

## MiniMax Total Conventional Hip Investigation

Note: This analysis compares the MiniMax femoral stem 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-2023>.

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 2022 are excluded from the comparator.

### TABLE 1

#### Revision Rate of Primary Total Conventional Hip Replacement

The revision rate of the MiniMax 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)
MiniMax	23	415	1528	1.51 (0.95, 2.26)
Other Total Conventional Hip	17429	493730	3079934	0.57 (0.56, 0.57)
<b>TOTAL</b>	<b>17452</b>	<b>494145</b>	<b>3081462</b>	<b>0.57 (0.56, 0.57)</b>

Note: Prostheses no longer used in 2022 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 MiniMax 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	8 Yrs
MiniMax	4.6 (2.9, 7.1)	5.3 (3.5, 8.0)	5.6 (3.8, 8.3)	5.6 (3.8, 8.3)	5.6 (3.8, 8.3)			
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, 2.8)	3.1 (3.0, 3.1)	3.4 (3.3, 3.4)	3.6 (3.6, 3.7)	3.9 (3.9, 4.0)

CPR	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs
MiniMax							
Other Total Conventional Hip	4.3 (4.2, 4.3)	4.6 (4.5, 4.7)	4.9 (4.8, 5.0)	5.3 (5.2, 5.4)	5.7 (5.6, 5.8)	6.1 (6.0, 6.2)	6.5 (6.4, 6.6)

CPR	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs
MiniMax							
Other Total Conventional Hip	6.9 (6.8, 7.1)	7.3 (7.1, 7.4)	7.6 (7.4, 7.8)	8.2 (8.0, 8.5)	8.5 (8.2, 8.8)	8.9 (8.5, 9.3)	9.3 (8.8, 9.8)

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

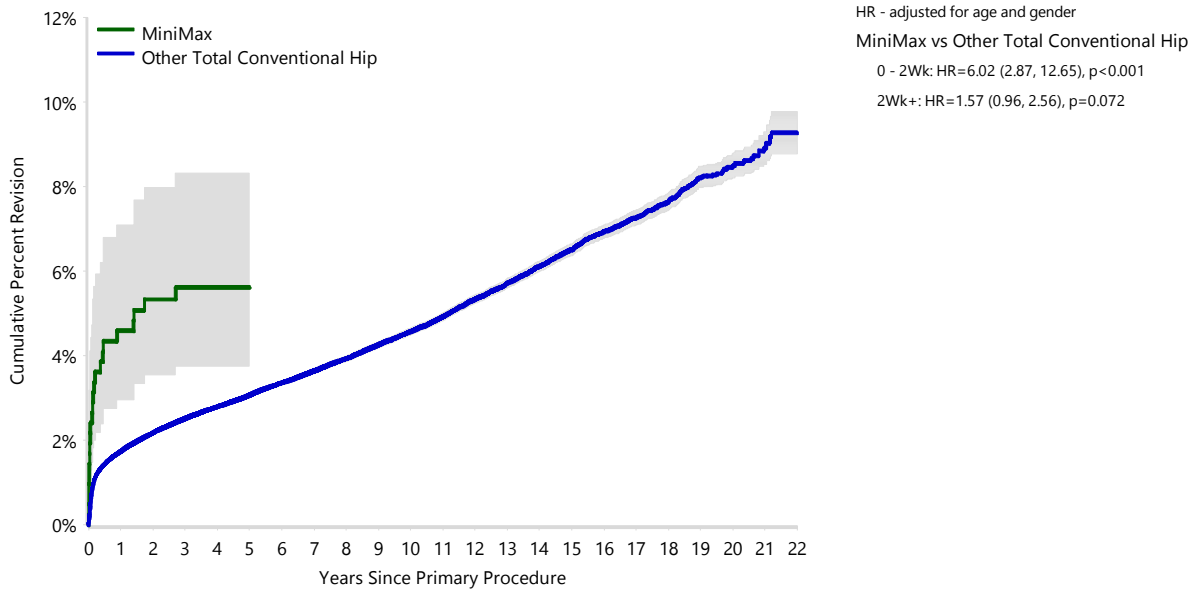
**FIGURE 1**

**Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement**

The yearly cumulative percent revision of the MiniMax 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**



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	11 Yrs
MiniMax	415	390	368	327	202	44	4	0	0	0	0	0
Other Total Conventional Hip	493730	437110	388349	343893	299458	258020	219307	183514	151369	124924	102632	83483

Number at Risk	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs
MiniMax	0	0	0	0	0	0	0	0	0	0	0
Other Total Conventional Hip	66659	51987	39538	29740	22330	16535	11402	7013	3737	1435	252

Note: Prostheses no longer used in 2022 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	MiniMax		Other Total Conventional Hip	
	Number	Percent	Number	Percent
Osteoarthritis	23	100.0	14409	82.7
Fractured Neck Of Femur			1291	7.4
Osteonecrosis			797	4.6
Developmental Dysplasia			279	1.6
Rheumatoid Arthritis			186	1.1
Failed Internal Fixation			147	0.8
Tumour			145	0.8
Other Inflammatory Arthritis			99	0.6
Fracture/Dislocation			46	0.3
Arthrodesis Takedown			16	0.1
Other			14	0.1
<b>TOTAL</b>	<b>23</b>	<b>100.0</b>	<b>17429</b>	<b>100.0</b>

Note: Prostheses no longer used in 2022 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 6.6 Years)

Revision Diagnosis	Number	MiniMax		Other Total Conventional Hip		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	3	0.7	13.0	3666	0.7	25.6
Prosthesis Dislocation/Instability	1	0.2	4.3	3594	0.7	25.1
Fracture	12	2.9	52.2	2948	0.6	20.6
Loosening	2	0.5	8.7	2562	0.5	17.9
Pain				270	0.1	1.9
Leg Length Discrepancy	2	0.5	8.7	262	0.1	1.8
Malposition				220	0.0	1.5
Incorrect Sizing	1	0.2	4.3	97	0.0	0.7
Implant Breakage Stem				90	0.0	0.6
Implant Breakage Acetabular Insert				89	0.0	0.6
Lysis				64	0.0	0.4
Implant Breakage Acetabular				49	0.0	0.3
Metal Related Pathology				44	0.0	0.3
Tumour				35	0.0	0.2
Wear Head				26	0.0	0.2
Heterotopic Bone				24	0.0	0.2
Wear Acetabular Insert				23	0.0	0.2
Implant Breakage Head				15	0.0	0.1
Wear Acetabulum				3	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	2	0.5	8.7	218	0.0	1.5
<b>N Revision</b>	<b>23</b>	<b>5.5</b>	<b>100.0</b>	<b>14303</b>	<b>2.9</b>	<b>100.0</b>
<b>N Primary</b>	<b>415</b>			<b>493730</b>		

Note: This table is restricted to revisions within 6.6 years for all groups to allow a time-matched comparison of revisions.

Note: Prostheses no longer used in 2022 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 MiniMax 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**

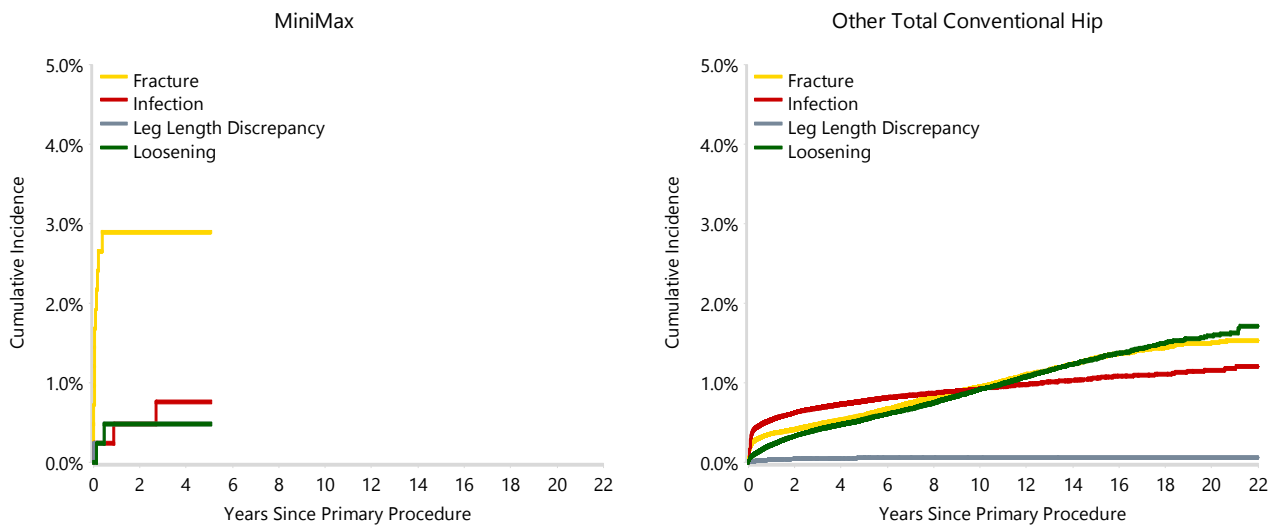


TABLE 5

**Type of Revision Performed for Primary Total Conventional Hip Replacement**

This analysis identifies the components used in the revision of the MiniMax 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 MiniMax 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 6.6 Years)**

Type of Revision	MiniMax		Other Total Conventional Hip	
	Number	Percent	Number	Percent
Femoral Component	11	47.8	4449	31.1
Acetabular Component	1	4.3	2651	18.5
THR (Femoral/Acetabular)	3	13.0	1529	10.7
Cement Spacer	1	4.3	536	3.7
Removal of Prostheses			86	0.6
Reinsertion of Components	1	4.3	25	0.2
Bipolar Head and Femoral			4	0.0
Total Femoral			4	0.0
Saddle			1	0.0
<b>N Major</b>	<b>17</b>	<b>73.9</b>	<b>9285</b>	<b>64.9</b>
Head/Insert	2	8.7	3808	26.6
Head Only	4	17.4	795	5.6
Minor Components			240	1.7
Insert Only			171	1.2
Bipolar Only			2	0.0
Cement Only			1	0.0
Head/Neck			1	0.0
<b>N Minor</b>	<b>6</b>	<b>26.1</b>	<b>5018</b>	<b>35.1</b>
<b>TOTAL</b>	<b>23</b>	<b>100.0</b>	<b>14303</b>	<b>100.0</b>

Note: This table is restricted to revisions within 6.6 years for all groups to allow a time-matched comparison of revisions.

Note: Prostheses no longer used in 2022 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 MiniMax 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 MiniMax Primary Total Conventional Hip Replacement by Fixation**

Fixation	N Revised	N Total
Cementless	23	415
<b>TOTAL</b>	<b>23</b>	<b>415</b>

**TABLE 7****Revision Rates of MiniMax 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 MiniMax Primary Total Conventional Hip Replacement by Bearing Surface**

Bearing Surface	N Revised	N Total
Ceramic/Ceramic	12	214
Ceramic/Non XLPE	5	123
Ceramic/XLPE	5	74
Metal/Non XLPE	0	2
Metal/XLPE	1	2
<b>TOTAL</b>	<b>23</b>	<b>415</b>



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

Approach	N Revised	N Total
Anterior	23	401
Posterior	0	14
<b>TOTAL</b>	<b>23</b>	<b>415</b>

TABLE 9

**Revision Rates of Primary Total Conventional Hip Replacement by State**

This enables a state by state variation to be identified for the MiniMax 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
MiniMax	NSW	8	57
	VIC	7	166
	QLD	0	1
	WA	1	4
	SA	5	156
	TAS	2	31
	Other Total Conventional Hip	NSW	4720
	VIC	4341	128158
	QLD	3451	86926
	WA	2388	58884
	SA	1616	45482
	TAS	403	16351
	ACT/NT	510	13218
<b>TOTAL</b>		<b>17452</b>	<b>494145</b>

Note: Prostheses no longer used in 2022 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 MiniMax Primary Total Conventional Hip Replacement by Year of Implant**

This analysis details the number of prostheses reported each year to the Registry for the MiniMax 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 2022 has a maximum of one year to be revised, whereas a primary procedure performed in 2020 has a maximum of three years to be revised.

**Table 10: Number of Revisions of MiniMax Primary Total Conventional Hip Replacement by Year of Implant**

Year of Implant	Number Revised	Total Number
2016	0	4
2017	3	43
2018	7	170
2019	8	133
2020	2	41
2021	2	19
2022	1	5
<b>TOTAL</b>	<b>23</b>	<b>415</b>

TABLE 11

**Revision Rates of MiniMax 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 MiniMax 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	Stem Type
<b>Femoral Stem</b>					
MiniMax	0113100L-0113108R	ANATOMICAL FEMORAL STEM Ti6AL7NB HA	NO	METAL	MINI STEM

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

Femoral Stem Range	N Revised	N Total
0113100L-0113108R	23	415
<b>TOTAL</b>	<b>23</b>	<b>415</b>

**TABLE 12****Revision Rates of MiniMax 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 MiniMax Primary Total Conventional Hip Replacement by Acetabular Component**

Acetabular Component	N Revised	N Total
Agilis	0	1
Mpact	12	183
Trinity	0	1
Versafitcup CC	6	105
Versafitcup DM	5	125
<b>TOTAL</b>	<b>23</b>	<b>415</b>