E.Motion/E.Motion Total Knee Investigation

Note: This analysis compares the E.Motion/E.Motion 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-2022.

Note: Procedures using prostheses with no recorded use in 2021 are excluded from the comparator.

TABLE 1

Revision Rate of Primary Total Knee Replacement

The revision rate of the E.Motion/E.Motion 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)
E.Motion/E.Motion	66	998	6577	1.00 (0.78, 1.28)
Other Total Knee	25995	726697	4722548	0.55 (0.54, 0.56)
TOTAL	**26061**	**727695**	**4729125**	**0.55 (0.54, 0.56)**

Note: Prostheses no longer used in 2021 are excluded from the comparator.

TABLE 2

Yearly Cumulative Percent Revision of Primary Total Knee Replacement

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

Table 2: Yearly Cumulative Percent Revision of Primary Total Knee Replacement

CPR	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
E.Motion/E.Motion	2.5 (1.7, 3.7)	4.4 (3.3, 5.9)	5.7 (4.4, 7.3)	6.3 (4.9, 8.0)	6.5 (5.1, 8.3)	6.7 (5.3, 8.5)	7.3 (5.7, 9.2)
Other Total Knee	1.0 (1.0, 1.0)	1.9 (1.9, 1.9)	2.5 (2.4, 2.5)	2.9 (2.9, 2.9)	3.2 (3.2, 3.3)	3.6 (3.5, 3.6)	3.9 (3.8, 3.9)

CPR	8 Yrs	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs
E.Motion/E.Motion	7.3 (5.7, 9.2)	7.3 (5.7, 9.2)	7.3 (5.7, 9.2)	7.3 (5.7, 9.2)			
Other Total Knee	4.2 (4.1, 4.2)	4.5 (4.4, 4.5)	4.8 (4.7, 4.8)	5.1 (5.0, 5.1)	5.4 (5.3, 5.5)	5.7 (5.7, 5.8)	6.1 (6.0, 6.1)

CPR	15 Yrs	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs
E.Motion/E.Motion							
Other Total Knee	6.4 (6.3, 6.6)	6.9 (6.7, 7.0)	7.3 (7.1, 7.4)	7.6 (7.4, 7.8)	7.9 (7.7, 8.1)	8.2 (7.9, 8.4)	8.2 (8.0, 8.5)

Note: Prostheses no longer used in 2021 are excluded from the comparator.

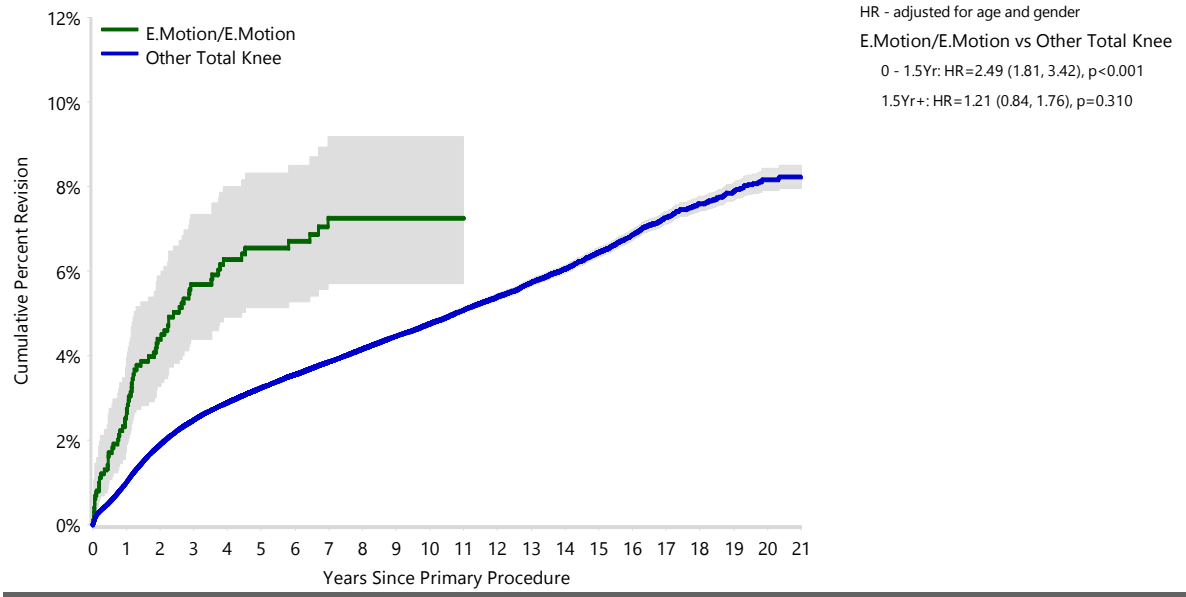
FIGURE 1

Yearly Cumulative Percent Revision of Primary Total Knee Replacement

The yearly cumulative percent revision of the E.Motion/E.Motion 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	8 Yrs	9 Yrs	10 Yrs
E.Motion/E.Motion	998	950	909	847	766	666	579	481	407	263	150
Other Total Knee	726697	656578	591851	526372	463275	403025	346553	293287	245345	202386	163352

Number at Risk	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs
E.Motion/E.Motion	64	9	0	0	0	0	0	0	0	0	0
Other Total Knee	128779	99100	75527	56481	41660	29601	19593	11953	6490	2687	605

Note: Prostheses no longer used in 2021 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

	E.Motion/E.Motion		Other Total Knee	
Primary Diagnosis	Number	Percent	Number	Percent
Osteoarthritis	66	100.0	25185	96.9
Rheumatoid Arthritis			331	1.3
Other Inflammatory Arthritis			161	0.6
Tumour			151	0.6
Osteonecrosis			98	0.4
Fracture			49	0.2
Other			19	0.1
Chondrocalcinosis			1	0.0
TOTAL	**66**	**100.0**	**25995**	**100.0**

Note: Prostheses no longer used in 2021 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 12.7 Years)

	E.Motion/E.Motion			Other Total Knee		
Revision Diagnosis	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	12	1.2	18.2	6845	0.9	27.3
Loosening	11	1.1	16.7	5569	0.8	22.2
Instability	6	0.6	9.1	2418	0.3	9.6
Pain	5	0.5	7.6	2013	0.3	8.0
Patellofemoral Pain	2	0.2	3.0	2013	0.3	8.0
Patella Erosion	7	0.7	10.6	1595	0.2	6.4
Arthrofibrosis	9	0.9	13.6	982	0.1	3.9
Fracture	1	0.1	1.5	874	0.1	3.5
Malalignment	1	0.1	1.5	593	0.1	2.4
Lysis	2	0.2	3.0	296	0.0	1.2
Wear Tibial Insert				287	0.0	1.1
Incorrect Sizing	2	0.2	3.0	256	0.0	1.0
Patella Maltracking	1	0.1	1.5	180	0.0	0.7
Bearing Dislocation	1	0.1	1.5	149	0.0	0.6
Implant Breakage Tibial Insert				134	0.0	0.5
Implant Breakage Patella				131	0.0	0.5
Metal Related Pathology	1	0.1	1.5	104	0.0	0.4
Prosthesis Dislocation	1	0.1	1.5	75	0.0	0.3
Synovitis	1	0.1	1.5	75	0.0	0.3
Osteonecrosis				58	0.0	0.2
Implant Breakage Tibial				39	0.0	0.2
Implant Breakage Femoral				33	0.0	0.1
Wear Patella				27	0.0	0.1
Tumour	1	0.1	1.5	25	0.0	0.1
Heterotopic Bone				13	0.0	0.1
Wear Tibial				9	0.0	0.0
Progression Of Disease				5	0.0	0.0
Patella Dislocation				2	0.0	0.0
Wear Femoral				2	0.0	0.0
Incorrect Side	1	0.1	1.5			
Other	1	0.1	1.5	299	0.0	1.2
N Revision	**66**	**6.6**	**100.0**	**25101**	**3.5**	**100.0**
N Primary	**998**			**726697**		

Note: This table is restricted to revisions within 12.7 years for all groups to allow a time-matched comparison of revisions.
Note: Prostheses no longer used in 2021 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 E.Motion/E.Motion 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

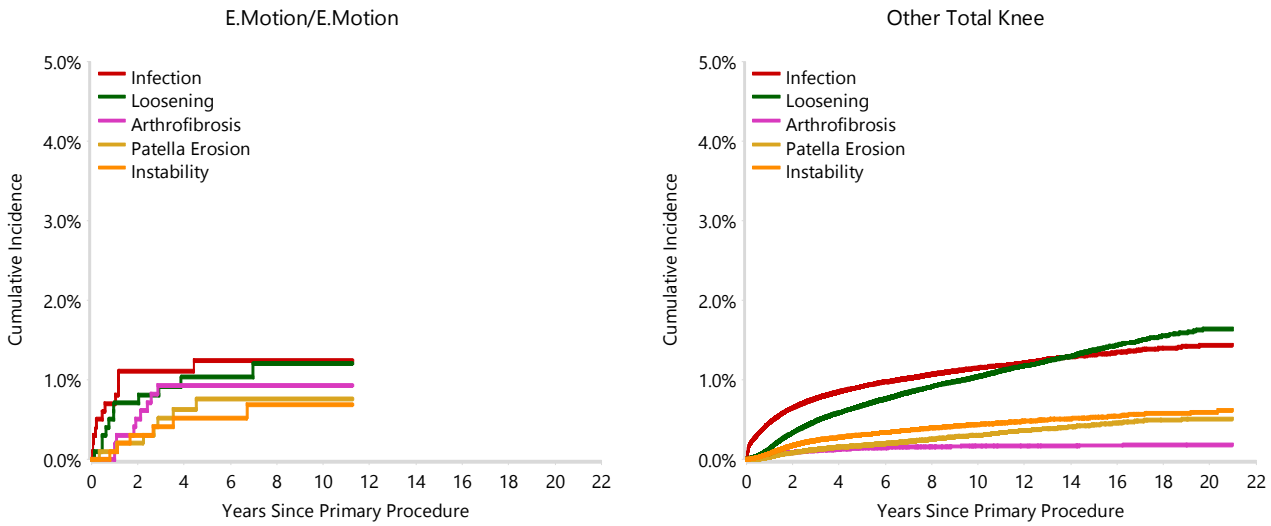


TABLE 5

Type of Revision Performed for Primary Total Knee Replacement

This analysis identifies the components used in the revision of the E.Motion/E.Motion 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 E.Motion/E.Motion total knee combination compared to all other total knee prostheses.

Table 5: Primary Total Knee Replacement - Type of Revision (Follow-up Limited to 12.7 Years)

	E.Motion/E.Motion		Other Total Knee	
Type of Revision	Number	Percent	Number	Percent
TKR (Tibial/Femoral)	18	27.3	6006	23.9
Tibial Component	4	6.1	2067	8.2
Cement Spacer	2	3.0	1327	5.3
Femoral Component	9	13.6	1295	5.2
Removal of Prostheses			147	0.6
Total Femoral			18	0.1
Reinsertion of Components			11	0.0
N Major	**33**	**50.0**	**10871**	**43.3**
Insert Only	15	22.7	6959	27.7
Patella Only	14	21.2	4689	18.7
Insert/Patella	4	6.1	2509	10.0
Minor Components			59	0.2
Cement Only			14	0.1
N Minor	**33**	**50.0**	**14230**	**56.7**
TOTAL	**66**	**100.0**	**25101**	**100.0**

Note: This table is restricted to revisions within 12.7 years for all groups to allow a time-matched comparison of revisions.
Note: Prostheses no longer used in 2021 are excluded from the comparator.

TABLE 6

Revision Rates of E.Motion/E.Motion 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 E.Motion/E.Motion Primary Total Knee Replacement by Fixation

Fixation	N Revised	N Total
Cemented	25	583
Cementless	36	385
Hybrid (Tibial Cemented)	3	27
Hybrid (Tibial Cementless)	2	3
TOTAL	**66**	**998**

TABLE 7

Revision Rates of E.Motion/E.Motion 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 E.Motion/E.Motion Primary Total Knee Replacement by Bearing Surface

Bearing Surface	N Revised	N Total
Non XLPE	66	998
TOTAL	**66**	**998**

TABLE 8

Revision Rates of E.Motion/E.Motion 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 E.Motion/E.Motion Primary Total Knee Replacement by Bearing Mobility

Bearing Mobility	N Revised	N Total
Rotating	66	998
TOTAL	**66**	**998**

TABLE 9

Revision Rates of E.Motion/E.Motion 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 E.Motion/E.Motion Primary Total Knee Replacement by Stability

Stability	N Revised	N Total
Minimally Stabilised	44	592
Posterior Stabilised	22	406
TOTAL	**66**	**998**

TABLE 10

Revision Rates of Primary Total Knee Replacement by State

This enables a state by state variation to be identified for the E.Motion/E.Motion 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
E.Motion/E.Motion	NSW	64	977
	VIC	0	2
	TAS	0	1
	ACT/NT	2	18
Other Total Knee	NSW	7658	252144
	VIC	5553	144485
	QLD	5690	153171
	WA	3235	77905
	SA	2837	63440
	TAS	418	16884
	ACT/NT	604	18668
TOTAL		**26061**	**727695**

Note: Prostheses no longer used in 2021 are excluded from the comparator.

TABLE 11

Number of Revisions of E.Motion/E.Motion Primary Total Knee Replacement by Year of Implant

This analysis details the number of prostheses reported each year to the Registry for the E.Motion/E.Motion 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 2021 has a maximum of one year to be revised, whereas a primary procedure performed in 2019 has a maximum of three years to be revised.

Table 11: Number of Revisions of E.Motion/E.Motion Primary Total Knee Replacement by Year of Implant

Year of Implant	Number Revised	Total Number
2009	1	12
2010	10	87
2011	9	114
2012	6	129
2013	13	171
2014	5	71
2015	8	93
2016	9	87
2017	5	101
2018	0	64
2019	0	45
2020	0	11
2021	0	13
TOTAL	**66**	**998**

TABLE 12

Revision Rates of E.Motion/E.Motion 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 E.Motion/E.Motion 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	Coating
Femoral				
E.Motion	NB702K-NB758K	PS COCR CEMENTED STANDARD FEMORAL COMPONENT	YES	
E.Motion	NB702Z-NB758Z	AS PS COCR CEMENTED PREMIUM FEMORAL COMPONENT	YES	
E.Motion	NO502K-NO608K	FP/UC CEMENTED STANDARD FEMORAL COMPONENT	YES	
E.Motion	NO502Z-NO608Z	AS FP/UC CEMENTED PREMIUM FEMORAL COMPONENT	YES	
E.Motion	NO582K-NO688K	FP/UC CEMENTLESS FEMORAL COMPONENT	NO	HA COATED
Tibial				
E.Motion	NB731K-NB788K	UC/PS CEMENTED MODULAR TIBIA PLATEAU	YES	
E.Motion	NB731Z-NB788Z	AS UC/PS CEMENTED MODULAR TIBIA PLATEAU	YES	
E.Motion	NB741K-NB798K	UC/PS CEMENTLESS MODULAR TIBIA PLATEAU	NO	HA COATED
E.Motion	NO521K-NO628K	FP CEMENTED TIBIAL PLATEAU	YES	

Table 12: Revised Number of E.Motion/E.Motion Primary Total Knee Replacement by Catalogue Number Range

Femoral Range	Tibial Range	N Revised	N Total
NB702K-NB758K	NB731K-NB788K	6	46
	NB731Z-NB788Z	0	7
	NB741K-NB798K	2	2
NB702Z-NB758Z	NB731K-NB788K	1	2
	NB731Z-NB788Z	13	348
	NB741K-NB798K	0	1
NO502K-NO608K	NB731K-NB788K	2	77
	NB731Z-NB788Z	0	3
NO502Z-NO608Z	NB731K-NB788K	1	1
	NB731Z-NB788Z	2	95
NO582K-NO688K	NB731K-NB788K	2	21
	NB731Z-NB788Z	0	4
	NB741K-NB798K	37	390
	NO521K-NO628K	0	1
TOTAL		**66**	**998**