

Continuum Total Conventional Hip Investigation

Note: This analysis compares the Continuum acetabular prosthesis with all other total conventional hip prostheses.

This prosthesis 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 metal/metal prostheses with head size larger than 32mm are excluded from the comparator. Procedures using prostheses with no recorded use in 2021 are excluded from the comparator.

TABLE 1

Revision Rate of Primary Total Conventional Hip Replacement

The revision rate of the Continuum total conventional hip prosthesis is compared to all other total conventional hip prostheses.

Table 1: Revision Rates of Primary Total Conventional Hip Replacement

Component	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs (95% CI)
Continuum	589	13684	84229	0.70 (0.64, 0.76)
Other Total Conventional Hip	15430	443112	2664125	0.58 (0.57, 0.59)
TOTAL	16019	456796	2748354	0.58 (0.57, 0.59)

Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 2

Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

The yearly cumulative percent revision of the Continuum total conventional hip prosthesis is compared to all other total conventional hip prostheses.

Table 2: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

CPR	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs
Continuum	2.7 (2.4, 2.9)	3.2 (2.9, 3.5)	3.5 (3.2, 3.8)	3.7 (3.4, 4.1)	3.9 (3.6, 4.3)	4.2 (3.9, 4.6)	4.6 (4.2, 4.9)
Other Total Conventional Hip	1.7 (1.7, 1.8)	2.2 (2.1, 2.2)	2.5 (2.5, 2.6)	2.8 (2.7, 2.9)	3.1 (3.0, 3.1)	3.4 (3.3, 3.4)	3.7 (3.6, 3.7)

CPR	8 Yrs	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs
Continuum	4.8 (4.4, 5.2)	5.1 (4.6, 5.5)	5.4 (4.9, 5.9)	5.5 (5.0, 6.0)	5.5 (5.0, 6.0)		
Other Total Conventional Hip	4.0 (3.9, 4.0)	4.3 (4.2, 4.4)	4.6 (4.5, 4.7)	5.0 (4.9, 5.1)	5.4 (5.3, 5.5)	5.8 (5.7, 5.9)	6.2 (6.1, 6.4)

CPR	15 Yrs	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs
Continuum							
Other Total Conventional Hip	6.7 (6.5, 6.8)	7.1 (6.9, 7.3)	7.5 (7.3, 7.7)	7.8 (7.6, 8.1)	8.6 (8.3, 8.9)	8.9 (8.5, 9.3)	9.8 (8.9, 10.8)

Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

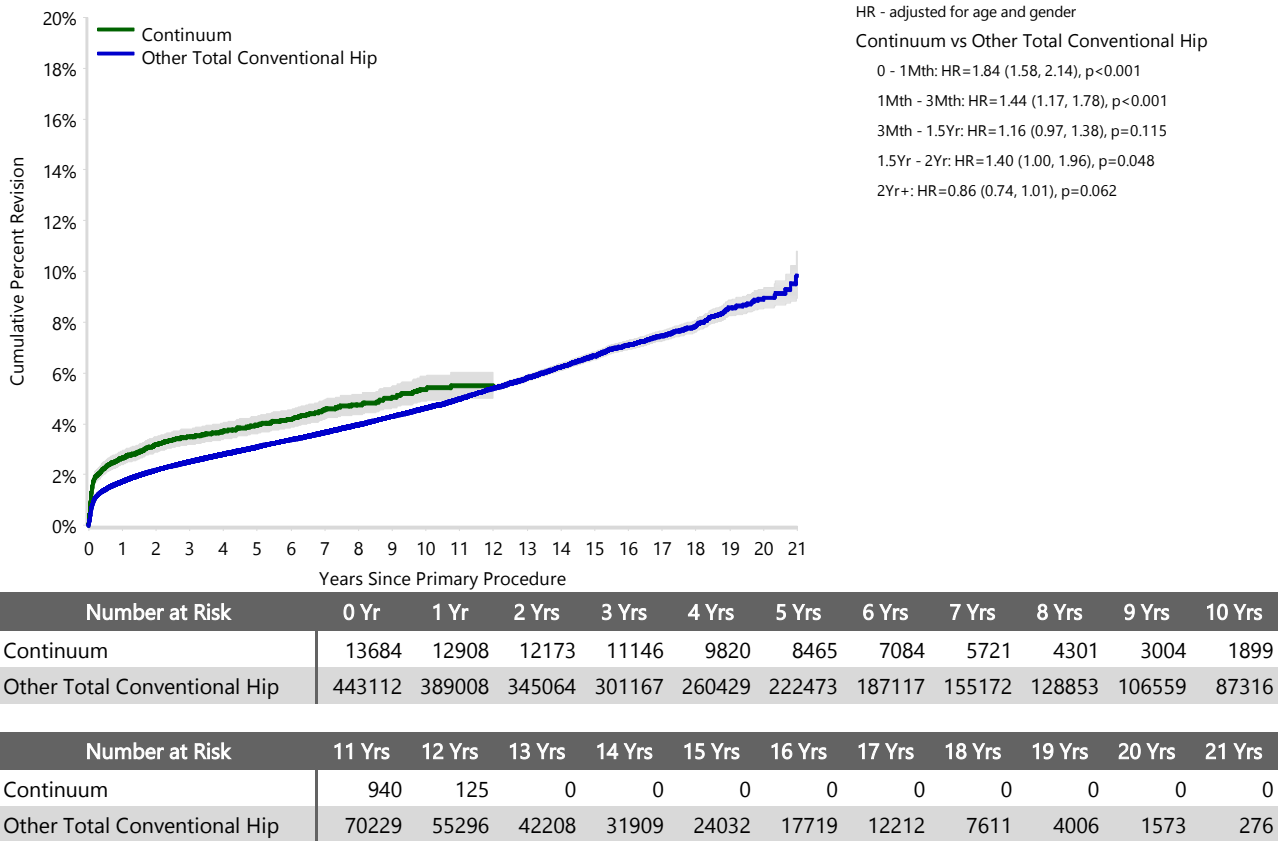
FIGURE 1

Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

The yearly cumulative percent revision of the Continuum total conventional hip prosthesis is compared to all other total conventional hip 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 Conventional Hip Replacement



Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 3

Primary Diagnosis for Revised Primary Total Conventional Hip 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 conventional hip prostheses.

Table 3: Primary Diagnosis for Revised Primary Total Conventional Hip Replacement

Primary Diagnosis	Continuum		Other Total Conventional Hip	
	Number	Percent	Number	Percent
Osteoarthritis	487	82.7	12774	82.8
Fractured Neck Of Femur	45	7.6	1125	7.3
Osteonecrosis	25	4.2	695	4.5
Developmental Dysplasia	15	2.5	233	1.5
Rheumatoid Arthritis	5	0.8	169	1.1
Tumour	2	0.3	136	0.9
Failed Internal Fixation	5	0.8	135	0.9
Other Inflammatory Arthritis	2	0.3	89	0.6
Fracture/Dislocation	2	0.3	45	0.3
Arthrodesis Takedown			16	0.1
Other	1	0.2	13	0.1
TOTAL	589	100.0	15430	100.0

Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm 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 Conventional Hip Replacement - Reason for Revision (Follow-up Limited to 12.3 Years)

Revision Diagnosis	Number	Continuum		Other Total Conventional Hip		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Prosthesis Dislocation/Instability	218	1.6	37.0	3462	0.8	23.5
Infection	108	0.8	18.3	3385	0.8	23.0
Fracture	121	0.9	20.5	3172	0.7	21.5
Loosening	65	0.5	11.0	2968	0.7	20.2
Pain	15	0.1	2.5	270	0.1	1.8
Leg Length Discrepancy	14	0.1	2.4	252	0.1	1.7
Malposition	16	0.1	2.7	211	0.0	1.4
Implant Breakage Stem	3	0.0	0.5	134	0.0	0.9
Lysis	5	0.0	0.8	131	0.0	0.9
Implant Breakage Acetabular Insert	4	0.0	0.7	106	0.0	0.7
Incorrect Sizing	7	0.1	1.2	92	0.0	0.6
Implant Breakage Acetabular	1	0.0	0.2	62	0.0	0.4
Wear Acetabular Insert	1	0.0	0.2	61	0.0	0.4
Metal Related Pathology	4	0.0	0.7	57	0.0	0.4
Wear Head	2	0.0	0.3	40	0.0	0.3
Tumour				36	0.0	0.2
Implant Breakage Head				27	0.0	0.2
Heterotopic Bone	1	0.0	0.2	22	0.0	0.1
Wear Acetabulum				7	0.0	0.0
Progression Of Disease				2	0.0	0.0
Osteonecrosis				1	0.0	0.0
Synovitis				1	0.0	0.0
Other	4	0.0	0.7	223	0.1	1.5
N Revision	589	4.3	100.0	14722	3.3	100.0
N Primary	13684			443112		

Note: This table is restricted to revisions within 12.3 years for all groups to allow a time-matched comparison of revisions.

Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

FIGURE 2

Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip 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 Continuum total conventional hip prosthesis. A comparative graph is provided of the cumulative incidence for the same reasons for revisions for all other total conventional hip prostheses.

Figure 2: Cumulative Incidence Revision Diagnosis for Primary Total Conventional Hip Replacement

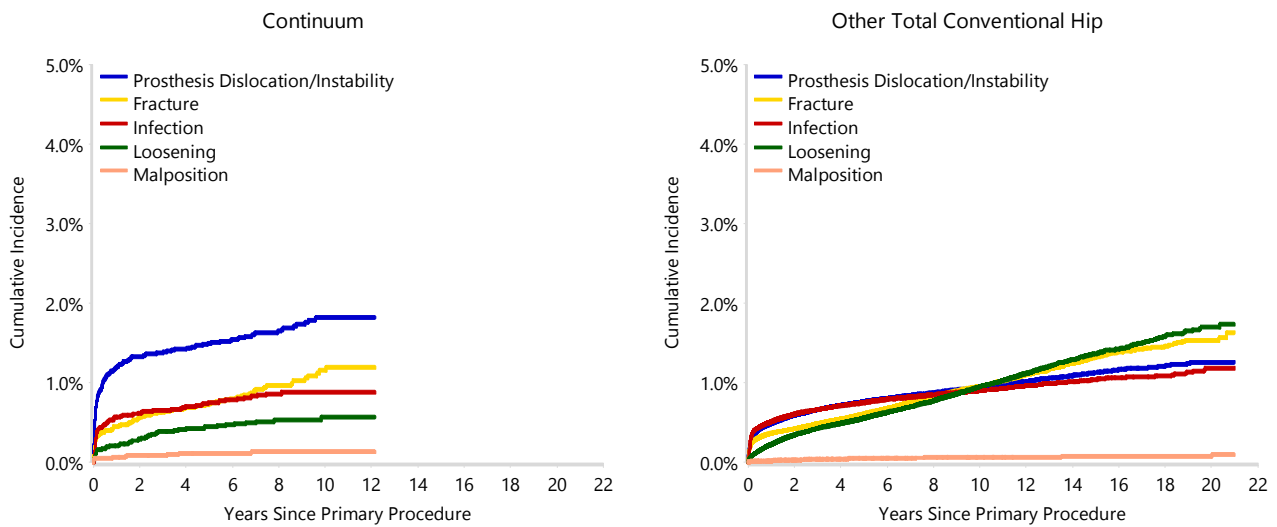


TABLE 5

Type of Revision Performed for Primary Total Conventional Hip Replacement

This analysis identifies the components used in the revision of the Continuum total conventional hip prosthesis and compares it to the components used in the revision of all other total conventional hip 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 conventional hip prostheses i.e. is there a difference in the type of revision undertaken for the Continuum total conventional hip prosthesis compared to all other total conventional hip prostheses.

Table 5: Primary Total Conventional Hip Replacement - Type of Revision (Follow-up Limited to 12.3 Years)

Type of Revision	Continuum		Other Total Conventional Hip	
	Number	Percent	Number	Percent
Femoral Component	175	29.7	4808	32.7
Acetabular Component	95	16.1	2806	19.1
THR (Femoral/Acetabular)	44	7.5	1637	11.1
Cement Spacer	20	3.4	562	3.8
Removal of Prostheses	1	0.2	92	0.6
Reinsertion of Components	1	0.2	24	0.2
Total Femoral			5	0.0
Bipolar Head and Femoral			4	0.0
Saddle			1	0.0
N Major	336	57.0	9939	67.5
Head/Insert	172	29.2	3603	24.5
Head Only	33	5.6	746	5.1
Minor Components	7	1.2	262	1.8
Insert Only	5	0.8	168	1.1
Head/Neck/Insert	22	3.7		
Head/Neck	11	1.9	1	0.0
Neck Only	3	0.5		
Bipolar Only			2	0.0
Cement Only			1	0.0
N Minor	253	43.0	4783	32.5
TOTAL	589	100.0	14722	100.0

Note: This table is restricted to revisions within 12.3 years for all groups to allow a time-matched comparison of revisions.

Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 6

Revision Rates of Continuum Primary Total Conventional Hip 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 Continuum Primary Total Conventional Hip Replacement by Fixation

Fixation	N Revised	N Total
Cemented	0	21
Cementless	374	8936
Hybrid (Femur Cemented)	214	4710
Reverse Hybrid (Femur Cementless)	1	17
TOTAL	589	13684

TABLE 7

Revision Rates of Continuum Primary Total Conventional Hip 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 prosthesis are listed.

Table 7: Revised Number of Continuum Primary Total Conventional Hip Replacement by Bearing Surface

Bearing Surface	N Revised	N Total
Ceramic/Ceramic	93	2253
Ceramic/Non XLPE	0	1
Ceramic/XLPE	128	3455
Ceramic/XLPE + Antioxidant	15	523
Metal/Metal	9	117
Metal/XLPE	330	6904
Metal/XLPE + Antioxidant	11	410
Ceramicised Metal/XLPE	3	16
Ceramicised Metal/XLPE + Antioxidant	0	1
Unknown	0	4
TOTAL	589	13684

TABLE 8**Revision Rates of Continuum Primary Total Conventional Hip Replacement by Approach**

This analysis is provided as some prostheses are used with a variety of surgical approaches. All surgical approaches used with this prosthesis are listed.

Table 8: Revised Number of Continuum Primary Total Conventional Hip Replacement by Approach

Approach	N Revised	N Total
Anterior	17	598
Lateral	77	1824
Posterior	144	3951
TOTAL	238	6373

Note: Excludes 7311 procedures with no approach recorded

TABLE 9

Revision Rates of Primary Total Conventional Hip Replacement by State

This enables a state by state variation to be identified for the Continuum total conventional hip prosthesis and provides the comparative data for each of the states for all other total conventional hip 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 9: Revised Number of Primary Total Conventional Hip Replacement by State

Component	State	N Revised	N Total
Continuum	NSW	222	6167
	VIC	132	2157
	QLD	82	2575
	WA	68	1065
	SA	26	455
	TAS	7	362
	ACT/NT	52	903
Other Total Conventional Hip	NSW	4129	128119
	VIC	3897	115599
	QLD	3082	78359
	WA	2143	53194
	SA	1392	41490
	TAS	365	14772
	ACT/NT	422	11579
TOTAL		16019	456796

Note: Prostheses no longer used in 2021 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 10**Number of Revisions of Continuum Primary Total Conventional Hip Replacement by Year of Implant**

This analysis details the number of prostheses reported each year to the Registry for the Continuum total conventional hip prosthesis. 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 10: Number of Revisions of Continuum Primary Total Conventional Hip Replacement by Year of Implant

Year of Implant	Number Revised	Total Number
2009	9	175
2010	64	1117
2011	69	1245
2012	55	1333
2013	79	1502
2014	61	1492
2015	58	1359
2016	52	1327
2017	40	1293
2018	44	1197
2019	29	850
2020	20	513
2021	9	281
TOTAL	589	13684

TABLE 11

Revision Rates of Continuum Primary Total Conventional Hip 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 Continuum 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	Material	Fixation
Acetabular					
Continuum	00875704000-00875708000	CONTINUUM ACETABULAR SYSTEM TRABECULAR METAL SHELL WITH UNI-HOLE POROUS	NO	METAL	HIGHLY POROUS
Continuum	00875704002-00875708002	CONTINUUM ACETABULAR SYSTEM TRABECULAR METAL SHELL WITH MULTI HOLES POROUS	NO	METAL	HIGHLY POROUS
Continuum	00875704401-00875708001	CONTINUUM ACETABULAR SYSTEM TRABECULAR METAL SHELL WITH CLUSTER HOLES POROUS	NO	METAL	HIGHLY POROUS

Table 11: Revised Number of Continuum Primary Total Conventional Hip Replacement by Catalogue Number Range

Acetabular Range	N Revised	N Total
00875704000-00875708000	41	941
00875704002-00875708002	14	190
00875704401-00875708001	534	12553
TOTAL	589	13684

TABLE 12

Revision Rates of Continuum Primary Total Conventional Hip Replacement by Component

A prosthesis may be combined with multiple components. This analysis has been undertaken to determine if the revision rate varies according to the component with which it is combined.

Table 12: Revised Number of Continuum Primary Total Conventional Hip Replacement by Femoral Stem Component

Femoral Stem Component	N Revised	N Total
Absolut	2	76
Accolade I	0	1
Accolade II	0	1
AcuMatch M-Series	0	3
Alloclassic	20	342
Anatomic II	6	246
Anthology	0	2
Apex	0	1
Arcos	1	16
Avenir	64	1779
C-Stem AMT	1	1
CLS	7	158
CORAIL	3	54
CPCS	0	13
CPT	181	3388
Echelon	0	3
Echo	0	1
Epoch	0	3
Exeter V40	7	241
KAR	0	1
M/L Taper	63	1662
ML Taper Kinectiv	98	2246
MS 30	19	937
MasterLoc	0	1
Mayo	0	7
Metafix	1	1
Mets	1	2
Natural Hip	0	18
Omnifit	1	7
Paragon	0	1
Polarstem	1	4
Profemur XM	0	1
Quadra-C	0	1
Quadra-H	1	5
Revitan	0	2
S-Rom	3	31
SL-Plus	1	2
Secur-Fit	2	39
Segmental System	0	7
Short Exeter V40	0	3
Sirius	0	22

Femoral Stem Component	N Revised	N Total
Spectron EF	0	1
Synergy	1	4
Taper Fit	0	1
Taperloc	17	779
Taperloc Microplasty	18	572
Trabecular Metal	50	701
VerSys	10	147
VerSys Heritage	0	1
Wagner	7	75
ZMR	3	74
TOTAL	589	13684