

## SMR/SMR L1 Total Stemmed Reverse Shoulder Investigation

Note: This analysis compares the SMR/SMR L1 humeral stem/glenoid combination with all other total stemmed reverse shoulder 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-2024>.

Note: Procedures using prostheses with no recorded use in 2023 are excluded from the comparator.

### TABLE 1

#### Revision Rate of Primary Total Stemmed Reverse Shoulder Replacement

The revision rate of the SMR/SMR L1 total stemmed reverse shoulder combination is compared to all other total stemmed reverse shoulder prostheses.

**Table 1: Revision Rates of Primary Total Stemmed Reverse Shoulder Replacement**

Component	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs (95% CI)
SMR/SMR L1	459	10943	52698	0.87 (0.79, 0.95)
Other Total Stemmed Reverse Shoulder	1570	44455	177041	0.89 (0.84, 0.93)
<b>TOTAL</b>	<b>2029</b>	<b>55398</b>	<b>229738</b>	<b>0.88 (0.85, 0.92)</b>

Note: Prostheses no longer used in 2023 are excluded from the comparator.

TABLE 2

**Yearly Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement**

The yearly cumulative percent revision of the SMR/SMR L1 total stemmed reverse shoulder combination is compared to all other total stemmed reverse shoulder prostheses.

**Table 2: Yearly Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement**

CPR	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
SMR/SMR L1	2.9 (2.6, 3.3)	3.7 (3.3, 4.0)	4.0 (3.6, 4.4)	4.2 (3.8, 4.6)	4.3 (3.9, 4.7)	4.5 (4.1, 5.0)
Other Total Stemmed Reverse Shoulder	2.2 (2.0, 2.3)	2.9 (2.8, 3.1)	3.4 (3.2, 3.6)	3.8 (3.6, 4.0)	4.1 (3.9, 4.3)	4.4 (4.2, 4.7)

CPR	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs	12 Yrs
SMR/SMR L1	4.7 (4.3, 5.2)	5.0 (4.5, 5.5)	5.1 (4.6, 5.7)	5.4 (4.8, 6.0)	5.9 (5.1, 6.8)	6.1 (5.3, 7.2)
Other Total Stemmed Reverse Shoulder	4.6 (4.4, 4.9)	5.0 (4.7, 5.3)	5.3 (5.0, 5.6)	5.7 (5.3, 6.1)	6.1 (5.6, 6.5)	6.5 (5.9, 7.1)

CPR	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs
SMR/SMR L1	6.5 (5.4, 7.7)	6.5 (5.4, 7.7)	6.5 (5.4, 7.7)		
Other Total Stemmed Reverse Shoulder	6.6 (6.0, 7.3)	7.1 (6.2, 8.2)	7.1 (6.2, 8.2)		

Note: Prostheses no longer used in 2023 are excluded from the comparator.

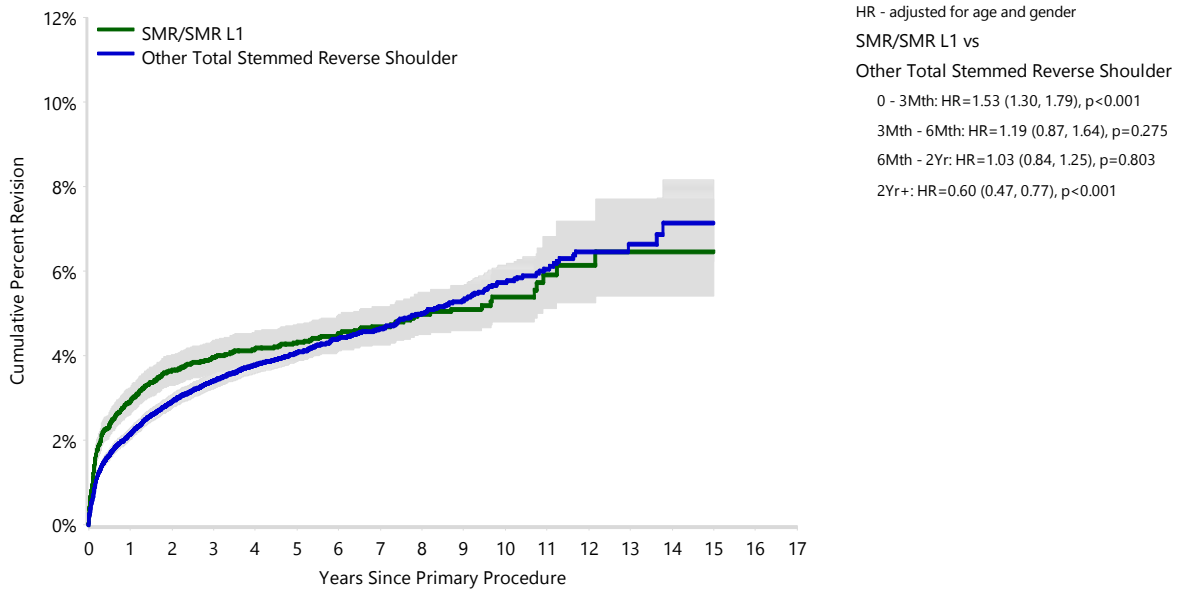
FIGURE 1

**Yearly Cumulative Percent Revision of Primary Total Stemmed Reverse Shoulder Replacement**

The yearly cumulative percent revision of the SMR/SMR L1 total stemmed reverse shoulder combination is compared to all other total stemmed reverse shoulder 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 Stemmed Reverse Shoulder Replacement**



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
SMR/SMR L1	10943	9576	8375	7029	5885	4743	3627	2712	1903
Other Total Stemmed Reverse Shoulder	44455	36093	29774	23882	18854	14303	10492	7460	5306

Number at Risk	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs
SMR/SMR L1	1313	844	473	309	268	236	125	39	6
Other Total Stemmed Reverse Shoulder	3757	2548	1645	989	565	322	135	39	7

Note: Prostheses no longer used in 2023 are excluded from the comparator.

TABLE 3

**Primary Diagnosis for Revised Primary Total Stemmed Reverse Shoulder 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 stemmed reverse shoulder prostheses.

**Table 3: Primary Diagnosis for Revised Primary Total Stemmed Reverse Shoulder Replacement**

Primary Diagnosis	SMR/SMR L1		Other Total Stemmed Reverse Shoulder	
	Number	Percent	Number	Percent
Osteoarthritis	177	38.6	592	37.7
Rotator Cuff Arthropathy	154	33.6	590	37.6
Fracture	101	22.0	256	16.3
Rheumatoid Arthritis	8	1.7	43	2.7
Instability	9	2.0	32	2.0
Tumour	1	0.2	31	2.0
Osteonecrosis	6	1.3	18	1.1
Other Inflammatory Arthritis	3	0.7	7	0.4
Other			1	0.1
<b>TOTAL</b>	<b>459</b>	<b>100.0</b>	<b>1570</b>	<b>100.0</b>

Note: Prostheses no longer used in 2023 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 Stemmed Reverse Shoulder Replacement - Reason for Revision

Revision Diagnosis	Number	SMR/SMR L1		Other Total Stemmed Reverse Shoulder		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Instability/Dislocation	164	1.5	35.7	488	1.1	31.1
Infection	81	0.7	17.6	443	1.0	28.2
Loosening	90	0.8	19.6	235	0.5	15.0
Fracture	61	0.6	13.3	160	0.4	10.2
Dissociation	9	0.1	2.0	62	0.1	3.9
Pain	12	0.1	2.6	30	0.1	1.9
Lysis	3	0.0	0.7	19	0.0	1.2
Implant Breakage Glenoid	1	0.0	0.2	17	0.0	1.1
Malposition	5	0.0	1.1	17	0.0	1.1
Arthrofibrosis	14	0.1	3.1	6	0.0	0.4
Incorrect Sizing	3	0.0	0.7	12	0.0	0.8
Heterotopic Bone	1	0.0	0.2	9	0.0	0.6
Metal Related Pathology	5	0.0	1.1	7	0.0	0.4
Rotator Cuff Insufficiency	2	0.0	0.4	7	0.0	0.4
Implant Breakage Humeral				4	0.0	0.3
Tumour	1	0.0	0.2	4	0.0	0.3
Wear Humeral Cup	1	0.0	0.2	4	0.0	0.3
Implant Breakage Glenoid Insert				3	0.0	0.2
Glenoid Erosion				1	0.0	0.1
Wear Glenoid Insert	1	0.0	0.2			
Other	5	0.0	1.1	42	0.1	2.7
<b>N Revision</b>	<b>459</b>	<b>4.2</b>	<b>100.0</b>	<b>1570</b>	<b>3.5</b>	<b>100.0</b>
<b>N Primary</b>	<b>10943</b>			<b>44455</b>		

Note: Prostheses no longer used in 2023 are excluded from the comparator.

FIGURE 2

Cumulative Incidence Revision Diagnosis of Primary Total Stemmed Reverse Shoulder 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 SMR/SMR L1 total stemmed reverse shoulder combination. A comparative graph is provided of the cumulative incidence for the same reasons for revisions for all other total stemmed reverse shoulder prostheses.

Figure 2: Cumulative Incidence Revision Diagnosis for Primary Total Stemmed Reverse Shoulder Replacement

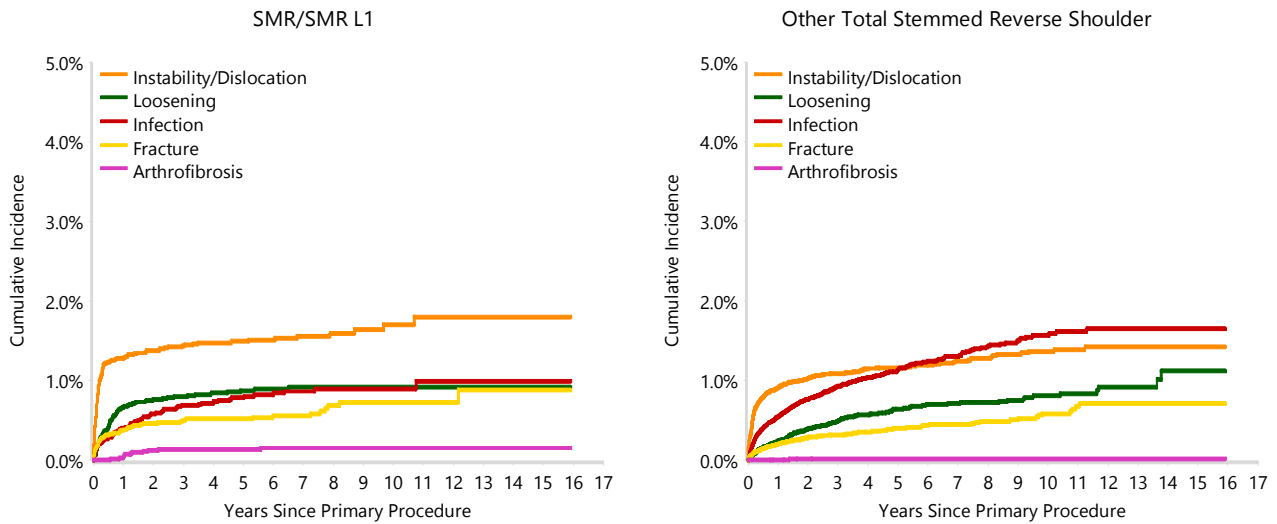


TABLE 5

**Type of Revision Performed for Primary Total Stemmed Reverse Shoulder Replacement**

This analysis identifies the components used in the revision of the SMR/SMR L1 total stemmed reverse shoulder combination and compares it to the components used in the revision of all other total stemmed reverse shoulder 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 stemmed reverse shoulder prostheses i.e. is there a difference in the type of revision undertaken for the SMR/SMR L1 total stemmed reverse shoulder combination compared to all other total stemmed reverse shoulder prostheses.

**Table 5: Primary Total Stemmed Reverse Shoulder Replacement - Type of Revision**

Type of Revision	SMR/SMR L1		Other Total Stemmed Reverse Shoulder	
	Number	Percent	Number	Percent
Humeral Component	101	22.0	418	26.6
Cement Spacer	16	3.5	168	10.7
Humeral/Glenoid	32	7.0	154	9.8
Glenoid Component	33	7.2	113	7.2
Removal of Prostheses	12	2.6	23	1.5
Reinsertion of Components			3	0.2
<b>N Major</b>	<b>194</b>	<b>42.3</b>	<b>879</b>	<b>56.0</b>
Cup/Head	89	19.4	307	19.6
Cup Only	84	18.3	247	15.7
Head Only	80	17.4	113	7.2
Minor Components	4	0.9	9	0.6
Cement Only	2	0.4	8	0.5
Reoperation	4	0.9	7	0.4
Head/Insert	2	0.4		
<b>N Minor</b>	<b>265</b>	<b>57.7</b>	<b>691</b>	<b>44.0</b>
<b>TOTAL</b>	<b>459</b>	<b>100.0</b>	<b>1570</b>	<b>100.0</b>

Note: Prostheses no longer used in 2023 are excluded from the comparator.

TABLE 6

**Revision Rates of SMR/SMR L1 Primary Total Stemmed Reverse Shoulder 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 SMR/SMR L1 Primary Total Stemmed Reverse Shoulder Replacement by Fixation**

Fixation	N Revised	N Total
Cemented	0	12
Cementless	427	10404
Hybrid (Glenoid Cemented)	12	135
Hybrid (Glenoid Cementless)	20	392
<b>TOTAL</b>	<b>459</b>	<b>10943</b>

TABLE 7

**Revision Rates of SMR/SMR L1 Primary Total Stemmed Reverse Shoulder 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 SMR/SMR L1 Primary Total Stemmed Reverse Shoulder Replacement by Bearing Surface**

Bearing Surface	N Revised	N Total
Ceramic/XLPE	0	8
Metal/XLPE	305	8389
XLPE/Metal	154	2530
Unknown	0	16
<b>TOTAL</b>	<b>459</b>	<b>10943</b>



TABLE 8

**Revision Rates of Primary Total Stemmed Reverse Shoulder Replacement by State**

This enables a state by state variation to be identified for the SMR/SMR L1 total stemmed reverse shoulder combination and provides the comparative data for each of the states for all other total stemmed reverse shoulder 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 8: Revised Number of Primary Total Stemmed Reverse Shoulder Replacement by State**

Component	State	N Revised	N Total
SMR/SMR L1	NSW	118	3213
	VIC	95	1811
	QLD	75	1579
	WA	103	2461
	SA	23	839
	TAS	14	395
	ACT/NT	31	645
Other Total Stemmed Reverse Shoulder	NSW	487	14547
	VIC	313	8721
	QLD	399	10777
	WA	180	4970
	SA	148	3802
	TAS	17	860
	ACT/NT	26	778
<b>TOTAL</b>		<b>2029</b>	<b>55398</b>

Note: Prostheses no longer used in 2023 are excluded from the comparator.

**TABLE 9****Number of Revisions of SMR/SMR L1 Primary Total Stemmed Reverse Shoulder Replacement by Year of Implant**

This analysis details the number of prostheses reported each year to the Registry for the SMR/SMR L1 total stemmed reverse shoulder 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 2023 has a maximum of one year to be revised, whereas a primary procedure performed in 2021 has a maximum of three years to be revised.

**Table 9: Number of Revisions of SMR/SMR L1 Primary Total Stemmed Reverse Shoulder Replacement by Year of Implant**

Year of Implant	Number Revised	Total Number
2005	0	2
2006	1	19
2007	16	124
2008	29	262
2009	13	271
2012	22	248
2013	31	563
2014	28	633
2015	43	732
2016	43	914
2017	32	930
2018	35	1046
2019	33	1055
2020	42	1009
2021	43	1189
2022	37	1028
2023	11	918
<b>TOTAL</b>	<b>459</b>	<b>10943</b>

TABLE 10

### Revision Rates of SMR/SMR L1 Primary Total Stemmed Reverse Shoulder 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 SMR/SMR L1 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
<b>Humeral Stem</b>				
SMR	130415110-130415130	CEMENTLESS FINNED MINI STEM Ti6AL4V	NO	METAL
SMR	130415140-130415240	FINNED STEM	NO	METAL
SMR	130615120-130615200	CEMENTED STEM	YES	METAL
SMR	130815134-130815166	REVISION STEM	NO	METAL
SMR	130915134-130915158	CEMENTED REVISION STEM	YES	METAL
SMR	131215200-131215240	REVISION STEM CEMENTED	YES	METAL
SMR	131315010-131315140	RESECTION STEM	NO	METAL
SMR	131515200-131515240	CEMENTED REVISION STEM	YES	METAL
<b>Glenoid</b>				
SMR L1	137520005-137520030	L1 METAL BACK GLENOID	NO	METAL
SMR L1	137520008-137520028	L1 METAL BACK GLENOID PEG	NO	METAL

Table 10: Revised Number of SMR/SMR L1 Primary Total Stemmed Reverse Shoulder Replacement by Catalogue Number Range

Humeral Stem Range	Glenoid Range	N Revised	N Total
130415110-130415130	137520005-137520030	35	530
130415140-130415240	137520005-137520030	396	10002
	137520008-137520028	0	9
130615120-130615200	137520005-137520030	13	281
130815134-130815166	137520005-137520030	15	92
130915134-130915158	137520005-137520030	0	22
131215200-131215240	137520005-137520030	0	4
131315010-131315140	137520005-137520030	0	2
131515200-131515240	137520005-137520030	0	1
<b>TOTAL</b>		<b>459</b>	<b>10943</b>