BMHR VST Total Conventional Hip Investigation

Note: This analysis compares the BMHR VST 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-2025.

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 2024 are excluded from the comparator.

TABLE 1

Revision Rate of Primary Total Conventional Hip Replacement

The revision rate of the BMHR VST 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)
BMHR VST	42	260	3231	1.30 (0.94, 1.76)
Other Total Conventional Hip	19492	552154	3552443	0.55 (0.54, 0.56)
TOTAL	**19534**	**552414**	**3555674**	**0.55 (0.54, 0.56)**

Note: Prostheses no longer used in 2024 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 BMHR VST total conventional hip prosthesis is compared to all other total conventional hip prostheses.

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

CPR	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
BMHR VST	1.9 (0.8, 4.6)	3.5 (1.8, 6.6)	4.6 (2.7, 8.0)	5.0 (3.0, 8.5)	7.0 (4.5, 10.8)	7.8 (5.1, 11.8)	9.3 (6.4, 13.6)	10.9 (7.7, 15.4)
Other Total Conventional Hip	1.7 (1.7, 1.8)	2.2 (2.1, 2.2)	2.5 (2.4, 2.5)	2.8 (2.7, 2.8)	3.0 (3.0, 3.1)	3.3 (3.3, 3.4)	3.6 (3.5, 3.6)	3.9 (3.8, 3.9)

CPR	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs
BMHR VST	10.9 (7.7, 15.4)	12.1 (8.7, 16.8)	13.4 (9.7, 18.2)	14.2 (10.5, 19.2)	15.6 (11.6, 20.7)	16.1 (12.0, 21.3)	19.4 (13.9, 26.6)	
Other Total Conventional Hip	4.2 (4.1, 4.2)	4.4 (4.4, 4.5)	4.8 (4.7, 4.8)	5.2 (5.1, 5.3)	5.5 (5.4, 5.6)	5.9 (5.8, 6.0)	6.3 (6.2, 6.4)	6.7 (6.6, 6.9)

CPR	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs	23 Yrs
BMHR VST							
Other Total Conventional Hip	7.1 (6.9, 7.2)	7.4 (7.3, 7.6)	7.9 (7.7, 8.1)	8.3 (8.0, 8.5)	8.8 (8.5, 9.1)	9.3 (9.0, 9.7)	9.9 (9.4, 10.5)

Note: Prostheses no longer used in 2024 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

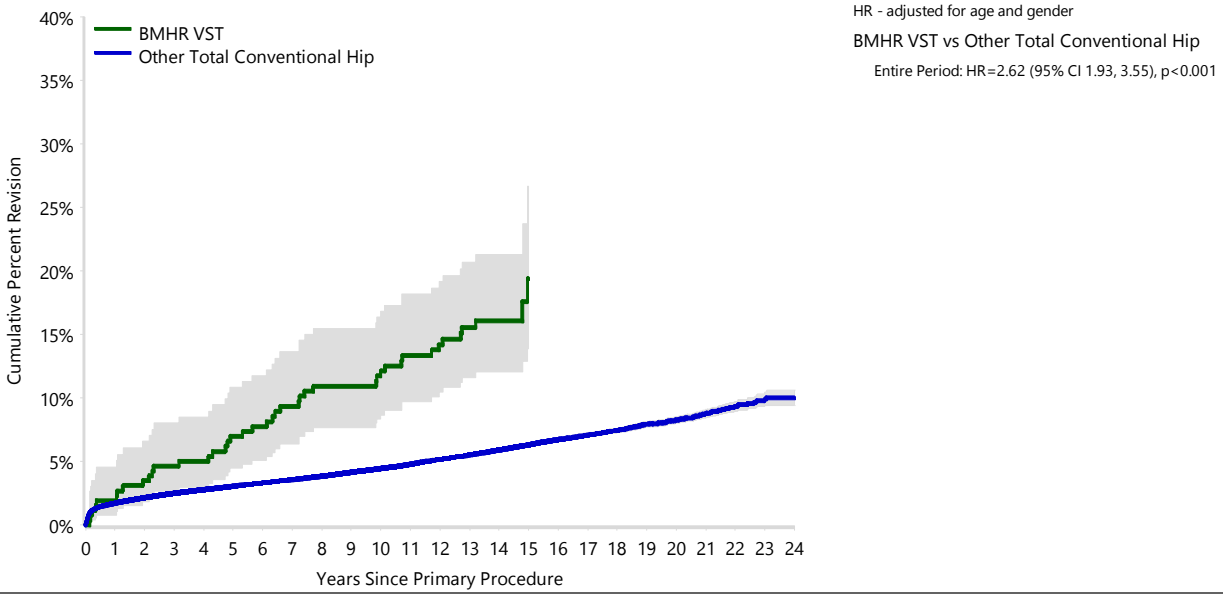
FIGURE 1

Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

The yearly cumulative percent revision of the BMHR VST 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
BMHR VST	260	253	249	246	244	239	235	229	224	224	219	211
Other Total Conventional Hip	552154	487715	432817	384210	337213	295811	254946	217123	182233	150376	122151	99378

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	23 Yrs
BMHR VST	198	175	115	45	2	0	0	0	0	0	0	0
Other Total Conventional Hip	80223	63999	49890	37936	28064	20581	15102	10871	7426	4536	2346	851

Note: Prostheses no longer used in 2024 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

	BMHR VST		Other Total Conventional Hip	
Primary Diagnosis	Number	Percent	Number	Percent
Osteoarthritis	35	83.3	16174	83.0
Fractured Neck Of Femur			1436	7.4
Osteonecrosis	7	16.7	856	4.4
Developmental Dysplasia			313	1.6
Rheumatoid Arthritis			210	1.1
Failed Internal Fixation			157	0.8
Tumour			148	0.8
Other Inflammatory Arthritis			112	0.6
Fracture/Dislocation			53	0.3
Other			19	0.1
Arthrodesis Takedown			14	0.1
TOTAL	**42**	**100.0**	**19492**	**100.0**

Note: Prostheses no longer used in 2024 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 16.7 Years)

Revision Diagnosis	BMHR VST			Other Total Conventional Hip		
	Number	% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	9	3.5	21.4	4744	0.9	24.7
Prosthesis Dislocation/Instability				4370	0.8	22.7
Fracture	6	2.3	14.3	4298	0.8	22.3
Loosening	9	3.5	21.4	3631	0.7	18.9
Pain	1	0.4	2.4	325	0.1	1.7
Leg Length Discrepancy				297	0.1	1.5
Malposition	1	0.4	2.4	266	0.0	1.4
Implant Breakage Stem				194	0.0	1.0
Lysis	2	0.8	4.8	189	0.0	1.0
Implant Breakage Acetabular Insert				126	0.0	0.7
Incorrect Sizing				98	0.0	0.5
Wear Acetabular Insert				92	0.0	0.5
Metal Related Pathology	13	5.0	31.0	81	0.0	0.4
Implant Breakage Acetabular				67	0.0	0.3
Wear Head	1	0.4	2.4	41	0.0	0.2
Tumour				40	0.0	0.2
Implant Breakage Head				28	0.0	0.1
Heterotopic Bone				27	0.0	0.1
Wear Acetabulum				9	0.0	0.0
Osteonecrosis				3	0.0	0.0
Synovitis				1	0.0	0.0
Other				310	0.1	1.6
N Revision	**42**	**16.2**	**100.0**	**19237**	**3.5**	**100.0**
N Primary	**260**			**552154**		

Note: This table is restricted to revisions within 16.7 years for all groups to allow a time-matched comparison of revisions.
Note: Prostheses no longer used in 2024 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 BMHR VST 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

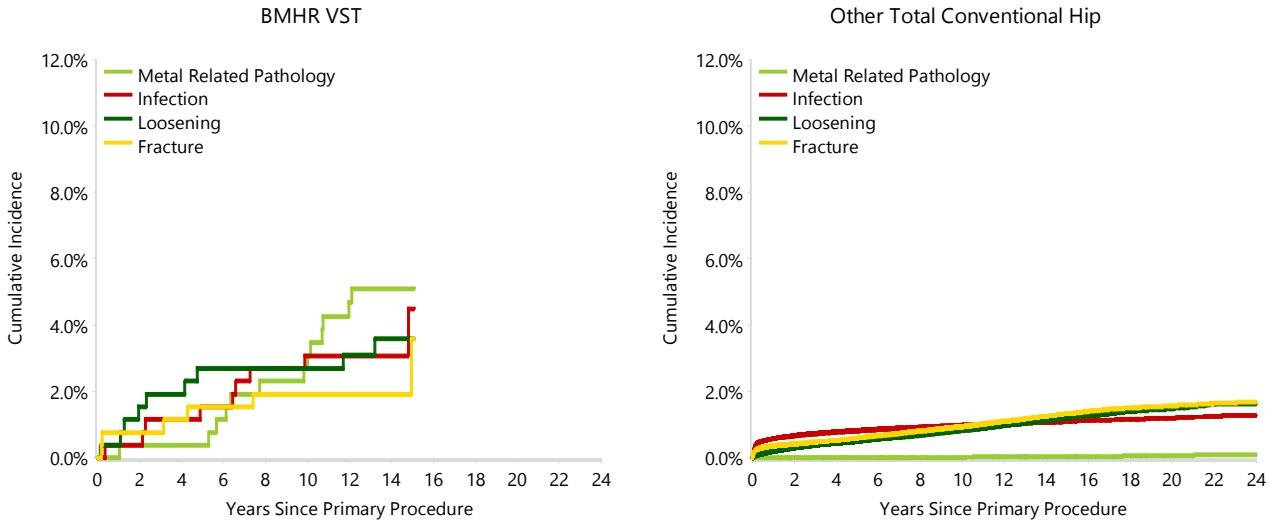


TABLE 5

Type of Revision Performed for Primary Total Conventional Hip Replacement

This analysis identifies the components used in the revision of the BMHR VST 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 BMHR VST 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 16.7 Years)

	BMHR VST		Other Total Conventional Hip	
Type of Revision	Number	Percent	Number	Percent
Femoral Component	10	23.8	6495	33.8
Acetabular Component	1	2.4	3346	17.4
THR (Femoral/Acetabular)	27	64.3	2200	11.4
Cement Spacer	3	7.1	592	3.1
Removal of Prostheses			97	0.5
Reinsertion of Components			29	0.2
Total Femoral			13	0.1
Bipolar Head and Femoral			9	0.0
N Major	**41**	**97.6**	**12781**	**66.4**
Head/Insert			5053	26.3
Head Only	1	2.4	920	4.8
Minor Components			302	1.6
Insert Only			178	0.9
Bipolar Only			1	0.0
Cement Only			1	0.0
Head/Neck			1	0.0
N Minor	**1**	**2.4**	**6456**	**33.6**
TOTAL	**42**	**100.0**	**19237**	**100.0**

Note: This table is restricted to revisions within 16.7 years for all groups to allow a time-matched comparison of revisions.
Note: Prostheses no longer used in 2024 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 BMHR VST 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 BMHR VST Primary Total Conventional Hip Replacement by Fixation

Fixation	N Revised	N Total
Cementless	41	257
Hybrid (Femur Cemented)	1	3
TOTAL	**42**	**260**

TABLE 7

Revision Rates of BMHR VST 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 BMHR VST Primary Total Conventional Hip Replacement by Bearing Surface

Bearing Surface	N Revised	N Total
Ceramic/Metal	0	2
Metal/Metal	42	258
TOTAL	**42**	**260**

TABLE 8

Revision Rates of BMHR VST 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 BMHR VST Primary Total Conventional Hip Replacement by Approach

Approach	N Revised	N Total
Lateral	0	1
TOTAL	**0**	**1**

Note: Excludes 259 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 BMHR VST 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
BMHR VST	NSW	7	59
	VIC	5	22
	QLD	30	176
	TAS	0	1
	ACT/NT	0	2
Other Total Conventional Hip	NSW	5288	159916
	VIC	4851	143812
	QLD	3893	100102
	WA	2492	62236
	SA	1926	51998
	TAS	448	18480
	ACT/NT	594	15610
TOTAL		**19534**	**552414**

Note: Prostheses no longer used in 2024 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 BMHR VST Primary Total Conventional Hip Replacement by Year of Implant

This analysis details the number of prostheses reported each year to the Registry for the BMHR VST 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 2024 has a maximum of one year to be revised, whereas a primary procedure performed in 2022 has a maximum of three years to be revised.

Table 10: Number of Revisions of BMHR VST Primary Total Conventional Hip Replacement by Year of Implant

Year of Implant	Number Revised	Total Number
2008	0	2
2009	16	65
2010	13	81
2011	9	71
2012	2	22
2013	2	13
2014	0	5
2015	0	1
TOTAL	**42**	**260**

TABLE 11

Revision Rates of BMHR VST 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 BMHR VST 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	Coating
Femoral Stem					
BMHR VST	74431311-74431315	HAP COLLARED FEMORAL COMPONENT	NO	METAL	HA COATED

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

Femoral Stem Range	N Revised	N Total
74431311-74431315	42	260
TOTAL	**42**	**260**

TABLE 12

Revision Rates of BMHR VST 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 BMHR VST Primary Total Conventional Hip Replacement by Acetabular Component

Acetabular Component	N Revised	N Total
BHR	42	256
R3	0	4
TOTAL	**42**	**260**