Yr: HR=3.80 (95% CI 2.59, 5.58), p<0.001 3Yr+: HR=1.48 (95% CI 1.22, 1.79), p<0.001

Note: Components have been compared to all other modern unicompartmental knee components

**Tibial Component



Prostheses with Higher than Anticipated Rates of Revision

Table IP17 Cumulative Percent Revision of Unicompartmental Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Identified and No Longer Used					
Advance/Advance	10.8 (4.2, 26.3)	27.0 (15.6, 44.4)	35.8 (22.5, 53.6)	41.6 (27.5, 59.4)	45.8 (30.7, 64.0)
BalanSys Uni/BalanSys Uni Convex	1.9 (0.3, 12.4)	7.4 (2.8, 18.5)	7.4 (2.8, 18.5)	24.8 (15.2, 38.9)	
BalanSys Uni/BalanSys Uni Mobile	7.0 (4.2, 11.6)	13.1 (9.1, 18.6)	14.6 (10.4, 20.4)	21.7 (16.5, 28.2)	
Eius/Eius	4.9 (2.4, 10.1)	12.8 (8.3, 19.5)	17.8 (12.4, 25.2)	22.3 (16.3, 30.2)	42.0 (33.8, 51.3)
Freedom PKR Active/Freedom PKR Active	1.9 (1.3, 2.7)	8.0 (6.7, 9.5)	13.8 (12.1, 15.6)	27.1 (24.9, 29.5)	45.2 (41.9, 48.6)
GMK-UNI/GMK-UNI	6.5 (3.7, 11.5)	17.3 (12.4, 23.9)	25.2 (19.3, 32.5)	29.8 (23.4, 37.4)	
Uniglide/Uniglide	4.8 (3.5, 6.6)	10.8 (8.8, 13.3)	13.0 (10.8, 15.6)	19.8 (17.0, 22.9)	34.3 (30.4, 38.6)
**Preservation Mobile	5.3 (3.5, 7.9)	15.5 (12.3, 19.5)	19.1 (15.6, 23.3)	27.2 (23.1, 31.9)	45.0 (39.9, 50.4)

Note: **Tibial Component

Table IP18 Yearly Usage of Unicompartmental Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Advance/Advance	37	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BalanSys Uni/BalanSys Uni Convex	26	7	9	1	3	3	5	.	.	.	.	.	.	.	.	.	.
BalanSys Uni/BalanSys Uni Mobile	195	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eius/Eius	140	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Freedom PKR Active/Freedom PKR Active	1098	102	75	68	63	51	31	12	5	.	.	.	.	.	.	.	.
GMK-UNI/GMK-UNI	15	2	.	21	22	16	19	17	12	29	3	8	3	1	.	.	.
Uniglide/Uniglide	614	30	38	25	22	9	5	8	3	.	1	1	.	.	.	.	.
**Preservation Mobile	400	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: **Tibial Component



Prostheses with Higher than Anticipated Rates of Revision

Primary Total Knee Replacement

There are no newly identified total knee replacement prostheses that are still used.

The Optetrak Logic PS femoral component is identified as having a higher rate of revision than other total knee replacement procedures. It has not been used since 2023.

Table IP19 Revision Rate of Total Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used					
ACS (cless)/ACS Fixed	154	3058	22301	0.69	Entire Period: HR=1.27 (95% CI 1.09, 1.49), p=0.002
Active Knee (cless)/Active Knee	834	7382	94948	0.88	0 - 1Yr: HR=1.04 (95% CI 0.84, 1.30), p=0.697 1Yr - 2.5Yr: HR=1.77 (95% CI 1.51, 2.08), p<0.001 2.5Yr - 3Yr: HR=1.19 (95% CI 0.78, 1.82), p=0.415 3Yr+: HR=2.22 (95% CI 2.04, 2.41), p<0.001
Apex Knee CR (cless)/Apex Knee (cless)	32	541	4560	0.70	0 - 1Yr: HR=2.39 (95% CI 1.39, 4.12), p=0.001 1Yr - 3Yr: HR=1.77 (95% CI 1.03, 3.05), p=0.039 3Yr+: HR=0.57 (95% CI 0.26, 1.27), p=0.168
Attune PS (ctd)/Attune (cless)	58	1264	4132	1.40	Entire Period: HR=1.94 (95% CI 1.50, 2.51), p<0.001
Columbus/Columbus	324	9316	45350	0.71	Entire Period: HR=1.18 (95% CI 1.06, 1.32), p=0.002
E.Motion/E.Motion	80	1048	9710	0.82	0 - 1.5Yr: HR=2.52 (95% CI 1.84, 3.45), p<0.001 1.5Yr+: HR=1.23 (95% CI 0.91, 1.67), p=0.183
Journey Oxinium/Journey	452	3034	37297	1.21	0 - 3Mth: HR=0.26 (95% CI 0.08, 0.80), p=0.019 3Mth - 1.5Yr: HR=2.36 (95% CI 1.89, 2.95), p<0.001 1.5Yr - 2.5Yr: HR=2.14 (95% CI 1.59, 2.88), p<0.001 2.5Yr - 3Yr: HR=1.63 (95% CI 0.92, 2.87), p=0.093 3Yr+: HR=3.12 (95% CI 2.79, 3.49), p<0.001
Mutars/Mutars	96	545	1720	5.58	Entire Period: HR=4.52 (95% CI 3.69, 5.54), p<0.001
Trekking/Trekking	83	1311	11383	0.73	0 - 1.5Yr: HR=1.91 (95% CI 1.37, 2.64), p<0.001 1.5Yr+: HR=1.21 (95% CI 0.91, 1.62), p=0.182
*Legion Oxinium FS	51	560	3632	1.40	0 - 3Mth: HR=6.93 (95% CI 4.18, 11.51), p<0.001 3Mth - 6Mth: HR=5.73 (95% CI 2.57, 12.77), p<0.001 6Mth - 1.5Yr: HR=1.86 (95% CI 0.97, 3.58), p=0.062 1.5Yr+: HR=1.64 (95% CI 1.07, 2.52), p=0.023
**Legion Revision Tibial Baseplate	89	1581	8776	1.01	0 - 6Mth: HR=3.38 (95% CI 2.39, 4.79), p<0.001 6Mth - 1.5Yr: HR=0.93 (95% CI 0.54, 1.60), p=0.797 1.5Yr+: HR=1.35 (95% CI 1.01, 1.82), p=0.046
Identified and No Longer Used					
+*Optetrak Logic PS	159	1751	10930	1.45	0 - 2Yr: HR=1.49 (95% CI 1.12, 1.99), p=0.006 2Yr - 2.5Yr: HR=2.05 (95% CI 1.13, 3.70), p=0.018 2.5Yr - 3Yr: HR=0.97 (95% CI 0.36, 2.59), p=0.955 3Yr - 3.5Yr: HR=2.96 (95% CI 1.59, 5.51), p<0.001 3.5Yr - 4.5Yr: HR=5.05 (95% CI 3.43, 7.44), p<0.001 4.5Yr - 9Yr: HR=4.66 (95% CI 3.52, 6.17), p<0.001 9Yr+: HR=15.96 (95% CI 9.27, 27.47), p<0.001
ACS/ACS Mobile PC (cless)	32	131	1222	2.62	Entire Period: HR=5.19 (95% CI 3.67, 7.34), p<0.001
AMK/AMK	27	203	2615	1.03	Entire Period: HR=2.39 (95% CI 1.64, 3.49), p<0.001
Advance/Advance	85	1009	10032	0.85	Entire Period: HR=1.69 (95% CI 1.37, 2.10), p<0.001
Buechel-Pappas/Buechel-Pappas	60	479	6143	0.98	Entire Period: HR=2.06 (95% CI 1.60, 2.65), p<0.001



Prostheses with Higher than Anticipated Rates of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
E.Motion (cless)/E.Motion Pro (ctd)	11	205	934	1.18	Entire Period: HR=1.82 (95% CI 1.01, 3.29), p=0.046
Eska RP/Eska RP	9	40	424	2.12	Entire Period: HR=4.83 (95% CI 2.52, 9.28), p<0.001
Evolis (cless)/Evolis (cless)	10	87	1020	0.98	Entire Period: HR=1.98 (95% CI 1.06, 3.67), p=0.031
Gemini MK II/Gemini MK II	8	21	228	3.51	Entire Period: HR=7.35 (95% CI 3.68, 14.70), p<0.001
Genesis (ctd)/Genesis (ctd)	11	62	742	1.48	Entire Period: HR=3.61 (95% CI 2.00, 6.52), p<0.001
Genesis II CR (cless)/Profix Mobile (ctd)	39	241	3230	1.21	Entire Period: HR=2.86 (95% CI 2.09, 3.92), p<0.001
Genesis II Oxinium CR (cless)/Genesis II	48	110	1084	4.43	0 - 1Yr: HR=10.78 (95% CI 6.25, 18.57), p<0.001
	.	.	.	.	1Yr - 1.5Yr: HR=24.14 (95% CI 13.36, 43.64), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=25.79 (95% CI 15.54, 42.82), p<0.001
	.	.	.	.	2.5Yr+: HR=2.77 (95% CI 1.44, 5.33), p=0.002
Genesis II Oxinium CR (cless)/Profix Mobile	58	88	674	8.60	0 - 6Mth: HR=7.03 (95% CI 2.64, 18.75), p<0.001
	.	.	.	.	6Mth - 1.5Yr: HR=46.32 (95% CI 32.72, 65.55), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=34.37 (95% CI 16.37, 72.14), p<0.001
	.	.	.	.	2Yr+: HR=6.70 (95% CI 4.03, 11.11), p<0.001
Genesis II Oxinium PS (ctd)/Genesis II (cless)	17	56	601	2.83	0 - 1Yr: HR=17.39 (95% CI 9.62, 31.41), p<0.001
	.	.	.	.	1Yr - 1.5Yr: HR=8.39 (95% CI 2.10, 33.56), p=0.002
	.	.	.	.	1.5Yr - 3Yr: HR=4.25 (95% CI 1.06, 16.98), p=0.040
	.	.	.	.	3Yr+: HR=1.09 (95% CI 0.27, 4.35), p=0.904
Genesis II Oxinium PS (ctd)/Genesis II (keel)	72	269	3363	2.14	Entire Period: HR=4.64 (95% CI 3.68, 5.84), p<0.001
HLS Noetos/HLS Noetos	45	294	3497	1.29	Entire Period: HR=2.72 (95% CI 2.03, 3.65), p<0.001
IB II/IB II	42	199	2693	1.56	0 - 2Yr: HR=0.93 (95% CI 0.30, 2.87), p=0.894
	.	.	.	.	2Yr - 2.5Yr: HR=5.38 (95% CI 1.74, 16.62), p=0.003
	.	.	.	.	2.5Yr+: HR=5.41 (95% CI 3.90, 7.51), p<0.001
Interax/Interax	12	52	533	2.25	0 - 3Yr: HR=0.89 (95% CI 0.13, 6.35), p=0.911
	.	.	.	.	3Yr+: HR=9.56 (95% CI 5.30, 17.26), p<0.001
Maxim (cless)/Vanguard (ctd)	75	413	5881	1.28	0 - 2Yr: HR=1.60 (95% CI 0.91, 2.81), p=0.105
	.	.	.	.	2Yr - 3Yr: HR=1.30 (95% CI 0.42, 4.03), p=0.650
	.	.	.	.	3Yr+: HR=3.59 (95% CI 2.78, 4.63), p<0.001
Nexgen LPS Flex (cless)/Nexgen	120	2114	18777	0.64	0 - 1.5Yr: HR=2.02 (95% CI 1.57, 2.60), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=1.73 (95% CI 1.00, 2.99), p=0.048
	.	.	.	.	2Yr - 2.5Yr: HR=1.37 (95% CI 0.71, 2.64), p=0.346
	.	.	.	.	2.5Yr+: HR=0.76 (95% CI 0.55, 1.05), p=0.101
Optetrak Logic CR/Optetrak Logic	256	1887	12471	2.05	0 - 1.5Yr: HR=1.10 (95% CI 0.76, 1.59), p=0.615
	.	.	.	.	1.5Yr - 2Yr: HR=2.36 (95% CI 1.42, 3.92), p<0.001
	.	.	.	.	2Yr - 3.5Yr: HR=3.76 (95% CI 2.85, 4.97), p<0.001
	.	.	.	.	3.5Yr - 6.5Yr: HR=7.52 (95% CI 6.16, 9.18), p<0.001
	.	.	.	.	6.5Yr - 7Yr: HR=14.78 (95% CI 9.45, 23.10), p<0.001
	.	.	.	.	7Yr+: HR=10.54 (95% CI 7.82, 14.20), p<0.001
Optetrak-CR (ctd)/Optetrak (ctd)	14	92	1013	1.38	Entire Period: HR=3.19 (95% CI 1.89, 5.38), p<0.001
Optetrak-PS/Optetrak	425	2410	30127	1.41	0 - 1Mth: HR=0.22 (95% CI 0.03, 1.56), p=0.130
	.	.	.	.	1Mth - 1.5Yr: HR=1.90 (95% CI 1.47, 2.47), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=2.83 (95% CI 2.11, 3.80), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=1.93 (95% CI 1.07, 3.50), p=0.029
	.	.	.	.	3Yr - 5.5Yr: HR=2.27 (95% CI 1.69, 3.04), p<0.001



Prostheses with Higher than Anticipated Rates of Revision

Femoral/Tibial	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
	.	.	.	.	5.5Yr+: HR=4.44 (95% CI 3.93, 5.02), p<0.001
Optetrak-PS/Optetrak RBK	116	1127	12619	0.92	Entire Period: HR=2.01 (95% CI 1.67, 2.41), p<0.001
Optetrak-PS/Optetrak-PS	14	55	588	2.38	Entire Period: HR=5.57 (95% CI 3.30, 9.40), p<0.001
PFC Sigma PS (ctd)/MBT (cless)	26	316	3609	0.72	Entire Period: HR=1.47 (95% CI 1.01, 2.16), p=0.046
Profix Oxinium (cless)/Profix	33	75	794	4.16	0 - 9Mth: HR=5.96 (95% CI 2.24, 15.88), p<0.001
	.	.	.	.	9Mth - 2Yr: HR=29.49 (95% CI 19.21, 45.25), p<0.001
	.	.	.	.	2Yr+: HR=3.12 (95% CI 1.56, 6.24), p=0.001
Profix Oxinium (cless)/Profix Mobile	71	158	1474	4.82	0 - 9Mth: HR=3.10 (95% CI 1.16, 8.27), p=0.023
	.	.	.	.	9Mth - 1.5Yr: HR=29.29 (95% CI 20.33, 42.20), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=19.62 (95% CI 10.19, 37.75), p<0.001
	.	.	.	.	2Yr - 2.5Yr: HR=38.42 (95% CI 22.72, 64.99), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=24.32 (95% CI 10.91, 54.21), p<0.001
	.	.	.	.	3Yr+: HR=2.36 (95% CI 1.22, 4.53), p=0.010
Profix Oxinium (ctd)/Profix (cless)	15	100	1439	1.04	Entire Period: HR=2.05 (95% CI 1.23, 3.39), p=0.005
Profix Oxinium (ctd)/Profix Mobile	30	228	3462	0.87	0 - 1.5Yr: HR=2.14 (95% CI 1.07, 4.29), p=0.031
	.	.	.	.	1.5Yr - 2.5Yr: HR=4.23 (95% CI 2.02, 8.85), p<0.001
	.	.	.	.	2.5Yr - 3.5Yr: HR=1.80 (95% CI 0.45, 7.20), p=0.406
	.	.	.	.	3.5Yr - 5.5Yr: HR=3.77 (95% CI 1.69, 8.39), p=0.001
	.	.	.	.	5.5Yr+: HR=0.77 (95% CI 0.37, 1.63), p=0.500
Profix/Profix Mobile	117	1005	13986	0.84	0 - 1.5Yr: HR=2.84 (95% CI 2.08, 3.87), p<0.001
	.	.	.	.	1.5Yr - 2.5Yr: HR=3.30 (95% CI 2.15, 5.06), p<0.001
	.	.	.	.	2.5Yr - 3Yr: HR=1.32 (95% CI 0.42, 4.09), p=0.634
	.	.	.	.	3Yr - 6.5Yr: HR=2.11 (95% CI 1.39, 3.20), p<0.001
	.	.	.	.	6.5Yr+: HR=1.09 (95% CI 0.76, 1.55), p=0.650
Rotaglide Plus/Rotaglide Plus	89	631	8491	1.05	0 - 1.5Yr: HR=1.36 (95% CI 0.77, 2.39), p=0.288
	.	.	.	.	1.5Yr - 2Yr: HR=3.72 (95% CI 1.87, 7.43), p<0.001
	.	.	.	.	2Yr+: HR=2.59 (95% CI 2.05, 3.29), p<0.001
SAL/SAL	15	56	779	1.92	0 - 8.5Yr: HR=1.69 (95% CI 0.63, 4.49), p=0.296
	.	.	.	.	8.5Yr+: HR=9.48 (95% CI 5.26, 17.08), p<0.001
Score (cless)/Score (cless)	280	3026	27352	1.02	Entire Period: HR=1.91 (95% CI 1.70, 2.15), p<0.001
Score (cless)/Score (ctd)	135	1679	13592	0.99	Entire Period: HR=1.90 (95% CI 1.61, 2.25), p<0.001
Scorpio NRG PS (cless)/Series 7000 (cless)	99	1172	14003	0.71	Entire Period: HR=1.33 (95% CI 1.09, 1.62), p=0.004
TC-Plus (cless)/TC-Plus (ctd)	8	63	780	1.03	Entire Period: HR=2.46 (95% CI 1.23, 4.92), p=0.010
Trac/Trac	27	138	1748	1.54	Entire Period: HR=3.36 (95% CI 2.31, 4.90), p<0.001
Vanguard PS/Regenerex	46	465	4581	1.00	0 - 1.5Yr: HR=2.54 (95% CI 1.60, 4.04), p<0.001
	.	.	.	.	1.5Yr - 2Yr: HR=2.84 (95% CI 1.18, 6.82), p=0.019
	.	.	.	.	2Yr+: HR=1.58 (95% CI 1.05, 2.37), p=0.029
Vanguard PS/Vanguard	407	5405	55751	0.73	0 - 1.5Yr: HR=1.96 (95% CI 1.67, 2.30), p<0.001
	.	.	.	.	1.5Yr+: HR=1.34 (95% CI 1.18, 1.52), p<0.001
*LCS Duofix	720	4866	62806	1.15	Entire Period: HR=2.50 (95% CI 2.32, 2.69), p<0.001
*LCS PS	80	638	7223	1.11	Entire Period: HR=2.46 (95% CI 1.97, 3.06), p<0.001
*Renasys	21	121	1645	1.28	Entire Period: HR=2.91 (95% CI 1.90, 4.47), p<0.001

Note: Components have been compared to all other modern total knee components

*Femoral Component

**Tibial Component



Prostheses with Higher than Anticipated Rates of Revision

Table IP20 Cumulative Percent Revision of Total Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Re-Identified and Still Used					
ACS (cless)/ACS Fixed	1.3 (1.0, 1.8)	3.7 (3.0, 4.4)	4.3 (3.7, 5.2)	5.7 (4.9, 6.8)	
Active Knee (cless)/Active Knee	1.1 (0.9, 1.4)	3.5 (3.1, 4.0)	5.0 (4.5, 5.5)	8.6 (8.0, 9.3)	15.3 (14.2, 16.4)
Apex Knee CR (cless)/Apex Knee (cless)	2.4 (1.4, 4.2)	4.9 (3.4, 7.1)	5.5 (3.9, 7.9)	6.3 (4.5, 8.8)	
Attune PS (ctd)/Attune (cless)	2.0 (1.3, 2.9)	4.5 (3.5, 6.0)			
Columbus/Columbus	1.2 (1.0, 1.4)	2.7 (2.4, 3.1)	3.8 (3.3, 4.2)	5.9 (5.1, 6.8)	
E.Motion/E.Motion	2.5 (1.7, 3.6)	5.6 (4.3, 7.2)	6.4 (5.1, 8.1)	8.4 (6.8, 10.4)	
Journey Oxinium/Journey	1.4 (1.0, 1.9)	4.6 (3.9, 5.4)	6.5 (5.6, 7.4)	11.2 (10.1, 12.4)	
Mutars/Mutars	7.5 (5.5, 10.3)	16.3 (13.1, 20.3)	22.6 (18.4, 27.6)		
Trekking/Trekking	2.2 (1.5, 3.2)	4.0 (3.1, 5.2)	4.9 (3.9, 6.2)	6.5 (5.2, 8.1)	
*Legion Oxinium FS	4.9 (3.4, 7.0)	7.3 (5.4, 9.9)	8.7 (6.5, 11.5)	10.6 (8.0, 14.0)	
**Legion Revision Tibial Baseplate	2.6 (1.9, 3.5)	4.4 (3.5, 5.6)	5.4 (4.3, 6.8)	7.8 (6.2, 9.9)	
Identified and No Longer Used					
+*Optetrak Logic PS	1.7 (1.2, 2.4)	3.5 (2.7, 4.5)	6.3 (5.2, 7.6)	16.7 (13.6, 20.3)	
ACS/ACS Mobile PC (cless)	7.7 (4.2, 13.8)	19.3 (13.5, 27.2)	20.1 (14.2, 28.2)	24.5 (17.9, 33.0)	
AMK/AMK	1.0 (0.2, 3.9)	5.0 (2.7, 9.1)	6.6 (3.9, 11.1)	11.4 (7.5, 16.9)	18.3 (12.1, 27.1)
Advance/Advance	2.0 (1.3, 3.1)	5.3 (4.1, 6.9)	6.4 (5.0, 8.1)	8.5 (6.9, 10.5)	
Buechel-Pappas/Buechel-Pappas	1.9 (1.0, 3.6)	5.7 (3.9, 8.2)	7.9 (5.8, 10.7)	10.5 (8.0, 13.7)	
E.Motion (cless)/E.Motion Pro (ctd)	2.0 (0.7, 5.1)	4.7 (2.5, 8.9)	6.3 (3.5, 11.3)		
Eska RP/Eska RP	7.5 (2.5, 21.5)	12.7 (5.5, 27.9)	18.2 (9.1, 34.5)	21.1 (11.1, 37.9)	
Evolis (cless)/Evolis (cless)	2.3 (0.6, 8.9)	8.0 (3.9, 16.1)	10.3 (5.5, 18.9)	11.5 (6.4, 20.4)	
Gemini MK II/Gemini MK II	9.5 (2.5, 33.0)	14.3 (4.8, 38.0)	23.8 (10.7, 48.1)	23.8 (10.7, 48.1)	
Genesis (ctd)/Genesis (ctd)	0.0 (0.0, 0.0)	6.7 (2.6, 16.8)	10.0 (4.6, 20.9)	16.1 (8.6, 28.9)	24.1 (13.3, 41.4)
Genesis II CR (cless)/Profix Mobile (ctd)	2.9 (1.4, 6.1)	7.7 (4.9, 11.9)	9.4 (6.3, 14.0)	14.7 (10.7, 20.1)	17.2 (12.7, 23.1)
Genesis II Oxinium CR (cless)/Genesis II	11.8 (7.0, 19.5)	38.9 (30.4, 48.7)	39.8 (31.3, 49.7)	42.8 (34.0, 52.7)	
Genesis II Oxinium CR (cless)/Profix Mobile	24.0 (16.3, 34.4)	52.8 (42.8, 63.5)	57.4 (47.4, 67.9)	61.1 (51.0, 71.3)	67.1 (56.7, 77.1)
Genesis II Oxinium PS (ctd)/Genesis II (cless)	19.6 (11.4, 32.7)	26.8 (17.1, 40.4)	30.4 (20.1, 44.2)	30.4 (20.1, 44.2)	
Genesis II Oxinium PS (ctd)/Genesis II (keel)	4.5 (2.6, 7.7)	14.9 (11.1, 19.7)	19.0 (14.8, 24.3)	22.6 (18.0, 28.2)	
HLS Noetos/HLS Noetos	3.4 (1.8, 6.2)	8.6 (5.9, 12.4)	10.7 (7.7, 14.9)	13.5 (10.0, 18.1)	
IB II/IB II	0.0 (0.0, 0.0)	3.6 (1.7, 7.3)	7.8 (4.8, 12.7)	15.9 (11.3, 22.1)	27.2 (20.1, 36.1)
Interax/Interax	0.0 (0.0, 0.0)	2.0 (0.3, 13.4)	8.3 (3.2, 20.7)	13.0 (6.0, 26.8)	
Maxim (cless)/Vanguard (ctd)	1.2 (0.5, 2.9)	3.7 (2.2, 6.0)	6.0 (4.0, 8.8)	9.4 (6.9, 12.8)	24.3 (19.6, 29.9)
Nexgen LPS Flex (cless)/Nexgen	2.4 (1.8, 3.2)	4.3 (3.5, 5.3)	5.0 (4.1, 6.0)	6.0 (5.0, 7.1)	
Optetrak Logic CR/Optetrak Logic	1.1 (0.7, 1.6)	4.3 (3.5, 5.4)	8.3 (7.1, 9.7)	21.5 (18.6, 24.7)	
Optetrak-CR (ctd)/Optetrak (ctd)	0.0 (0.0, 0.0)	6.6 (3.0, 14.0)	10.1 (5.4, 18.5)	12.8 (7.3, 22.0)	
Optetrak-PS/Optetrak	1.5 (1.1, 2.0)	4.8 (4.0, 5.7)	6.4 (5.5, 7.5)	12.2 (10.9, 13.6)	23.6 (21.5, 26.0)
Optetrak-PS/Optetrak RBK	1.8 (1.2, 2.7)	4.6 (3.5, 6.0)	6.0 (4.7, 7.5)	9.0 (7.4, 10.9)	
Optetrak-PS/Optetrak-PS	1.8 (0.3, 12.2)	16.4 (8.9, 29.1)	20.0 (11.6, 33.3)	24.4 (14.9, 38.5)	
PFC Sigma PS (ctd)/MBT (cless)	2.2 (1.1, 4.6)	5.4 (3.4, 8.6)	7.1 (4.7, 10.5)	7.4 (5.0, 10.9)	
Profix Oxinium (cless)/Profix	13.3 (7.4, 23.4)	36.1 (26.4, 48.1)	37.5 (27.6, 49.5)	42.0 (31.7, 54.2)	46.0 (35.1, 58.5)
Profix Oxinium (cless)/Profix Mobile	9.0 (5.4, 14.6)	40.2 (32.9, 48.3)	41.5 (34.2, 49.7)	46.0 (38.4, 54.3)	
Profix Oxinium (ctd)/Profix (cless)	4.0 (1.5, 10.3)	8.0 (4.1, 15.4)	9.0 (4.8, 16.6)	11.2 (6.4, 19.4)	16.6 (10.3, 26.2)
Profix Oxinium (ctd)/Profix Mobile	2.2 (0.9, 5.2)	7.2 (4.4, 11.4)	9.4 (6.3, 14.1)	11.8 (8.2, 16.8)	14.3 (10.2, 20.0)
Profix/Profix Mobile	2.3 (1.5, 3.4)	6.5 (5.1, 8.2)	8.2 (6.6, 10.1)	10.0 (8.3, 12.1)	13.4 (11.2, 16.0)
Rotaglide Plus/Rotaglide Plus	0.8 (0.3, 1.9)	4.1 (2.8, 6.0)	5.8 (4.2, 8.0)	11.1 (8.8, 14.0)	18.2 (14.8, 22.2)
SAL/SAL	0.0 (0.0, 0.0)	1.9 (0.3, 12.6)	1.9 (0.3, 12.6)	14.8 (7.3, 28.6)	37.5 (24.0, 55.2)
Score (cless)/Score (cless)	1.5 (1.1, 2.0)	4.6 (3.9, 5.4)	6.3 (5.5, 7.3)	9.9 (8.7, 11.1)	
Score (cless)/Score (ctd)	1.5 (1.0, 2.2)	3.8 (3.0, 4.9)	5.6 (4.6, 6.8)	9.1 (7.7, 10.8)	



Prostheses with Higher than Anticipated Rates of Revision

CPR	1 Yr	3 Yrs	5 Yrs	10 Yrs	20 Yrs
Scorpio NRG PS (class)/Series 7000 (class)	1.2 (0.7, 2.0)	4.9 (3.8, 6.3)	6.2 (4.9, 7.7)	7.4 (6.0, 9.0)	
TC-Plus (class)/TC-Plus (ctd)	1.6 (0.2, 10.7)	8.4 (3.6, 19.1)	8.4 (3.6, 19.1)	14.4 (7.4, 26.9)	14.4 (7.4, 26.9)
Trac/Trac	2.2 (0.7, 6.6)	5.9 (3.0, 11.4)	9.0 (5.2, 15.2)	15.1 (9.9, 22.8)	
Vanguard PS/Regenerex	3.2 (2.0, 5.3)	7.1 (5.1, 9.9)	7.8 (5.7, 10.6)	9.4 (7.0, 12.6)	
Vanguard PS/Vanguard	1.8 (1.5, 2.2)	4.2 (3.7, 4.8)	5.2 (4.7, 5.9)	7.4 (6.7, 8.1)	
*LCS Duofix	1.5 (1.2, 1.9)	5.9 (5.3, 6.6)	9.7 (8.9, 10.6)	13.0 (12.1, 14.1)	
*LCS PS	2.1 (1.2, 3.5)	6.7 (5.0, 9.0)	8.5 (6.6, 11.0)	12.0 (9.6, 14.8)	
*Renasys	2.5 (0.8, 7.5)	4.2 (1.8, 9.8)	8.5 (4.6, 15.1)	11.2 (6.7, 18.5)	

Note: *Femoral Component

**Tibial Component

Table IP21 Yearly Usage of Total Knee Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ACS (class)/ACS Fixed	.	.	41	118	284	337	331	238	266	259	319	209	169	127	180	144	36
Active Knee (class)/Active Knee	4188	479	601	500	427	319	336	176	91	35	21	24	17	1	39	64	64
Apex Knee CR (class)/Apex Knee (class)	.	.	.	69	83	118	78	11	3	29	53	6	23	48	7	2	11
Attune PS (ctd)/Attune (class)	.	.	.	.	.	.	.	.	.	.	1	38	530	287	136	223	49
Columbus/Columbus	534	135	135	108	69	36	60	118	358	670	828	1115	1104	1080	1084	1077	805
E.Motion/E.Motion	12	87	114	129	171	71	93	87	101	64	45	12	15	14	13	14	6
Journey Oxinium/Journey	1567	464	334	343	325	.	.	.	.	.	.	.	.	.	.	.	1
Mutars/Mutars	.	.	.	2	12	8	15	14	26	32	63	56	62	71	75	49	60
Trekking/Trekking	.	35	102	133	107	108	106	129	216	143	100	65	20	18	10	12	7
*Legion Oxinium FS	76	28	24	31	30	18	23	25	24	37	30	37	53	38	41	30	15
**Legion Revision Tibial Baseplate	137	56	47	63	54	47	38	50	50	87	93	129	173	147	152	127	131
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
+*Optetrak Logic PS	.	.	.	.	.	2	172	203	163	211	313	324	188	130	45	.	.
ACS/ACS Mobile PC (class)	.	.	20	37	57	17	.	.	.	.	.	.	.	.	.	.	.
AMK/AMK	203	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Advance/Advance	139	115	138	74	7	92	92	100	90	69	58	17	13	5	.	.	.
Buechel-Pappas/Buechel-Pappas	275	148	44	4	.	7	1	.	.	.	.	.	.	.	.	.	.
E.Motion (class)/E.Motion Pro (ctd)	.	.	.	.	.	1	6	.	6	24	24	36	29	23	36	20	.
Eska RP/Eska RP	40	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Evolis (class)/Evolis (class)	22	11	9	20	7	11	7	.	.	.	.	.	.	.	.	.	.
Gemini MK II/Gemini MK II	21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis (ctd)/Genesis (ctd)	62	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II CR (class)/Profix Mobile (ctd)	191	9	17	2	22	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium CR (class)/Genesis II	110	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium CR (class)/Profix Mobile	88	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium PS (ctd)/Genesis II (class)	19	35	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Genesis II Oxinium PS (ctd)/Genesis II (keel)	269	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HLS Noetos/HLS Noetos	197	48	28	20	1	.	.	.	.	.	.	.	.	.	.	.	.
IB II/IB II	199	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Interax/Interax	52	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.



Prostheses with Higher than Anticipated Rates of Revision

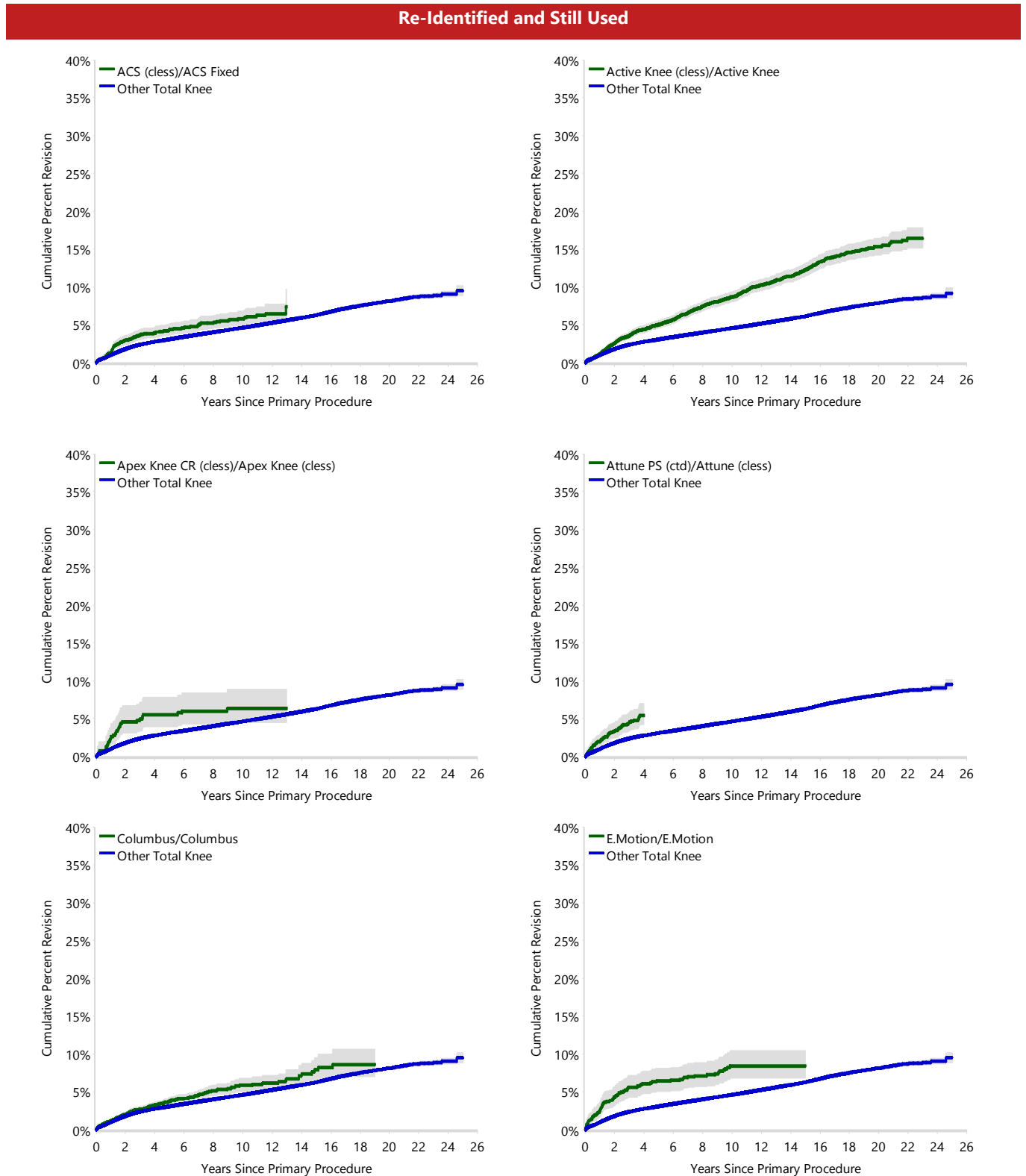
Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Maxim (cless)/Vanguard (ctd)	413	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Nexgen LPS Flex (cless)/Nexgen	.	73	78	149	312	238	280	225	252	221	188	82	12	4	.	.	.
Optetrak Logic CR/Optetrak Logic	.	.	.	.	.	21	171	234	321	339	286	195	226	83	11	.	.
Optetrak-CR (ctd)/Optetrak (ctd)	49	.	5	6	8	24	.	.	.	.	.	.	.	.	.	.	.
Optetrak-PS/Optetrak	1502	198	202	200	151	115	30	3	5	3	1	.	.	.	.	.	.
Optetrak-PS/Optetrak RBK	540	82	40	37	50	100	56	46	88	75	13	.	.	.	.	.	.
Optetrak-PS/Optetrak-PS	55	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PFC Sigma PS (ctd)/MBT (cless)	49	.	25	89	110	42	.	1	.	.	.	.	.	.	.	.	.
Profix Oxinium (cless)/Profix	75	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix Oxinium (cless)/Profix Mobile	158	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix Oxinium (ctd)/Profix (cless)	97	2	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix Oxinium (ctd)/Profix Mobile	228	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Profix/Profix Mobile	1003	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rotaglide Plus/Rotaglide Plus	631	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SAL/SAL	56	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Score (cless)/Score (cless)	359	187	204	195	239	273	263	170	160	214	151	252	354	5	.	.	.
Score (cless)/Score (ctd)	12	.	5	15	90	181	324	300	267	122	205	114	44	.	.	.	.
Scorpio NRG PS (cless)/Series 7000 (cless)	432	166	114	67	71	76	72	77	69	28	.	.	.	.	.	.	.
TC-Plus (cless)/TC-Plus (ctd)	63	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trac/Trac	138	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vanguard PS/Regenerex	4	121	54	27	15	21	18	76	59	56	14	.	.	.	.	.	.
Vanguard PS/Vanguard	999	478	607	561	451	523	445	331	310	205	186	136	117	56	.	.	.
*LCS Duofix	4866	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
*LCS PS	165	203	109	51	69	39	2	.	.	.	.	.	.	.	.	.	.
*Renasys	121	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: *Femoral Component

**Tibial Component

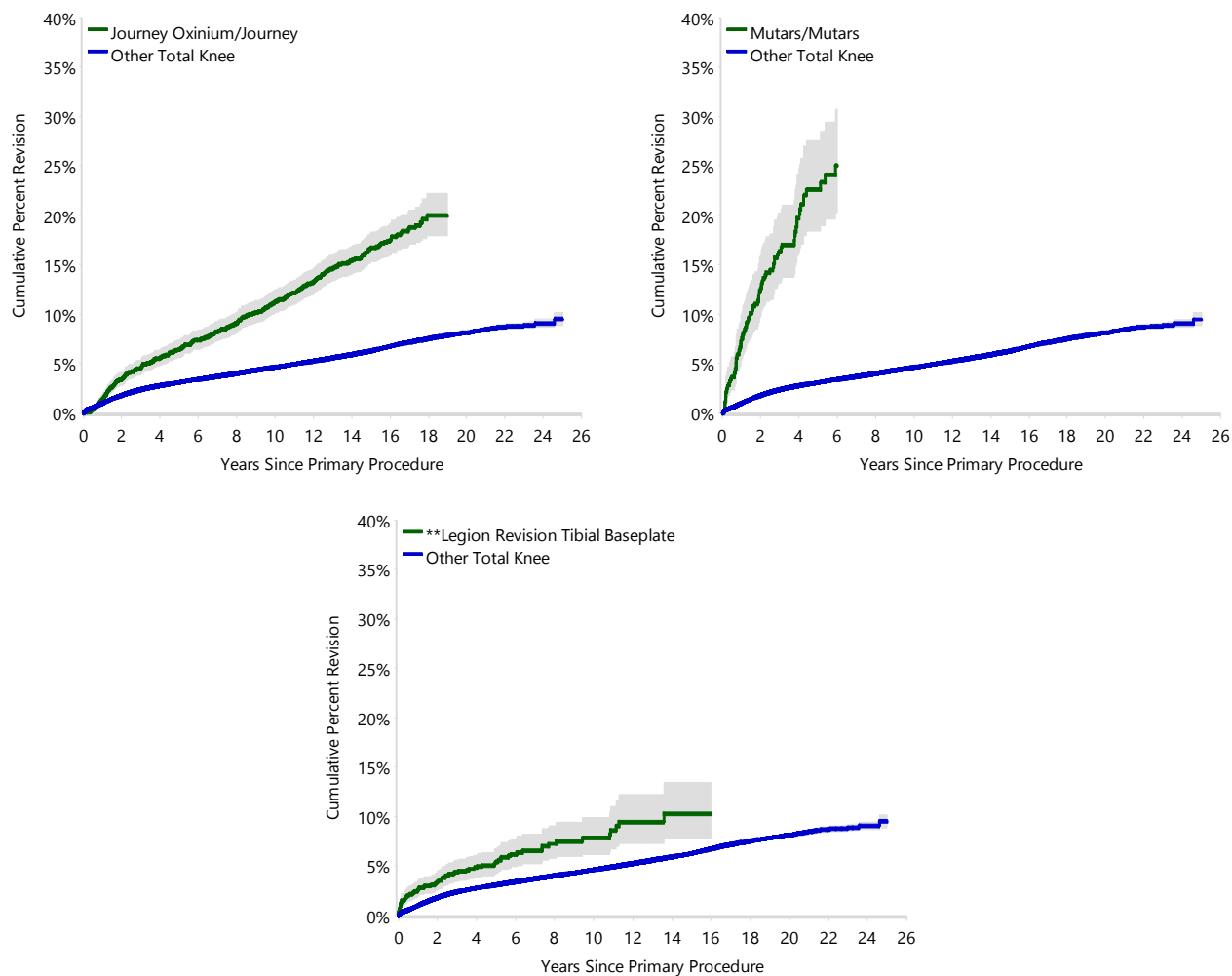
Prostheses with Higher than Anticipated Rates of Revision

Figure IP5 Cumulative Percent Revision of Re-Identified and Still Used Total Knee Prostheses





Prostheses with Higher than Anticipated Rates of Revision



Prostheses with Higher than Anticipated Rates of Revision

Primary Partial Shoulder Replacement

HEMI STEMMED ANATOMIC

There are no newly identified hemi stemmed anatomic shoulder prostheses.

The Delta Xtend/Delta Xtend and the Global Unite/Global Unite combinations are re-identified and still used.

Table IP22 Revision Rate of Hemi Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Humeral Stem/Head	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used					
Delta Xtend/Delta Xtend	17	81	552	3.08	Entire Period: HR=2.20 (95% CI 1.35, 3.58), p=0.001
Global Unite/Global Unite	44	232	1513	2.91	Entire Period: HR=1.76 (95% CI 1.29, 2.40), p<0.001

Note: Components have been compared to all other modern hemi stemmed anatomic shoulder components

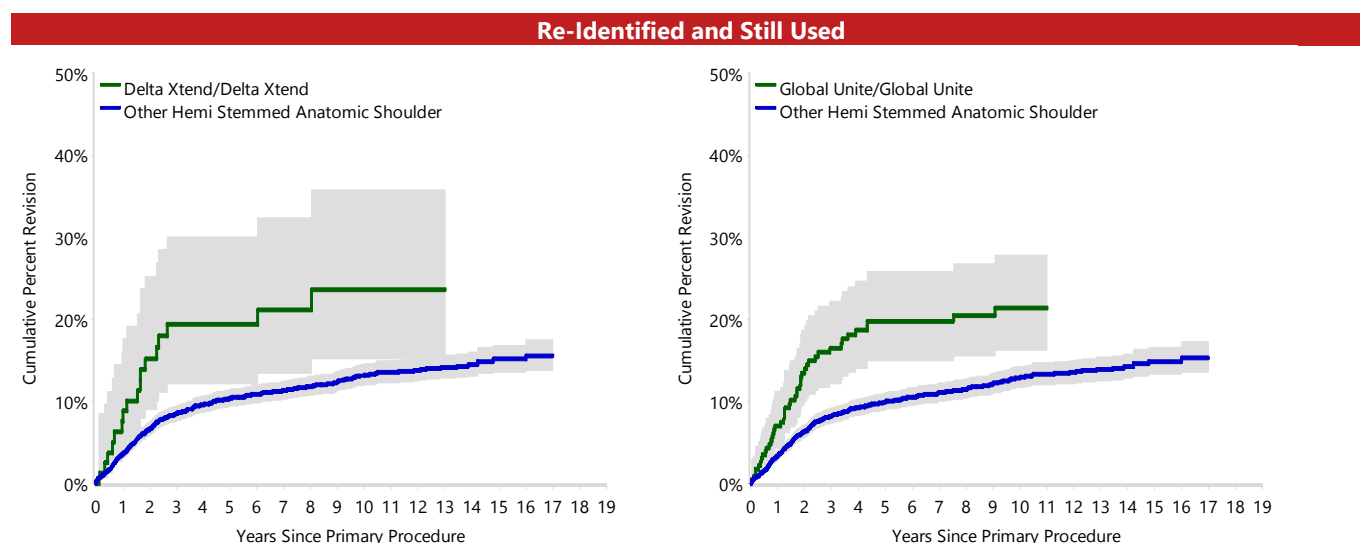
Table IP23 Cumulative Percent Revision of Hemi Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Delta Xtend/Delta Xtend	7.5 (3.5, 16.0)	19.3 (12.1, 30.1)	19.3 (12.1, 30.1)	21.1 (13.5, 32.3)	23.6 (15.1, 35.7)
Global Unite/Global Unite	7.0 (4.3, 11.1)	16.5 (12.2, 22.1)	19.8 (15.0, 25.8)	19.8 (15.0, 25.8)	

Table IP24 Yearly Usage of Hemi Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Delta Xtend/Delta Xtend	16	9	5	10	7	6	5	4	3	6	3	1	.	1	2	2	1
Global Unite/Global Unite	.	.	.	15	37	25	38	37	14	12	11	12	6	2	7	12	4

Figure IP6 Cumulative Percent Revision of Re-Identified and Still Used Hemi Stemmed Anatomic Shoulder Prostheses





Prostheses with Higher than Anticipated Rates of Revision

Primary Total Shoulder Replacement

TOTAL STEMMED ANATOMIC

There are no newly identified total stemmed anatomic shoulder prostheses.

The Equinox/Equinox (Hybrid Glenoid) is re-identified and still used.

Table IP25 Revision Rate of Total Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Humeral Stem/Glenoid	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
Equinox/Equinox (Hybrid Glenoid)	66	477	2488	2.65	0 - 2.5Yr: HR=1.52 (95% CI 0.99, 2.32), p=0.054 2.5Yr+: HR=5.24 (95% CI 3.63, 7.56), p<0.001
Identified and No Longer Used	.	.	.	.	
Comprehensive/Custom Made (Comprehensive)	7	18	85	8.25	Entire Period: HR=6.99 (95% CI 3.29, 14.86), p<0.001
Equinox/Equinox (All Poly)	38	305	1969	1.93	0 - 2Yr: HR=1.83 (95% CI 1.08, 3.12), p=0.025 2Yr+: HR=2.72 (95% CI 1.75, 4.22), p<0.001
SMR/SMR L1	514	2441	20958	2.45	0 - 1.5Yr: HR=3.30 (95% CI 2.66, 4.10), p<0.001 1.5Yr+: HR=2.38 (95% CI 1.99, 2.85), p<0.001
SMR/SMR L2	331	856	7382	4.48	Entire Period: HR=5.93 (95% CI 5.08, 6.91), p<0.001
Univers 3D/Univers 3D	17	34	310	5.48	Entire Period: HR=6.93 (95% CI 4.23, 11.35), p<0.001
Vaios/Vaios	19	36	233	8.15	Entire Period: HR=8.39 (95% CI 5.27, 13.36), p<0.001

Note: Components have been compared to all other modern total stemmed anatomic shoulder components

Table IP26 Cumulative Percent Revision of Total Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Equinox/Equinox (Hybrid Glenoid)	3.4 (2.1, 5.6)	6.2 (4.3, 8.9)	10.3 (7.7, 13.8)	16.1 (12.2, 21.1)	
Identified and No Longer Used					
Comprehensive/Custom Made (Comprehensive)	16.7 (5.7, 43.2)	27.8 (12.6, 54.4)	33.8 (16.8, 60.4)	42.1 (22.2, 69.5)	
Equinox/Equinox (All Poly)	2.0 (0.9, 4.3)	6.0 (3.8, 9.3)	8.1 (5.4, 12.0)	11.9 (8.4, 16.8)	
SMR/SMR L1	5.9 (5.1, 6.9)	11.4 (10.2, 12.8)	13.8 (12.5, 15.2)	16.2 (14.8, 17.8)	26.6 (24.4, 29.0)
SMR/SMR L2	9.5 (7.7, 11.7)	22.2 (19.6, 25.2)	29.8 (26.9, 33.1)	34.1 (31.0, 37.4)	40.3 (36.9, 43.8)
Univers 3D/Univers 3D	5.9 (1.5, 21.5)	14.7 (6.4, 31.8)	21.2 (10.7, 39.4)	31.0 (18.0, 50.1)	48.9 (32.7, 68.0)
Vaios/Vaios	13.9 (6.0, 30.2)	27.8 (16.0, 45.5)	39.1 (25.3, 57.0)	48.7 (33.6, 66.4)	57.0 (40.5, 74.6)

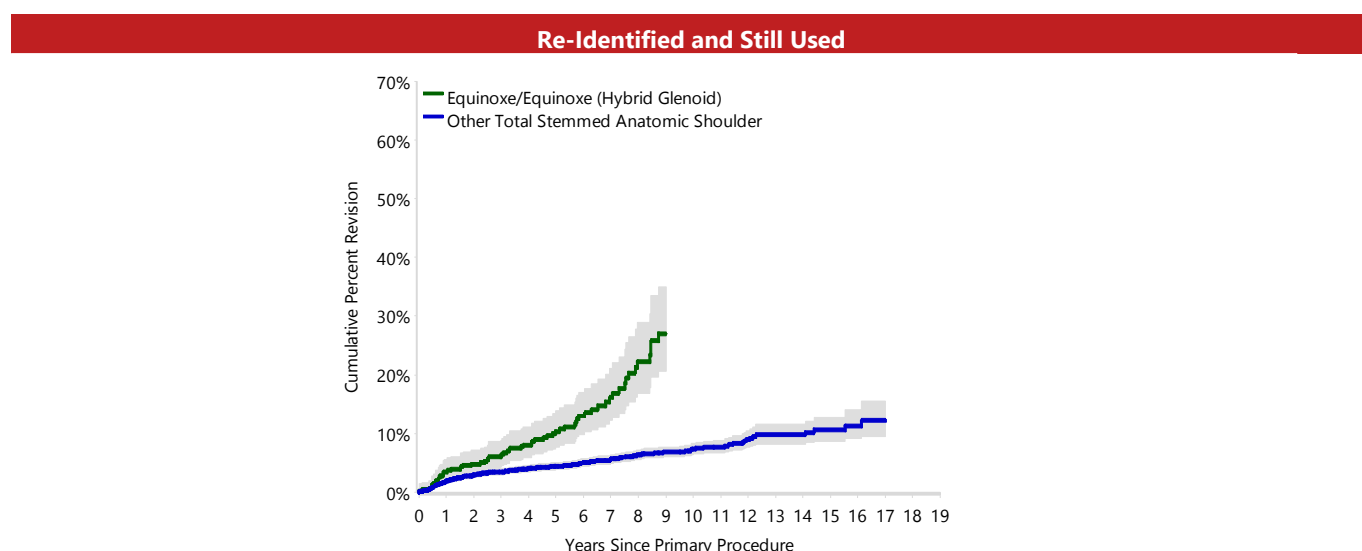


Prostheses with Higher than Anticipated Rates of Revision

Table IP27 Yearly Usage of Total Stemmed Anatomic Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equinox/Equinox (Hybrid Glenoid)	.	.	.	.	.	14	38	19	35	34	68	74	64	63	24	22	22
Identified and No Longer Used	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Comprehensive/Custom Made (Comprehensive)	.	.	.	.	.	.	.	1	4	7	5	1	.	.	.	.	.
Equinox/Equinox (All Poly)	.	.	6	10	26	18	8	23	36	45	37	18	28	24	24	2	.
SMR/SMR L1	619	.	.	156	302	256	242	195	172	128	98	72	70	65	66	.	.
SMR/SMR L2	43	343	336	134	.	.	.	.	.	.	.	.	.	.	.	.	.
Univers 3D/Univers 3D	34	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vaios/Vaios	.	.	16	17	2	1	.	.	.	.	.	.	.	.	.	.	.

Figure IP7 Cumulative Percent Revision of Re-Identified and Still Used Total Stemmed Anatomic Shoulder Prostheses





Prostheses with Higher than Anticipated Rates of Revision

TOTAL STEMMED REVERSE

There are no newly identified total stemmed reverse shoulder prostheses

The Equinox/Equinox, SMR/SMR L1 and Verso/Verso combinations have been re-identified and are still being used.

Table IP28 Revision Rate of Total Stemmed Reverse Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Humeral Stem/Glenoid	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used	.	.	.	.	
Equinox/Equinox	336	8272	29754	1.13	0 - 1Mth: HR=1.11 (95% CI 0.84, 1.46), p=0.478 1Mth - 3Mth: HR=0.70 (95% CI 0.51, 0.96), p=0.025 3Mth - 1.5Yr: HR=1.11 (95% CI 0.91, 1.35), p=0.289 1.5Yr - 2Yr: HR=1.32 (95% CI 0.87, 2.00), p=0.194 2Yr - 3.5Yr: HR=1.06 (95% CI 0.74, 1.51), p=0.753 3.5Yr+: HR=2.67 (95% CI 2.04, 3.50), p<0.001
SMR/SMR L1	542	12721	70814	0.77	0 - 3Mth: HR=1.65 (95% CI 1.43, 1.92), p<0.001 3Mth - 1.5Yr: HR=1.09 (95% CI 0.92, 1.28), p=0.332 1.5Yr+: HR=0.62 (95% CI 0.51, 0.74), p<0.001
Verso/Verso	7	41	141	4.98	Entire Period: HR=4.27 (95% CI 2.03, 8.97), p<0.001

Note: Components have been compared to all other modern total stemmed reverse shoulder components.

This combination is one of two that have reached the 'non-inferior' 10 year performance benchmark (for further information refer to the 10, 15, 20 Year Prosthesis Outcomes chapter in this report).

Table IP29 Cumulative Percent Revision of Total Stemmed Reverse Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

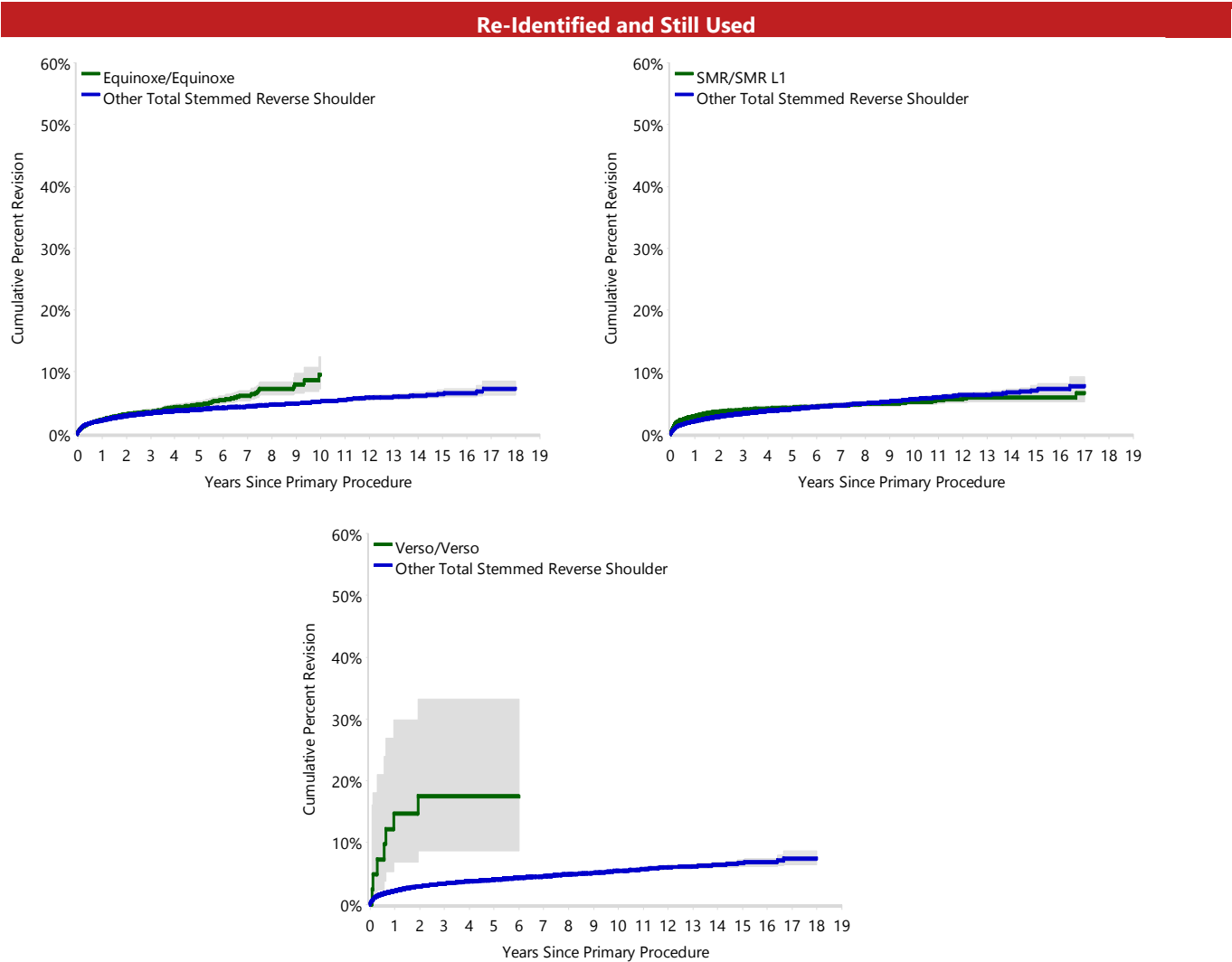
CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Equinox/Equinox	2.3 (2.0, 2.6)	3.5 (3.1, 4.0)	4.7 (4.2, 5.3)	6.1 (5.3, 6.9)	
SMR/SMR L1	2.8 (2.6, 3.2)	3.9 (3.5, 4.2)	4.2 (3.9, 4.6)	4.6 (4.2, 5.0)	5.9 (5.2, 6.6)
Verso/Verso	14.7 (6.9, 29.8)	17.5 (8.7, 33.2)	17.5 (8.7, 33.2)		

Table IP30 Yearly Usage of Total Stemmed Reverse Shoulder Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used																	
Equinox/Equinox	.	.	1	9	14	32	103	168	332	495	675	855	955	1059	1352	1290	932
SMR/SMR L1	678	.	.	248	563	633	732	914	930	1046	1056	1009	1191	1034	946	920	821
Verso/Verso	.	.	.	.	.	.	.	.	.	5	8	1	6	5	13	2	1

Prostheses with Higher than Anticipated Rates of Revision

Figure IP8 Cumulative Percent Revision of Re-Identified and Still Used Total Stemmed Reverse Shoulder Prostheses





Prostheses with Higher than Anticipated Rates of Revision

Primary Total Ankle Replacement

There are no newly identified total ankle replacement prostheses.

Table IP31 Revision Rate of Total Ankle Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Talar/Tibial Tray	N Revised	N Total	Obs. Years	Revisions/ 100 Obs. Yrs	Hazard Ratio, P Value
Re-Identified and Still Used					
Hintermann Series H3/Hintermann Series H3	115	574	5090	2.26	Entire Period: HR=1.99 (95% CI 1.61, 2.46), p<0.001
Identified and No Longer Used					
S.T.A.R/S.T.A.R	14	49	436	3.21	Entire Period: HR=2.43 (95% CI 1.42, 4.13), p=0.001

Note: Components have been compared to all other total ankle components

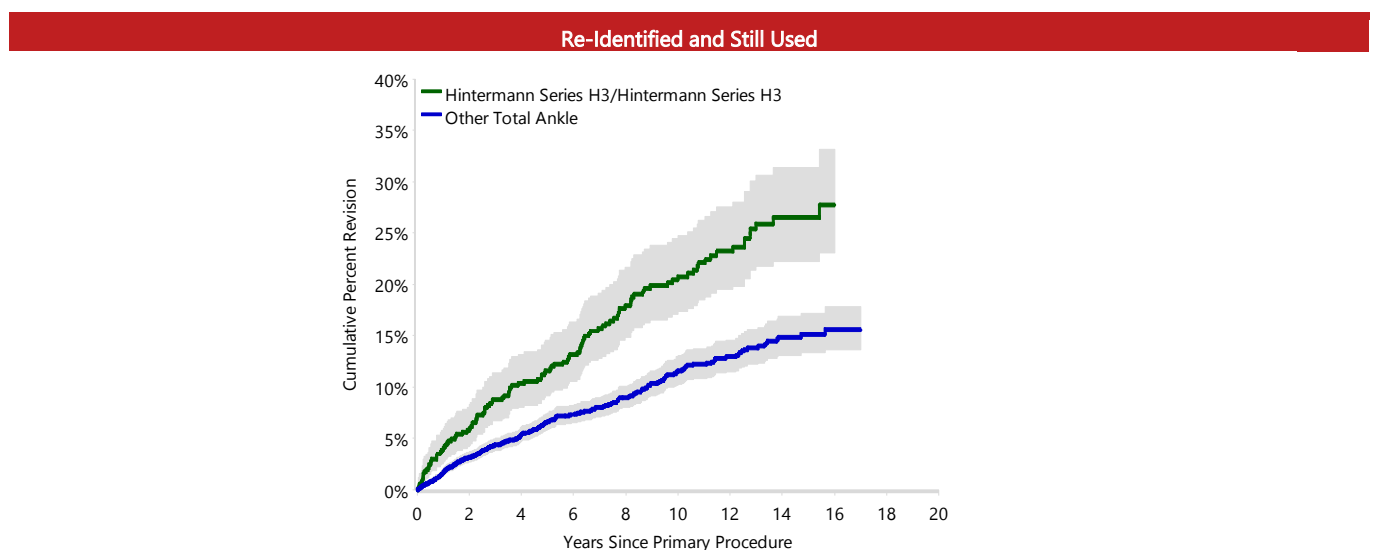
Table IP32 Cumulative Percent Revision of Total Ankle Prostheses Identified as Having a Higher than Anticipated Rate of Revision

CPR	1 Yr	3 Yrs	5 Yrs	7 Yrs	13 Yrs
Re-Identified and Still Used					
Hintermann Series H3/Hintermann Series H3	4.0 (2.7, 6.0)	8.8 (6.7, 11.4)	11.6 (9.2, 14.6)	15.7 (12.8, 19.2)	25.9 (21.8, 30.6)
Identified and No Longer Used					
S.T.A.R/S.T.A.R	4.1 (1.0, 15.5)	12.6 (5.8, 25.8)	14.7 (7.3, 28.4)	21.3 (12.0, 35.9)	

Table IP33 Yearly Usage of Total Ankle Prostheses Identified as Having a Higher than Anticipated Rate of Revision

Year of Implant	≤2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Re-Identified and Still Used																	
Hintermann Series H3/Hintermann Series H3	85	63	56	67	48	40	34	12	25	30	13	20	24	21	20	15	1
Identified and No Longer Used																	
S.T.A.R/S.T.A.R	4	3	4	2	15	12	4	4		1							

Figure IP9 Cumulative Percent Revision of Re-Identified and Still Used Total Ankle Prostheses







Appendices

Appendices

APPENDIX 1 – Participating Hospitals and Coordinators

VICTORIA			
Public Hospitals		Private Hospitals	
Austin Health	R Kentish / B Murray	Ballarat Day Procedure Centre	A Ingram
Bacchus Marsh Hospital	C Clifford / J Dehnert	Beleura Private Hospital	J Leyland
Bairnsdale Regional Health Service	S Guns	Bellbird Private Hospital	B Van Denberg
Bass Coast Health	L Mckenzie / P Dewar	Cabrini Brighton	D Heng
Bendigo Health	E Smith / S Sharp / C Jensen	Cabrini Malvern	D Heng
Broadmeadows Hospital	R Paul / B Wilson	Epping Private Hospital	J Jose
Central Gippsland Health	M Pasmucans / J Hunt	Epworth Eastern	K Longley
Cohuna District Hospital	K Storm	Epworth Freemasons	C Nozzolillo
Colac Area Health	A Tout	Epworth Geelong	N Cuttiford
Dandenong Hospital	K Ferguson / M Murray	Epworth Richmond	A Condon
East Grampians Health Service	K Carr / J Debney / J Sargent	Essendon Private Hospital	E Jordan
Eastern Health Box Hill	L Bingham / D Wickramasinghe	Glenferrie Private Hospital	L Banbury / S Srisawat / S Jones / M
Eastern Health Maroondah	B Connelly / G Whitmore	Holmesglen Private Hospital	N Malovic
Echuca Regional Health	H Lias / K Giorgianni	John Fawcner Private Hospital	B Emmett
Footscray Hospital	L Carbone / A Dijk	Knox Private Hospital	J Assauw / E George / H McCarty
Frankston Hospital	J Harry	La Trobe Private Hospital	J Flestado / J Telfer
Frankston Public Surgical Centre	N Larner / S Reeves	Linacre Private Hospital	M Krotwaar / R Carliesh / B Prentice / D
Goulburn Valley Health	A Stevens	Maryvale Private Hospital	F Van Dyke / K Collier
Grampians Health Ballarat	M Nicholson / B Anderson	Masada Private Hospital	D MacKenzie / S Howell
Grampians Health Horsham	M Markby / A Ampt	Melbourne Private Hospital	T Perkins
Grampians Health Stawell	S Hamilton / C Ellen	Mildura Health Private Hospital	S Malcolm
Hamilton Base Hospital	C Raymond / R Broadfoot	Mitcham Private Hospital	J Lonthyil / J Nankivell
Kyabram District Health Service	B Harrison / L Walker	Mulgrave Private Hospital	B Gurung / A Chandrakumar
Latrobe Regional Hospital	S Lovison	Northern Private Hospital	L Macpherson
Mildura Base Public Hospital	K Mailes	Northpark Private Hospital	J Flestado / M Muganiwa / K Morris
Monash Medical Centre	J Cranston	Peninsula Private Hospital	K Jones
Moorabbin Hospital	C Jackson / L Mason	Ringwood Private Hospital	C Burns
Northeast Health Wangaratta	D Reidy	Shepparton Private Hospital	V Cabatu / A Lam
Northern Hospital Epping	S Perry	St John of God Ballarat Hospital	G Mathachan
Portland District Health	M Ashby	St John of God Bendigo Hospital	A Sheehan
Sandringham Hospital	G Jack / L Scopel / S Kurup	St John of God Berwick Hospital	R Jamieson
St Vincent's Hospital Melbourne	A Lynskey / D Thangavel	St John of God Geelong Hospital	C Hay
Sunshine Hospital	A Dijk	St John of God Warrnambool Hospital	G Wheaton / L McPherson
Swan Hill District Health	D Hartland	St Vincent's Private Hospital East	E Valenton / S Francis
The Alfred	T Krohman	St Vincent's Private Hospital Fitzroy	D Dellevirgini / N Carter
The Royal Children's Hospital	S Lauletta	St Vincent's Private Hospital Kew	S Vohra / H Xing
The Royal Melbourne Hospital	H Eggleston	St Vincent's Private Hospital Werribee	D Adanza / D Sanchez / M Ipio / L Fifis
University Hospital Geelong	M Quinn / D Barber	Sunshine Private Hospital	C Alagao
Warrnambool Base Hospital	W Marsh / T Kelly	The Avenue Hospital	K Seng / R Crompton / T Kilpi
West Gippsland Healthcare Group	B Norman / S Backman	The Bays Hospital	L Charenko / L Kerr / S Burton
West Wimmera Health Service	T Heinrich	The Melbourne Eastern Private Hospital	J Phillpotts
Williamstown Hospital	J Bonganay / A Chircop	Vermont Private Hospital	V Howell / D Cooper
		Wangaratta Private Hospital	J McKie
		Warringal Private Hospital	M Dey / M Bhagat
		Waverley Private Hospital	E Fernandez / N Smith / N Dator



Appendices

VICTORIA			
Public Hospitals		Private Hospitals	
		Werribee Mercy Hospital	J Anwar
		Western Private Hospital	M Samson / D Cringasu

NEW SOUTH WALES			
Public Hospitals		Private Hospitals	
Albury Base Hospital	L Rhodes	Albury Wodonga Private Hospital	R Daggett
Armidale Hospital	J Waters / A Sutherland / A Prater	Armidale Private Hospital	K Latter
Auburn Health Service	A Balangue / M Malonzo	Baringa Private Hospital	E Ford / K Henderson / F Howson
Bankstown-Lidcombe Hospital	W Liaw / N Bassett* / K Och	Bathurst Private Hospital	K Quinton / D Carter
Bathurst Hospital	B Hodges	Brisbane Waters Private Hospital	A Ryan
Belmont Hospital	J Jones / J Osland	Calvary Riverina Hospital	F Oxley / L Pennier
Blacktown Hospital	J Tsang	Campbelltown Private Hospital	J Blanch / C Macdonald
Bowral and District Hospital	R Roberts / B Allan	Delmar Private Hospital	C Byrne
Broken Hill Base Hospital	T Kerle / S Beahl	Dubbo Private Hospital	A Wright / K Troth / S Cross
Campbelltown Hospital	K Hanger / S Paudel / S Birch	Dudley Private Hospital	P Fullgrabe
Canterbury Hospital	J Cubitt	East Sydney Private Hospital	T Woodgate
Chris O'Brien Lifehouse	S Harnedy	Forster Private Hospital	S Jose / D Conway / S Daczko
Coffs Harbour Health Campus	J Bellenger	Gosford Private Hospital	A Maguire
Concord Repatriation General Hospital	D Debello	Hawkesbury District Health Service	E Jones / S Garden
Dubbo Hospital	K Chapman / R Willis	Holroyd Private Hospital	M Brosas
Fairfield Hospital	C Youkhana	Hunter Valley Private Hospital	R Pridue
Gosford Hospital	K Mizzi / T Hoad / K Brown / M Farthing	Hurstville Private Hospital	J Mati / T Ross
Goulburn Base Hospital	K Goode / L Phelan	Insight Private Hospital	J Furness
Grafton Base Hospital	K Shaw / G Snook	Kareena Private Hospital	A Burazer / B Mitchell
Hornsby Ku-Ring-Gai Hospital	J Colville / B Chu	Kogarah Private Hospital	R Duag
Institute of Rheumatology and	M Hatzianeou	Lake Macquarie Private Hospital	V Jones / C Wright
John Hunter Hospital	J Gilbert / F Bristow	Lakeview Private Hospital	S Mitchell / H MacAllister
Lismore Base Hospital	G Nettle	Lingard Private Hospital	A Flaherty / K Bailey / A Dagg
Liverpool Hospital	S Seap	Macquarie University Hospital	J Guthrie
Maitland Hospital	B Game	Maitland Private Hospital	J Hayward / M Mead
Manning Hospital	G Cooke	Mater Hospital North Sydney	N Guerrero
Mount Druitt Hospital	C Boyd	Mayo Private Hospital	K Boucher
Murwillumbah District Hospital	S Smith / G Jacklin	Nepean Private Hospital	J Vimalraj
Nepean Hospital	D Dobbs / R Steward	Newcastle Private Hospital	D Fogarty / J Kelly
Orange Health Service	J Allenby	North Shore Private Hospital	A Bloxham
Port Macquarie Base Hospital	J Atkins / A Bartlett	Northern Beaches Hospital	S Maristela
Prince of Wales Hospital	E Katz	Norwest Private Hospital	J Woodward / R Shepherd
Royal Newcastle Centre	D Sommer / G Cutler	Nowra Private Hospital	D Maslen / G Hutton
Royal North Shore Hospital	H Celep	Orange Private Hospital	A McClelland
Royal Prince Alfred Hospital	J Wilkie	Port Macquarie Private Hospital	T Bell
Ryde Hospital	K Jones / H Nowlan	Prince of Wales Private Hospital	F Sarmiento
Shoalhaven Memorial Hospital	L Royston	Shellharbour Private Hospital	M Stevens / J Wilkinson
South East Regional Hospital	K Wild-Edwards / L Williams	Somerset Private Hospital	F Strachan
St George Hospital	D Gray / D Elliott	Southern Highlands Private Hospital	L Byrne
St Vincent's Hospital Sydney	A Baker / L Hatton	St George Private Hospital	L Mayo
Sutherland Hospital	P Beattie / C Kirgan	St Luke's Care	D Papadopoulos

NEW SOUTH WALES			
Public Hospitals		Private Hospitals	
Tamworth Hospital	M Lebrocq	St Vincent's Private Community Hospital	M Blackman
The Children's Hospital at Westmead	A Galstaun	St Vincent's Private Hospital Sydney	H George / M McGlynn / M Bancroft
Tweed Valley Hospital	A Budd / N Prestage	St Vincent's Private Hospital Lismore	J Hospers
Wagga Wagga Base Hospital	M O'Reilly / J Bowden / A Meek	Strathfield Private Hospital	F Abood / J Mati
Westmead Hospital	D Martic	Sydney Adventist Hospital	A Hickey
Wollongong Hospital	C Jackson	Sydney South West Private Hospital	H Tran
Wyong Hospital	T Clancy / M Randall	Tamara Private Hospital	R Moody
		The George Centre	S Calubaquib
		The Sydney Private Hospital	P Gyawali / R Cabading / S David / M
		Toronto Private Hospital	S Keys
		Tuggerah Lakes Private Hospital	J Hanneghan
		Waratah Private Hospital	K Graham
		Warners Bay Private Hospital	A Harrison
		Westmead Private Hospital	K Teren / L Yogathasar
		Wollongong Private Hospital	R Chapple / J Burns

QUEENSLAND			
Public Hospitals		Private Hospitals	
Bundaberg Hospital	J Anderson / D Norman / J Larsen	Brisbane Private Hospital	L Drabble
Cairns Hospital	H Campbell / E Walker / C McCall / L	Buderim Private Hospital	S Newbury
Gold Coast University Hospital	M Armstrong	Caboolture Private Hospital	B Altona / L King
Hervey Bay Hospital	M Elsworth	Cairns Private Hospital	L Rush
Ipswich Hospital	S Wilkinson	Friendly Society Private Hospital	K Smith / M Alcorn
Logan Hospital	M Harrison / S Childs	Gold Coast Private Hospital	V French
Mackay Base Hospital	B Daley / C Ruthenberg	Greenslopes Private Hospital	K Williams / R Griffin
Maryborough Hospital	Y Howlett / S Hose	Hervey Bay Surgical Hospital	M Pracy
Mater Hospital Brisbane	M Colbeck / C Steains / A Roeun	Hillcrest Rockhampton Private Hospital	J Smith
Nambour General Hospital	B Rajan / T Graham / R Hutchison	John Flynn Private Hospital	L Sarquis
Princess Alexandra Hospital	S Reed	Mater Private Hospital Brisbane	N Herden / A Williams / M Baltais / S
Queen Elizabeth II Jubilee Hospital	D Cal	Mater Private Hospital Bundaberg	J Zillmann / L Zunker / M Mooney
Queensland Children's Hospital	F Wright / M Cullen	Mater Private Hospital Mackay	H Douglas
Redcliffe Hospital	S Ovchinnikoff / G van Fleet	Mater Private Hospital Redland	D Chambers / T Hinder / T Diab / J
Redland Hospital	M McGahey	Mater Private Hospital Rockhampton	T Harkin / M Havik
Robina Hospital	R Kapera / L Thompson	Mater Private Hospital Springfield	C Cullen / C James
Rockhampton Hospital	M Todd / S Platzke	Mater Private Hospital Townsville	M Allan / J Humphreys
Royal Brisbane and Women's Hospital	G McPhee / B Ballantyne / A Dowe	Nambour Selangor Private Hospital	L Shanahan / S Pfeiffer / T Dempsey
Sunshine Coast University Hospital	F Tognolini / C Jones	Noosa Hospital	M Hale / J Andersson
Surgical, Treatment & Rehabilitation	E Daniels	North West Private Hospital	D Campbell / T Auckland
The Prince Charles Hospital	L Tuppin / R Seddon / S Butler	Pacific Private Hospital	A Keen
Toowoomba Hospital	F Chadwick / A Lostroh	Peninsula Private Hospital	A Moutrey
Townsville Hospital & Health Service	T Cudmore	Pindara Private Hospital	M Pederson / E Moire
		St Andrew's Ipswich Private Hospital	M Grant
		St Andrew's Toowoomba Hospital	A Shannon
		St Andrew's War Memorial Hospital	S Flood
		St Stephen's Hospital	S Costello / K McLaughlan
		St Vincent's Private Hospital Northside	D Ravn / L Shannon



Appendices

QUEENSLAND			
Public Hospitals		Private Hospitals	
		St Vincent's Private Hospital Toowoomba R Butler / A Fitzgerald	
		Sunnybank Private Hospital	F Robinston
		Sunshine Coast University Private	T Prothero
		The Wesley Hospital	C Gregory / K Patel
		Westside Private Hospital	M Esdale / B Owen

WESTERN AUSTRALIA			
Public Hospitals		Private Hospitals	
Albany Health Campus	P Karra	Bethesda Health Care	H Hanekom / J Fitzroy
Armadale Health Service	L Bennett / E Griffiths	Hollywood Private Hospital	L Godfrey / M Connor
Bunbury Regional Hospital	C Wicksteed / L Watterson-Stutley	Joondalup Health Campus	D Crowley / D Jenkins / T Rankin / J Holmes
Busselton Health Campus	G Moyes	Mount Private Hospital	M Gontran / M Huyser
Fiona Stanley Hospital	J Duncan	Peel Health Campus	G Keogh
Fremantle Hospital	E Jiji	South Perth Hospital	D Waters
Geraldton Hospital	J Joseph	St John of God Bunbury Hospital	C Habig / I Du Plessis
Kalgoorlie Health Campus	N Hintz	St John of God Geraldton Hospital	L Culallad / K Hutton / R Caporn
Osborne Park Hospital	T Hughes / K Zhang	St John of God Midland Hospital	S Blinman
Perth Children's Hospital	K Theedom	St John of God Mt Lawley Hospital	F Campos
Rockingham General Hospital	C Beaney	St John of God Murdoch Hospital	C Sheen / A Kapiteyn
Royal Perth Hospital	L Daly	St John of God Subiaco Hospital	P Emrose
Sir Charles Gairdner Hospital	T Lemmey / M Requilme	Waikiki Private Hospital	B Muir

SOUTH AUSTRALIA			
Public Hospitals		Private Hospitals	
Clare Hospital	M Green	Ashford Hospital	E Moore / L Kowalik
Flinders Medical Centre	A Olson / S McAndrew	Burnside Hospital, Stepney	S Williams / K Stapleton / S Chong / F
Gawler Health Service	T Sayce	Burnside Hospital, Toorak Gardens	L Johnson / T Behrendt
Lyell McEwin Hospital	L Wills	Calvary Adelaide Hospital	D Jocey-Prior / T Heinrich
Modbury Hospital	J Harris / B Foster	Calvary Central Districts Hospital	L Keech / M Ireland
Mount Barker District Soldiers Memorial	K Schultz / E Crowder	Calvary North Adelaide Hospital	A Labang
Mount Gambier and Districts Health	K Duncan	Flinders Private Hospital	M Ender
Murray Bridge Soldiers Memorial	J Colwell	Glenelg Community Hospital	N Russell-Higgins / V Lawrence / R
Naracoorte Health Service	T Berry	North Eastern Community Hospital	L Shaw
Noarlunga Hospital	C Roper / K Thomson	St Andrew's Hospital	C McAllister / L White
Port Augusta Hospital	J Haynes / L Turner	Stirling Hospital	S Kemp
Port Lincoln Hospital	C Weber	The Memorial Hospital	J Ohlson / J Emery
Port Pirie Regional Health Service	N Dolphin / A Murray / L Cutler	Western Hospital	A Scheepers / R Dalziel
Riverland General Hospital	M Gardner / N Romeo		
Royal Adelaide Hospital	L Davies / A Wilson / R Woodfine		
South Coast District Hospital	J Hunt / A Price		
The Queen Elizabeth Hospital	A Hunter		
Whyalla Hospital and Health Service	K Sibanda / E Windhouwer / M Prunty		
Women's and Children's Hospital	M Betterman		

TASMANIA			
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Appendices

Public Hospitals		Private Hospitals	
Launceston General Hospital	M Postmus / E Davidson	Calvary Lenah Valley Hospital	B Stephensen / K Harrex / E Hey / A
North West Regional Hospital	T Gorrie	Calvary St John's Hospital	C Farrell
Royal Hobart Hospital	M Chandler / S Kirkham	Calvary St Luke's Hospital	T Morice / G Stratton
		Hobart Private Hospital	J Dohnt
		North-West Private Hospital	P Purva

NORTHERN TERRITORY			
Public Hospitals		Private Hospitals	
Alice Springs Hospital	C Wooding / L Mathieson / M Bibal	Darwin Private Hospital	Y Wing / A Thomas / S Delaney
Royal Darwin Hospital	D Shih / W Rogers		

AUSTRALIAN CAPITAL TERRITORY			
Public Hospitals		Private Hospitals	
Canberra Hospital	T Schild / H Boyd	Calvary Bruce Private Hospital	C Morris
North Canberra Hospital	R Kathage / T Pula / J Cain	Calvary John James Hospital	S Sreesan / J Lynch
		Canberra Private Hospital	A John / S Phillips / L Tuohy / M Rogina
		The National Capital Private Hospital	G Palada / R Barancewicz / I Coronado



Appendices

Appendix 2 - Glossary

STATISTICAL TERMS

Adjustment: The process of re-estimating a crude measure, such as a rate or rate ratio, to minimise the effects of a difference in the distribution of a characteristic, such as age, between groups being compared on that measure. Adjustment may be carried out in the context of a modelling procedure, for example, linear or proportional hazards regression models, or by standardising the data set against a reference population with a known age distribution, for example, the World Standard Population or the Australian population defined by the Australian Bureau of Statistics Census in a specified year.

Censoring: When the outcome of interest is the time to a defined event, for example, revision of a prosthesis, the event may not occur during the available period of observation. For example, the Registry analyses its data on prosthesis revision for the period ending 31 December each year, and many prostheses will not have been revised by that time. Unless the prosthesis was revised prior to 31 December the outcome is unknown. For the majority, we only know that up until 31 December they had not yet been revised. The times to revision for these prostheses are said to have been censored at 31 December. Statistical methods exist to ensure that censored data are not ignored in analysis, rather information on survival up until the time of censoring is used to give the best possible estimates of survival or revision probabilities.

Chi-Square (χ^2) Test: Any test whose statistic has a chi-square distribution under the null hypothesis is called a chi-square test. A common example is a test for association between two categorical variables whose data are arrayed in a cross-classification table of counts (Pearson's chi-square test). This can be generalised to many situations where the distribution of observed data is being compared to an expected theoretical distribution.

Closure of the Database: Closure of the database occurs in April of the report year for procedures up to 31 December of the preceding year. Due to delays in receipt of the procedure form, some procedures are not included until the following annual report.

Competing Risk: Any event that changes the probability of occurrence of another event is known as a competing risk for the other event. For example, death is a competing risk for revision because the probability of revision after death cannot be assumed to be the same as the probability of revision before death. Another example is that if interest centres on specific causes of revision, then each cause (infection, loosening etc) is a competing risk for each other cause. Treating a competing risk event as a right censoring will bias the estimation of the risk of the event of interest.

Confidence Interval: A set of values for a summary measure, such as a rate or rate ratio, constructed so the set has a specified probability of including the true value of the measure. The specified probability is called the confidence

interval, the end points are called lower and upper confidence limits; 95% confidence intervals are most common.

Cox Model or Proportional Hazards Model: A statistical model that relates the hazard for an individual at any time t to an (unspecified) baseline hazard and a set of predictor variables, such as treatment type, age, gender etc. The Cox model produces hazard ratios that allow comparisons between groups of the rate of the event of interest. The main assumption of a Cox model is that the ratio of hazards between groups that we wish to compare does not vary over time. If the hazard for prosthesis Model A is twice that of prosthesis Model B at three years, it will also be twice at four years, and so on. This is referred to as the 'proportional hazards assumption'. If the hazard ratio is not proportional over the entire time of observation, then a time varying model is used, which estimates a separate hazard ratio within each pre-defined time period. Within each time period, the hazards are proportional. The Registry uses a set algorithm which iteratively chooses time points until the assumption of proportional hazards is met for each time period. The time points are selected based on where the greatest change in hazard occurs between the two comparison groups, weighted by the number of events in that time period.

Cumulative Incidence Function: An estimator of the actual probability of revision in the presence of a competing risk. In these circumstances, the Kaplan-Meier estimate, which treats competing risks as censored, overestimates the true probability. In the competing risks paradigm, patients who have already had a revision or who have died are excluded from the set at risk of being revised. Under Kaplan-Meier, only patients who have already been revised are excluded from the risk set; dead patients are analysed as though they are still at risk of revision.

Cumulative Percent Revision: Otherwise known as the 'cumulative failure rate'. This is defined as $100 \times [1 - S(t)]$ where $S(t)$ is the survivorship probability estimated by the Kaplan-Meier method (see survival curve, below). The cumulative percent revision gives the percent of procedures revised up until time t , and allows for right censoring due to death (but see Cumulative Incidence Function above) or closure of the database for analysis.

Hazard Ratio: A hazard is an estimate of the instantaneous risk of occurrence of an event, for example revision, at a point in time, t . A hazard ratio results from dividing one group's hazard by another's to give a comparative measure of the instantaneous risk of experiencing the event of interest. In this report, hazard ratios are adjusted for age and gender as appropriate. Hazard ratios are either for the entire survivorship period (if proportional; see 'Cox Model or Proportional Hazards Model' section above) or for specific time periods (if the hazard for the entire survivorship period is not proportional).

For example, a comparison of Primary Total Conventional Hip Replacement for a Primary Diagnosis of Avascular Necrosis (AVN), Developmental Dysplasia of the Hip (DDH) and Osteoarthritis (OA):

Avascular Necrosis vs Osteoarthritis.

Entire Period: HR=1.34 (1.16, 1.54), $p < 0.001$

The hazard ratio for this comparison is proportional over the entire time of observation. AVN has a significantly higher rate of event (in this case, revision) compared to OA over the entire time of observation ($p < 0.001$). The hazard is 1.34 times higher for AVN compared to OA and, with 95% confidence, the true hazard for AVN will lie between 1.16 times higher and 1.54 times higher than the hazard for OA.

Developmental Dysplasia vs Osteoarthritis

0-3Mth: HR=1.75 (1.21, 2.52), $p = 0.002$

3Mth+: HR=1.07 (0.78, 1.45), $p = 0.683$

The hazard ratio is not proportional over the entire time of observation, so the hazard ratio has been divided into two periods; the time from primary arthroplasty to three months following the primary and three months following the primary to the end of observation. DDH has a significantly higher revision rate compared to OA in the first three months following the primary ($p = 0.002$). The hazard for revision in the first three months is 1.75 times higher for DDH than for OA and with 95% confidence, the true hazard for DDH will lie between 1.21 and 2.52 times higher. From three months following the primary to the end of observation, there is no significant difference in the revision rate between DDH and OA ($p = 0.683$).

Incidence Rate: The number of new occurrences of an event divided by a measure of the population at risk of that event over a specified time period. The population at risk is often given in terms of person-time: for example, if 6 persons are each at risk over 4 months, they contribute $6 \times 1/3 = 2$ person-years to the denominator of the incidence rate. The incidence rate ratio (IRR) is commonly used to compare the incidence rates of two groups. If the two groups' incidence rates are the same, the result is an IRR of 1.

Log Rank Test: A family of statistical tests that compares the survival experience of two or more groups over the entire time of observation (contrast with comparison of survival at a defined time, e.g. five-year survival).

Observed Component Years: For each procedure, component time is the time during which it is at risk of being revised. This is calculated as the number of days from the date of the primary procedure until either the date of revision, date of death or end of study (31/12/2019) whichever happens first. This is then divided by 365.25 to obtain the number of component years. Each primary procedure then contributes this calculated number of component years to the overall total component years for a particular category of prosthesis.

For example: A primary total hip procedure performed on 1/1/2019 was revised on 1/7/2019. Therefore, the number of days that this procedure is at risk of being revised is 183 days. This prosthesis then contributes 0.5 ($183/365.25$) component years to the overall number of observed component years for the total hip procedure category.

A patient with a primary procedure on 1/1/2019 died without being revised on 1/4/2019. This procedure contributes 0.25 component years.

A primary procedure occurs on 1/1/2019 and has not been revised. This procedure contributes 1 component year (as observation time is censored at 31/12/2019).

Survival Curve: A plot of the proportion of subjects who have not yet experienced a defined event (for example, death or revision of prosthesis) versus time. The Kaplan-Meier method is the one most commonly used. The curve takes account of subjects whose ultimate survival time is not known, a phenomenon called 'censoring'. The survival estimate at each time is accompanied by a confidence interval based on the method of Greenwood. An interval is interpretable only at the time for which it was estimated and the sequence of intervals (depicted as shading on the Kaplan-Meier curve) cannot be used to judge the significance of any perceived difference over the entire time of observation. Often, for convenience, the curve is presented to show the proportion revised by a certain time, rather than the proportion not being revised ('surviving'). In the Registry, we call this cumulative percent revision (CPR). The Kaplan-Meier method is biased in the presence of a competing risk and will overestimate the risk of revision. In such circumstances, use of the cumulative incidence function for all competing risks, rather than the Kaplan-Meier estimate, is advised. The cumulative incidence of all competing risks must be assessed simultaneously to avoid bias in interpretation.



Appendices

Appendix 3 – Diagnosis Hierarchy

DIAGNOSIS HIERARCHY FOR PRIMARY PARTIAL HIP REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Failed Internal Fixation
3	Fractured Neck of Femur
4	Osteonecrosis/AVN
5	Rheumatoid Arthritis
6	Osteoarthritis (including Post Traumatic OA)
7	Developmental Dysplasia
8	Osteochondritis Dissecans
9	Other

DIAGNOSIS HIERARCHY FOR PRIMARY TOTAL RESURFACING HIP REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Arthrodesis Takedown
3	Osteonecrosis/AVN
4	Rheumatoid Arthritis
5	Developmental Dysplasia
6	Other Inflammatory Arthritis
7	Osteoarthritis (including Post Traumatic OA)
8	Fracture/Dislocation (acetabulum)
9	Other

DIAGNOSIS HIERARCHY FOR PRIMARY TOTAL HIP REPLACEMENT (EXCLUDING TOTAL RESURFACING)

Rank	Diagnosis
1	Tumour
2	Arthrodesis Takedown
3	Failed Internal Fixation
4	Fractured Neck of Femur
5	Osteonecrosis/AVN
6	Rheumatoid Arthritis
7	Developmental Dysplasia
8	Other Inflammatory Arthritis
9	Osteoarthritis (including Post Traumatic OA)
10	Fracture/Dislocation (acetabulum)
11	Other

DIAGNOSIS HIERARCHY FOR REVISION HIP REPLACEMENT

Rank	Diagnosis	Category
1	Tumour	Dominant diagnosis independent of prosthesis/surgery
2	Infection	
3	Leg Length Discrepancy	Surgical procedure
4	Incorrect Sizing	
5	Malposition	
6	Metal Related Pathology	Reaction to prosthesis
7	Loosening	
8	Lysis	
9	Wear Hip Insert	Wear and implant breakage
10	Wear Acetabular Cup/Shell	
11	Wear Head	
12	Implant Breakage Head	
13	Implant Breakage Stem	
14	Implant Breakage Hip Insert	
15	Implant Breakage Acetabular Cup/Shell	
16	Prosthesis Dislocation	Stability of prosthesis
17	Instability	
18	Fracture (Femur/Acetabular/Neck/Periprosthetic)	Fracture of bone
19	Chondrolysis/Acetabular Erosion	Progression of disease on non-operated part of joint
20	Progression of Disease	
21	Synovitis	New diseases occurring in association with joint replacement
22	Osteonecrosis/AVN	
23	Heterotopic Bone	
24	Pain	Pain
25	Other	Remaining diagnoses



Appendices

DIAGNOSIS HIERARCHY FOR PRIMARY KNEE REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Osteonecrosis/AVN
3	Rheumatoid Arthritis
4	Other Inflammatory Arthritis
5	Osteoarthritis (including Post Traumatic OA)
6	Chondrocalcinosis
7	Osteochondritis Dissecans

DIAGNOSIS HIERARCHY FOR REVISION KNEE REPLACEMENT

Rank	Diagnosis	Category
1	Tumour	Dominant diagnosis independent of prosthesis/surgery
2	Infection	
3	Incorrect Side	Surgical procedure
4	Incorrect Sizing	
5	Malalignment	
6	Metal Related Pathology	Reaction to prosthesis
7	Loosening	
8	Lysis	
9	Wear Knee Insert	Wear and implant breakage
10	Wear Tibial Tray	
11	Wear Femoral	
12	Wear Patella	
13	Implant Breakage Femoral	
14	Implant Breakage Knee Insert	
15	Implant Breakage Tibial Tray	
16	Implant Breakage Patella	
17	Bearing Dislocation	Stability of prosthesis/knee
18	Patellar Dislocation	
19	Prosthesis Dislocation	
20	Instability	
21	Patellar Maltracking	
22	Fracture (Femur/Tibia/Patella/Periprosthetic)	Fracture of bone
23	Progression of Disease	Progression of disease on non-operated part of join

24	Patellar Erosion	
25	Synovitis	
26	Arthrofibrosis	New diseases occurring in association with joint replacement
27	Osteonecrosis/AVN	
28	Heterotopic Bone	
29	Patellofemoral Pain	Pain
30	Pain	
31	Other	Remaining diagnoses

DIAGNOSIS HIERARCHY FOR PRIMARY SHOULDER REPLACEMENT

Rank	Diagnosis
1	Tumour
2	Fracture (including Failed Internal Fixation)
3	Instability
4	Dislocation
5	Osteonecrosis/AVN
6	Rheumatoid Arthritis
7	Other Inflammatory Arthritis
8	Rotator Cuff Arthropathy
9	Hill-Sachs Defect
10	Osteoarthritis (including Post Traumatic OA)
11	Osteochondritis Dissecans
12	Other

DIAGNOSIS HIERARCHY FOR REVISION SHOULDER REPLACEMENT

Rank	Diagnosis	Category
1	Tumour	Dominant diagnosis independent of prosthesis/surgery
2	Infection	
3	Incorrect Side	Surgical procedure
4	Incorrect Sizing	
5	Malalignment	
6	Metal Related Pathology	Reaction to prosthesis
7	Loosening	
8	Lysis	
9	Wear Glenoid Insert	Wear and implant breakage



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10	Wear Glenoid	
11	Wear Humeral	
12	Wear Humeral Cup	
13	Implant Breakage Glenoid Insert	
14	Implant Breakage Glenoid	
15	Implant Breakage Humeral	
16	Implant Breakage Head	
17	Instability/ Dislocation	
18	Rotator Cuff Insufficiency	Stability of prosthesis
19	Dissociation	
20	Fracture (Glenoid/Humeral/Periprosthetic)	Fracture of bone
21	Progression of Disease	
22	Glenoid Erosion	Progression of disease on non-operated part of join
23	Synovitis	
24	Arthrofibrosis	
25	Osteonecrosis/AVN	New diseases occurring in association with joint replacement
26	Heterotopic Bone	
27	Pain	Pain
28	Other	Remaining diagnoses

APPENDIX 4 – Patient Consent and Confidentiality Guidelines

PATIENT CONSENT

The Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) obtains consent to include information from individuals undergoing joint replacement by using the 'opt off' approach. The implementation of the new Commonwealth Legislation at the end of 2001 resulted in the Registry meeting with the Privacy Commission to ensure that the system used for patient consent is within the privacy guidelines.

Using this approach, patients are provided with a Patient Information Sheet. This explains what information is required, how it is collected and the avenues to take should an individual not want their information included in the Registry. The information is provided to patients by surgeons and hospitals prior to surgery. To accommodate patients that may have questions, wish to opt out or discuss any issues, a freecall number is available to contact the Registry.

PATIENT CONFIDENTIALITY

Joint replacement patients will not be contacted directly by the Registry. No individual patient will be identified during analysis or in reports and publications produced by the Registry. Patient operative and prostheses data is managed in accordance with the Guidelines for the Protection of Privacy in the Conduct of Medical Research. Personal data collected are for use by the AOA National Joint Replacement Registry only. The Registry has been listed as a Federal Quality Assurance Activity and all information is protected (refer to section below).

DATA MANAGEMENT AND CONFIDENTIALITY

The South Australian Health and Medical Research Institute (SAHMRI) undertakes data entry, validation and analysis and provides secure data storage. Only a small number of identified positions have access to patient information.

Declaration of the project as a Quality Assurance Activity ensures that Registry and SAHMRI staff are bound to maintain confidentiality. Confidentiality not only applies to individual patients but also includes surgeons and hospitals.

SAHMRI has security systems to restrict access to SAHMRI and Registry staff only. There are policies and procedures in place as well as software barriers to protect personal information. These include the use of codes, passwords, and encryption.

The proforma used for data collection are stored in a secure locked room at SAHMRI. Forms are scanned and electronically stored. After data entry and data cleaning, all data are securely stored and retained in accordance with good scientific practice.

SURGEON CONFIDENTIALITY

Surgeon confidentiality is assured. The purpose of the Registry is to provide demographic and outcome information relevant to joint replacement surgery. Surgeon name is not recorded in the Registry database.

It is an important Registry function to provide a service to surgeons that allows them to monitor and audit their own performance. For this reason, surgeons have a choice to identify themselves by code, which can be linked to their procedures. This is optional and there is no requirement to provide the surgeon code. These codes are provided to surgeons by AOA.

Surgeons are provided with access to their own information through a secure online facility. It is important to emphasise that surgeons have the choice of using their code and that surgeon name is not recorded in the database.

FEDERAL QUALITY ASSURANCE ACTIVITY

The AOANJRR was initially declared a Federal Quality Assurance Activity in March 1999, by the then Federal Minister for Health and Aged Care, Dr Wooldridge. This was renewed in 2001, 2006, 2011, 2016 and for a further five years in July 2022. An amendment was approved in 2018 to add collection of Knee Osteotomy procedures. This declaration ensures freedom from subpoena and absolute confidentiality of information held by the Registry.

The Quality Assurance legislation is part of the Health Insurance Act of 1973. This act was amended in 1992 to include quality assurance confidentiality. The Act operates on the underlying assumption that quality assurance activities are in the public interest.

A declaration as a Quality Assurance Activity by the Commonwealth Minister of Health prohibits the disclosure of information, which identifies individual patients or health care providers that is known solely as a result of the declared quality assurance activity. It is not possible to provide identifying information to any individual or organisation including the government.

The protection provided by the declaration assures surgeons, hospitals and government that information supplied to the Registry remains confidential and secure. The act also protects persons engaging in those activities in good faith from civil liability in respect of those activities.



Appendices

APPENDIX 5 – Patient Information Sheet

INTRODUCTION – ABOUT THE REGISTRY

You are about to have an operation on one of your joints. More than 100,000 people have a joint replacement or knee osteotomy operation each year in Australia. Most of these operations are very successful. However, a number of people who have a joint operation may at some time require another operation on that joint. This may occur due to a variety of reasons. For instance, if you have had a joint replacement the most common cause is that the joint replacement has worn out. How quickly this occurs depends on which of the many different types of artificial joints have been used. For those patients having a knee osteotomy the aim is to delay or prevent the need for having a joint replacement.

In order to improve the success of these operations, the Australian Orthopaedic Association set up the National Joint Replacement Registry in 1999. The purpose is to monitor and report on the results of these operations. This information helps everyone working in the health system to ensure patients get the best treatment possible both now and in the future. Another important Registry role is that it assists hospitals and doctors to locate people in the uncommon event a problem with any medical device used is identified.

To do this it is important for the Registry to record a small amount of information on as many people having these operations as possible. It is also important to record if any subsequent operations have occurred. By analysing this information, it is possible to identify which of the medical devices are working best and the best type of operation for each patient. We are asking you to participate in the Registry, by allowing us to document information relevant to your operation.

YOUR INVOLVEMENT – THE INFORMATION WE NEED

The information we require includes your name, date of birth, address, Medicare number, hospital identity number, the name of the hospital and the reason you are having a joint replacement or knee osteotomy. This information is necessary to accurately link you to the medical device inserted as well as linking any following joint surgery you may have, to your previous records. We will also record the day of the operation, which joint was operated on and the type of medical device used. No other personal information is recorded. Government Departments also provide information so that the Registry can check the accuracy of the data and update records to reflect if someone has died.

INFORMATION – HOW WE WILL KEEP YOUR INFORMATION CONFIDENTIAL

Your personal information is confidential and safety measures are in place to protect this information. Your personal information is protected by an Act of Parliament. This means you cannot be identified in any reports produced by the Registry. On occasion, your data may be linked to other government health datasets to further enhance the Registry's ability to improve patient outcomes. Your de-identified data may be used for other research projects and may be shared with national and international collaborators.

HOW WE WILL COLLECT THE INFORMATION

Although we are asking to record your operation details in the Registry you are not required to do anything. Your surgeon and/or theatre staff will complete the form that contains your personal details at the time of your operation and send it to us. The information will be entered into the secure Registry database which is stored in the South Australian Health & Medical Research Institute, Adelaide, South Australia.

RISKS AND BENEFITS – TO YOU

There are no risks to you by having your details in the Registry. The Registry produces general reports on a variety of factors that influence the success of joint operations. The results of joint operations have greatly improved because of this information.

WHAT TO DO IF YOU DON'T WANT TO BE IN THE REGISTRY

We understand that not everyone is comfortable about having his or her personal details documented in a registry. If you feel this way and do not want your details recorded, please contact the Manager on 1800 068 419 (freecall) as well as making your decision known to hospital staff. A decision on whether or not you wish to be involved in the Registry does not affect your treatment in any way. If you have any questions, concerns, or require further information on the National Joint Replacement Registry please do not hesitate to contact the Registry.

Concerns or complaints related to the data collection process may be directed to the AOANJRR on 1800 068 419 (freecall) or alternatively the Australian Government, Office of the Privacy Commissioner on 1300 363 992

APPENDIX 6 – Implementation Timeline

IMPLEMENTATION OF NATIONAL JOINT REPLACEMENT REGISTRY FOR HIP, KNEE AND SHOULDER REPLACEMENT

The Registry was implemented in a staged manner on a state-by-state basis. The table below shows the commencement date for each state or territory. Implementation was completed nationally by mid 2002, therefore 2003 was the first year of complete national data.

National data collection on shoulder replacement commenced in November 2007. Knee osteotomy data collection commenced in early 2018.

State/Territory	Commencement Date
South Australia	September 1999
Queensland	April 2000
Western Australia	April 2000
Victoria	July 2000
Tasmania	September 2000
Northern Territory	October 2000
Australian Capital Territory	May 2001
New South Wales	June 2001



Appendices

APPENDIX 7 – ICD – 10-AM Codes

ICD-10-AM CODES – v12 (2022 Edition) State Health Department Separation Data	
HIP	
Partial Hip Replacement	
49315-00	Partial arthroplasty (excludes Austin Moore)
47522-00	Hemiarthroplasty of femur (Austin Moore)
Primary Total Hip Replacement	
49318-00	Total arthroplasty of hip unilateral
49319-00	Total arthroplasty of hip bilateral
90607-00 [1489]	Resurfacing of hip, unilateral
90607-01 [1489]	Resurfacing of hip, bilateral
Revision Hip Replacement	
49312-00	Excision arthroplasty of hip (removal of prosthesis without replacement)
49324-00	Revision of total arthroplasty of hip
49327-00	Revision of total arthroplasty with bone graft to acetabulum
49330-00	Revision of total arthroplasty with bone graft to femur
49333-00	Revision of total arthroplasty with bone graft to acetabulum and femur
49339-00	Revision of total arthroplasty with anatomic specific allograft to acetabulum
49342-00	Revision of total arthroplasty of hip with anatomic specific allograft to femur
49345-00	Revision of total arthroplasty with anatomic specific allograft to acetabulum and femur
49346-00	Revision of partial arthroplasty hip replacement

ICD-10-AM CODES – v12 (2022 Edition) State Health Department Separation Data

KNEE

Partial Knee Replacement

Patellofemoral Knee Replacement

49534-01 Total replacement arthroplasty of patellofemoral joint of knee

Unicompartmental Knee Replacement

49517-00 Hemi arthroplasty of knee

Primary Total Knee Replacement

49518-00 Total arthroplasty of knee unilateral

49519-00 Total arthroplasty of knee bilateral

49521-00 Total arthroplasty of knee with bone graft to femur unilateral

49521-01 Total arthroplasty of knee with bone graft to femur bilateral

49521-02 Total arthroplasty of knee with bone graft to tibia unilateral

49521-03 Total arthroplasty of knee with bone graft to tibia bilateral

49524-00 Total arthroplasty of knee with bone graft to femur and tibia unilateral

49524-01 Total arthroplasty of knee with bone graft to femur and tibia bilateral

Revision Knee Replacement

49512-00 Arthrodesis with removal of prosthesis

49515-00 Removal-prostheses from knee

49527-00 Revision of total arthroplasty of knee excluding patella resurfacing

49530-00 Revision of total arthroplasty of knee with bone graft to femur

49530-01 Revision of total arthroplasty of knee with bone graft to tibia

49533-00 Revision of total arthroplasty of knee with bone graft to femur and tibia

49554-00 Revision of total arthroplasty of knee with anatomic specific allograft

90562-00 Patella resurfacing

SHOULDER

Partial Shoulder Replacement

48915-00 Hemi arthroplasty of shoulder

Total Shoulder Replacement

48918-00 Total arthroplasty of shoulder

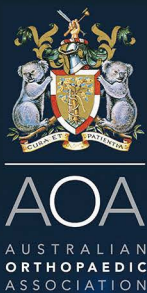
Revision Shoulder Replacement

48921-00 Revision of total joint replacement of shoulder

48924-00 Revision of total joint replacement of shoulder with bone graft

48927-00 Removal of shoulder prosthesis

48942-00 Arthrodesis and removal of shoulder prosthesis



Australian
Orthopaedic
Association
National
Joint
Replacement
Registry

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