Vanguard PS/Vanguard Total Knee Investigation

Note: This analysis compares the Vanguard PS/Vanguard femoral/tibial combination with all other total knee prostheses.

This combination has been identified as having a significantly higher rate of revision. For a detailed explanation of the process used by the Registry that results in identification of prostheses that have a higher than anticipated rate of revision please refer to the Prostheses with Higher than Anticipated Rates of Revision chapter of the most recent AOANJRR Annual Report, https://aoanjrr.sahmri.com/annual-reports-2026.

Note: Procedures using prostheses with no recorded use in 2025 are excluded from the comparator.

TABLE 1

Revision Rate of Primary Total Knee Replacement

The revision rate of the Vanguard PS/Vanguard total knee combination is compared to all other total knee prostheses.

Table 1: Revision Rates of Primary Total Knee Replacement

Component	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs (95% CI)
Vanguard PS/Vanguard	407	5405	55751	0.73 (0.66, 0.80)
Other Total Knee	27284	791430	5145922	0.53 (0.52, 0.54)
TOTAL	**27691**	**796835**	**5201673**	**0.53 (0.53, 0.54)**

Note: Prostheses no longer used in 2025 are excluded from the comparator.

TABLE 2

Yearly Cumulative Percent Revision of Primary Total Knee Replacement

The yearly cumulative percent revision of the Vanguard PS/Vanguard total knee combination is compared to all other total knee prostheses.

Table 2: Yearly Cumulative Percent Revision (95% CI) of Primary Total Knee Replacement

CPR	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
Vanguard PS/Vanguard	1.8 (1.5, 2.2)	3.4 (2.9, 3.9)	4.2 (3.7, 4.8)	4.8 (4.2, 5.4)	5.2 (4.7, 5.9)	5.8 (5.2, 6.4)
Other Total Knee	1.0 (1.0, 1.0)	1.8 (1.8, 1.8)	2.4 (2.3, 2.4)	2.8 (2.7, 2.8)	3.1 (3.1, 3.1)	3.4 (3.4, 3.5)

CPR	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs	12 Yrs
Vanguard PS/Vanguard	6.1 (5.4, 6.7)	6.4 (5.8, 7.1)	6.9 (6.2, 7.6)	7.4 (6.7, 8.1)	7.7 (7.0, 8.5)	7.9 (7.2, 8.7)
Other Total Knee	3.7 (3.7, 3.8)	4.0 (4.0, 4.1)	4.3 (4.3, 4.4)	4.6 (4.6, 4.7)	4.9 (4.9, 5.0)	5.3 (5.2, 5.3)

CPR	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs	18 Yrs
Vanguard PS/Vanguard	8.4 (7.6, 9.3)	8.7 (7.8, 9.6)	9.3 (8.4, 10.3)	9.5 (8.5, 10.6)	9.5 (8.5, 10.6)	10.5 (8.9, 12.4)
Other Total Knee	5.6 (5.5, 5.7)	5.9 (5.8, 6.0)	6.3 (6.2, 6.4)	6.7 (6.6, 6.9)	7.2 (7.0, 7.3)	7.5 (7.4, 7.7)

CPR	19 Yrs	20 Yrs	21 Yrs	22 Yrs	23 Yrs	24 Yrs	25 Yrs
Vanguard PS/Vanguard							
Other Total Knee	7.9 (7.7, 8.0)	8.1 (7.9, 8.3)	8.5 (8.2, 8.7)	8.7 (8.4, 9.0)	8.8 (8.6, 9.2)	9.1 (8.7, 9.5)	9.5 (8.8, 10.2)

Note: Prostheses no longer used in 2025 are excluded from the comparator.

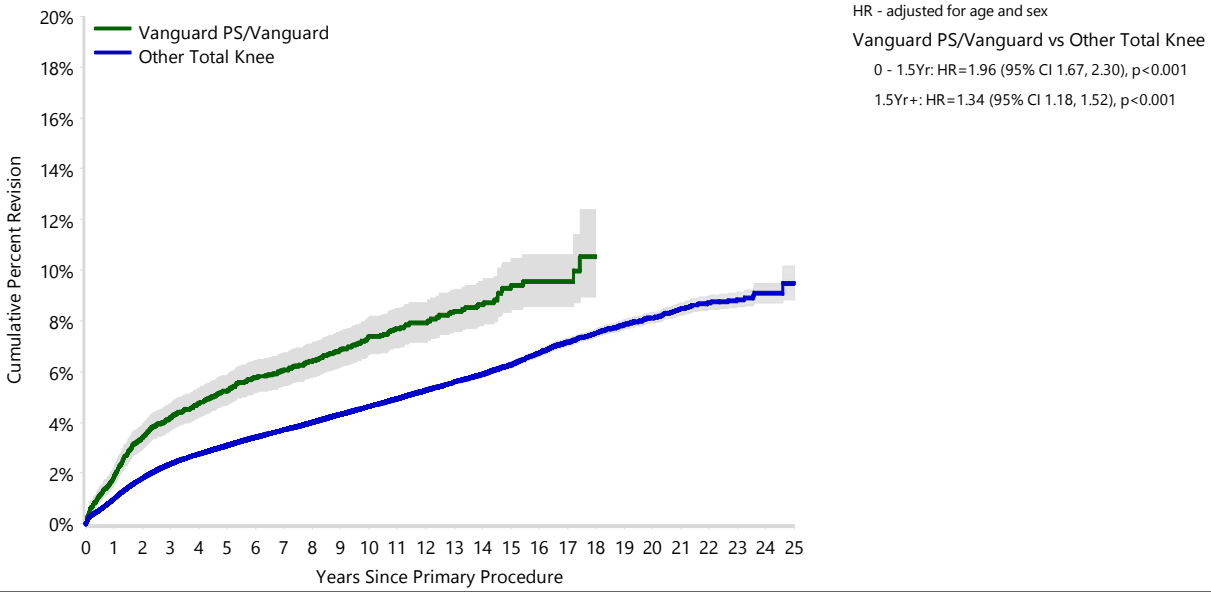
FIGURE 1

Yearly Cumulative Percent Revision of Primary Total Knee Replacement

The yearly cumulative percent revision of the Vanguard PS/Vanguard total knee combination is compared to all other total knee prostheses. In addition, hazard ratios are reported.

Hazard ratios are reported for specific time periods during which the hazard ratio is constant. This is done to enable more specific and valid comparisons of the risk of revision over time. The pattern of variation in risk has important implications with respect to the underlying reasons for any difference.

Figure 1: Cumulative Percent Revision of Primary Total Knee Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Vanguard PS/Vanguard	5405	5265	5146	5044	4878	4661	4397	4112
Other Total Knee	791430	708699	628274	550835	487544	424868	369845	315999

Number at Risk	8 Yrs	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs
Vanguard PS/Vanguard	3816	3445	3053	2577	2095	1682	1227	807	511
Other Total Knee	266816	222320	182654	146980	117201	92187	70380	52526	38351

Number at Risk	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs	23 Yrs	24 Yrs	25 Yrs
Vanguard PS/Vanguard	250	92	36	5	0	0	0	0	0
Other Total Knee	27628	19434	13616	9427	6164	3657	2096	972	244

Note: Prostheses no longer used in 2025 are excluded from the comparator.

TABLE 3

Primary Diagnosis for Revised Primary Total Knee Replacement

This table identifies the diagnosis of the primary procedure which was subsequently revised. This information is provided as there is a variation on outcome depending on the primary diagnosis. It is therefore important when considering the reasons for a higher than anticipated rate of revision that there is identification of the primary diagnosis. This information should be compared to the primary diagnosis for the revisions of all other total knee prostheses.

Table 3: Primary Diagnosis for Revised Primary Total Knee Replacement

	Vanguard PS/Vanguard		Other Total Knee	
Primary Diagnosis	Number	Percent	Number	Percent
Osteoarthritis	392	96.3	26392	96.7
Rheumatoid Arthritis	11	2.7	330	1.2
Tumour			199	0.7
Other Inflammatory Arthritis	3	0.7	177	0.6
Osteonecrosis	1	0.2	104	0.4
Fracture			55	0.2
Other			26	0.1
Chondrocalcinosis			1	0.0
TOTAL	**407**	**100.0**	**27284**	**100.0**

Note: Prostheses no longer used in 2025 are excluded from the comparator.

TABLE 4

Reasons for Revision

This is reported in two ways: a percentage of primary procedures revised and as a percentage of all revision procedures.

% Primaries Revised: This shows the proportional contribution of each revision diagnosis as a percentage of the total number of primary procedures. This percentage can be used to approximate the risk of being revised for that diagnosis. Differing percentages between groups, with the same distribution of follow up time, may identify problems of concern.

% Revisions: The number of revisions for each diagnosis is expressed as a percentage of the total number of revisions. This shows the distribution of reasons for revision within a group but cannot be used as a comparison between groups.

Table 4: Primary Total Knee Replacement - Reason for Revision (Follow-up Limited to 20.4 Years)

Revision Diagnosis	Vanguard PS/Vanguard			Other Total Knee		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	106	2.0	26.0	7884	1.0	28.9
Loosening	133	2.5	32.7	5755	0.7	21.1
Instability	39	0.7	9.6	2871	0.4	10.5
Patella Erosion	16	0.3	3.9	2032	0.3	7.5
Pain	27	0.5	6.6	1866	0.2	6.8
Patellofemoral Pain	17	0.3	4.2	1556	0.2	5.7
Arthrofibrosis	8	0.1	2.0	1181	0.1	4.3
Fracture	16	0.3	3.9	1134	0.1	4.2
Malalignment	5	0.1	1.2	511	0.1	1.9
Wear Tibial Insert	5	0.1	1.2	372	0.0	1.4
Lysis	4	0.1	1.0	291	0.0	1.1
Implant Breakage Tibial Insert	5	0.1	1.2	252	0.0	0.9
Incorrect Sizing	4	0.1	1.0	218	0.0	0.8
Patella Maltracking	1	0.0	0.2	192	0.0	0.7
Bearing Dislocation	1	0.0	0.2	150	0.0	0.6
Implant Breakage Patella	2	0.0	0.5	147	0.0	0.5
Metal Related Pathology	5	0.1	1.2	114	0.0	0.4
Prosthesis Dislocation	2	0.0	0.5	78	0.0	0.3
Synovitis				64	0.0	0.2
Wear Patella				52	0.0	0.2
Osteonecrosis	1	0.0	0.2	51	0.0	0.2
Implant Breakage Femoral				49	0.0	0.2
Implant Breakage Tibial	4	0.1	1.0	39	0.0	0.1
Tumour				36	0.0	0.1
Heterotopic Bone				16	0.0	0.1
Progression Of Disease				8	0.0	0.0
Wear Tibial				6	0.0	0.0
Patella Dislocation				3	0.0	0.0
Incorrect Side				1	0.0	0.0
Wear Femoral				1	0.0	0.0
Other	6	0.1	1.5	314	0.0	1.2
N Revision	**407**	**7.5**	**100.0**	**27244**	**3.4**	**100.0**
N Primary	**5405**			**791430**		

Note: This table is restricted to revisions within 20.4 years for all groups to allow a time-matched comparison of revisions.
Note: Prostheses no longer used in 2025 are excluded from the comparator.

FIGURE 2

Cumulative Incidence Revision Diagnosis of Primary Total Knee Replacement

This figure details the cumulative incidence of the most common reasons for revision. The five most common reasons for revision are included as long as each of these reasons account for more than 10 procedures or at least 5% of all revisions for the Vanguard PS/Vanguard total knee combination. A comparative graph is provided of the cumulative incidence for the same reasons for revisions for all other total knee prostheses.

Figure 2: Cumulative Incidence Revision Diagnosis for Primary Total Knee Replacement

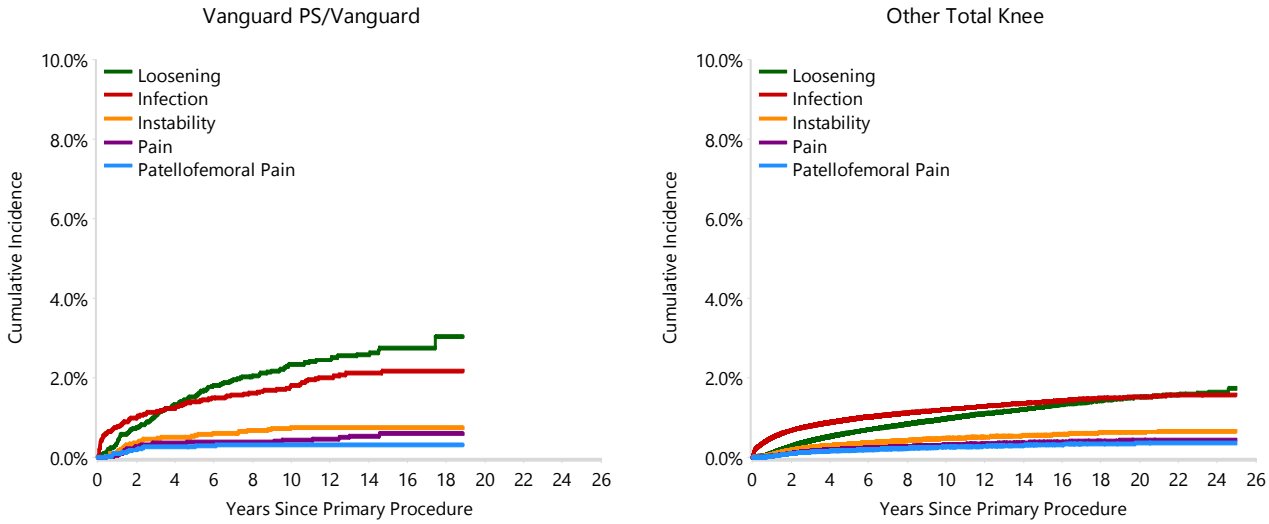


TABLE 5

Type of Revision Performed for Primary Total Knee Replacement

This analysis identifies the components used in the revision of the Vanguard PS/Vanguard total knee combination and compares it to the components used in the revision of all other total knee prostheses.

The reason this analysis is undertaken is to identify whether there is one or more components which are being replaced that differ from the components replaced for revisions of all other total knee prostheses i.e. is there a difference in the type of revision undertaken for the Vanguard PS/Vanguard total knee combination compared to all other total knee prostheses.

Table 5: Primary Total Knee Replacement - Type of Revision (Follow-up Limited to 20.4 Years)

	Vanguard PS/Vanguard		Other Total Knee	
Type of Revision	Number	Percent	Number	Percent
TKR (Tibial/Femoral)	116	28.5	6657	24.4
Tibial Component	61	15.0	1908	7.0
Femoral Component	7	1.7	1313	4.8
Cement Spacer	31	7.6	1137	4.2
Removal of Prostheses			134	0.5
Total Femoral			23	0.1
Reinsertion of Components	3	0.7	8	0.0
N Major	**218**	**53.6**	**11180**	**41.0**
Insert Only	106	26.0	8565	31.4
Patella Only	55	13.5	4493	16.5
Insert/Patella	23	5.7	2929	10.8
Minor Components	5	1.2	66	0.2
Cement Only			11	0.0
N Minor	**189**	**46.4**	**16064**	**59.0**
TOTAL	**407**	**100.0**	**27244**	**100.0**

Note: This table is restricted to revisions within 20.4 years for all groups to allow a time-matched comparison of revisions.
Note: Prostheses no longer used in 2025 are excluded from the comparator.

TABLE 6

Revision Rates of Vanguard PS/Vanguard Primary Total Knee Replacement by Fixation

This analysis is provided as some prostheses have more than one fixation option. Additionally there are prostheses where an alternative to the recommended approach to fixation was used e.g. a cementless prosthesis that has been cemented or vice-versa.

Table 6: Revised Number of Vanguard PS/Vanguard Primary Total Knee Replacement by Fixation

Fixation	N Revised	N Total
Cemented	365	4679
Cementless	1	13
Hybrid (Tibial Cemented)	41	711
Hybrid (Tibial Cementless)	0	2
TOTAL	**407**	**5405**

TABLE 7

Revision Rates of Vanguard PS/Vanguard Primary Total Knee Replacement by Bearing Surface

This analysis is provided as some prostheses are combined with a variety of bearing surfaces. All bearing surfaces used with this combination are listed.

Table 7: Revised Number of Vanguard PS/Vanguard Primary Total Knee Replacement by Bearing Surface

Bearing Surface	N Revised	N Total
Non XLPE	401	5289
XLPE + Antioxidant	6	114
Unknown	0	2
TOTAL	**407**	**5405**

TABLE 8

Revision Rates of Vanguard PS/Vanguard Primary Total Knee Replacement by Bearing Mobility

This analysis is provided as some prostheses are combined with a variety of bearing mobilities. All bearing mobilities used with this combination are listed.

Table 8: Revised Number of Vanguard PS/Vanguard Primary Total Knee Replacement by Bearing Mobility

Bearing Mobility	N Revised	N Total
Fixed	407	5402
Rotating	0	1
Unknown	0	2
TOTAL	**407**	**5405**

TABLE 9

Revision Rates of Vanguard PS/Vanguard Primary Total Knee Replacement by Stability

This analysis is provided as some prostheses are combined with a variety of stabilities. All stabilities used with this combination are listed.

Table 9: Revised Number of Vanguard PS/Vanguard Primary Total Knee Replacement by Stability

Stability	N Revised	N Total
Fully Stabilised	0	2
Hinged	0	1
Minimally Stabilised	0	1
Posterior Stabilised	407	5399
Unknown	0	2
TOTAL	**407**	**5405**

TABLE 10

Revision Rates of Primary Total Knee Replacement by State

This enables a state by state variation to be identified for the Vanguard PS/Vanguard total knee combination and provides the comparative data for each of the states for all other total knee prostheses.

The purpose of this analysis is to determine if the higher than anticipated rate of revision has widespread distribution between states. If there is widespread distribution then the reason for the higher than anticipated rate of revision is unlikely to be surgeon specific. If the prosthesis has been used in only a small number of states it is not possible to distinguish if the higher than anticipated rate of revision is related to the prosthesis, surgeon, technique or patient.

Table 10: Revised Number of Primary Total Knee Replacement by State

Component	State	N Revised	N Total
Vanguard PS/Vanguard	NSW	56	1025
	VIC	158	1795
	QLD	151	1799
	WA	2	4
	SA	24	334
	TAS	0	19
	ACT/NT	16	429
Other Total Knee	NSW	7550	259497
	VIC	6020	163565
	QLD	5789	167244
	WA	3600	92841
	SA	3220	73114
	TAS	475	15075
	ACT/NT	630	20094
TOTAL		**27691**	**796835**

Note: Prostheses no longer used in 2025 are excluded from the comparator.

TABLE 11

Number of Revisions of Vanguard PS/Vanguard Primary Total Knee Replacement by Year of Implant

This analysis details the number of prostheses reported each year to the Registry for the Vanguard PS/Vanguard total knee combination. It also provides the subsequent number of revisions of the primaries reported in that year.

Primary procedures performed in later years have had less follow up time therefore the number revised is expected to be less than the number revised in earlier years. For example, a primary procedure performed in 2025 has a maximum of one year to be revised, whereas a primary procedure performed in 2023 has a maximum of three years to be revised.

Table 11: Number of Revisions of Vanguard PS/Vanguard Primary Total Knee Replacement by Year of Implant

Year of Implant	Number Revised	Total Number
2005	1	22
2006	4	81
2007	15	145
2008	29	321
2009	39	430
2010	49	478
2011	53	607
2012	49	561
2013	34	451
2014	44	523
2015	22	445
2016	15	331
2017	23	310
2018	11	205
2019	11	186
2020	4	136
2021	4	117
2022	0	56
TOTAL	**407**	**5405**

TABLE 12

Revision Rates of Vanguard PS/Vanguard Primary Total Knee Replacement by Catalogue Number Range

Many prostheses have a number of catalogue ranges. The catalogue range is specific to particular design features; more than one catalogue range usually indicates a minor difference in design in a particular Vanguard PS/Vanguard prosthesis.

This analysis has been undertaken to determine if the revision rate varies according to the catalogue number range.

Model	Catalogue Range	Catalogue Description	Cement	Mobility	Stability	Material	Coating	Fixation
Femoral								
Vanguard PS	183100-183136	VANGUARD PS OPEN BOX FEMORAL INTERLOK	YES					MATT
Vanguard PS	183100TNBN-183136TNBN	VANGUARD PS OPEN BOX FEMORAL INTERLOK TINBN COATED	YES					MATT
Vanguard PS	183200-183236	VANGUARD PS CLOSED BOX FEMORAL INTERLOK	YES					MATT
Vanguard PS	184500-184536	VANGUARD PS OPEN BOX FEMORAL POROUS COATED/BOND COATED	NO					POROUS
Tibial								
Vanguard	141210-141219	TITANIUM PRIMARY INTERLOK TIBIAL TRAY	YES			METAL		MATT
Vanguard	141221-141227	COCR I-BEAM MODULAR INTERLOK TIBIAL TRAY	YES					MATT
Vanguard	141230-141238	COCR FINNED MODULAR INTERLOK TIBIAL TRAY W/LOCKING BAR	YES					MATT
Vanguard	141241-141247	COCR I-BEAM MODULAR POLISHED INTERLOK TIBIAL TRAY	YES			METAL		POLISHED
Vanguard	141250-141258	COCR FINNED MODULAR POLISHED INTERLOK TIBIAL TRAY	YES			METAL		POLISHED
Vanguard	141250TNBN-141258TNBN	COCR TINBN FINNED MODULAR POLISHED INTERLOK TIBIAL TRAY	YES			METAL		POLISHED
Vanguard	141260-141268	TITANIUM PRIMARY POROUS TIBIAL TRAY	NO					POROUS
Vanguard	141361-141367	COCR FINNED HIGHLY POLISHED POROUS & HA TIBIAL TRAY	NO				HA COATED	POROUS
Vanguard	141480-141488	TITANIUM OFFSET INTERLOK TIBIAL TRAY	YES					
Vanguard	185200-185208	360 TIBIAL TRAY W/ TI LOCKING BAR & SCREW	YES			METAL		
Vanguard	189420-189528	VANGUARD PS MONO-LOCK DCM TIBIAL BEARING/I-BEAM BEARING ARCOM UHMWPE	YES	FIXED	POSTERIOR STABILISED	NON CROSS-LINKED POLYETHYLENE		

Table 12: Revised Number of Vanguard PS/Vanguard Primary Total Knee Replacement by Catalogue Number Range

Femoral Range	Tibial Range	N Revised	N Total
183100-183136	141210-141219	55	410
	141221-141227	6	52
	141230-141238	13	334
	141241-141247	33	304
	141250-141258	249	3394
	141250TNBN-141258TNBN	3	35
	141260-141268	0	3
	141480-141488	3	23
	185200-185208	1	27
	189420-189528	0	3
183100TNBN-183136TNBN	141210-141219	0	1
	141250TNBN-141258TNBN	0	7
183200-183236	141210-141219	0	6
	141230-141238	0	12
	141241-141247	0	9
	141250-141258	2	47
	141480-141488	0	3
	189420-189528	0	8
184500-184536	141210-141219	1	18
	141230-141238	3	23
	141241-141247	0	26
	141250-141258	36	619
	141250TNBN-141258TNBN	1	7
	141260-141268	0	1
	141361-141367	1	13
	141480-141488	0	3
	185200-185208	0	2
	189420-189528	0	15
TOTAL		**407**	**5405**