

# Australian Orthopaedic Association National Joint Replacement Registry

2023 SUPPLEMENTARY REPORT

## Cement in Hip and Knee Arthroplasty



**AOA**  
AUSTRALIAN  
ORTHOPAEDIC  
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Australian  
Orthopaedic  
Association  
National  
Joint  
Replacement  
Registry

**Australian Orthopaedic Association National Joint Replacement Registry**

## **Cement in Hip and Knee Arthroplasty**

2023 Supplementary Report

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National Joint Replacement Registry

**Cement in Hip and Knee Arthroplasty  
2023 Supplementary Report**

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The Registry greatly appreciates the participation of all joint replacement patients throughout Australia. Their contribution allows ongoing improvements in arthroplasty outcomes to be achieved.

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# Summary

This supplementary report provides information on the use of cement in primary total hip and primary total knee replacement. The trends in use over time and the revision rates for antibiotic cement and plain cement are provided.

The use of antibiotic cement has increased over time. In 2022, 99.9% of cemented total conventional hip replacements and 99.3% of cemented total knee replacements used antibiotic cement.

In primary total conventional hip replacement, antibiotic cement has a higher rate of revision in the first 6 months and a lower rate after 1.5 years compared to plain cement (Table C6 and Figure C3). When revision for infection is analysed, antibiotic cement has a higher rate of revision in the first 3 months and a lower rate of revision for infection after this time compared to plain cement (Table C8 and Figure C6).

In primary total knee replacement, antibiotic cement has a lower rate of revision compared to plain cement (Table C16 and Figure C9). However, this may be confounded by multiple factors and there is no difference in the rate of revision for infection.

# Hip Replacement

## CEMENT TRENDS IN HIP REPLACEMENT

**Table C1 10 Most Used Cement Types for Femoral Prostheses in Primary Hip Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
3225	Simplex P	14265	Simplex Tobra*	13233	Simplex Tobra*	13444	Simplex Tobra*	13051	Simplex Tobra*
3061	Antibiotic Simplex*	2380	Palacos R+G Pro*	2667	Palacos R+G Pro*	3035	Palacos R+G Pro*	3273	Palacos R+G Pro*
2394	Simplex Tobra*	2244	Palacos MV+G*	2201	Palacos MV+G*	2502	Palacos MV+G*	2601	Palacos MV+G*
672	CMW 1 G*	1563	Palacos R+G*	1643	Palacos R+G*	1594	Palacos R+G*	1337	Palacos R+G*
583	CMW 1 Plain	276	Simplex P	330	Cemex System GENTA FAST*	469	Palacos MV+G Pro*	718	Palacos MV+G Pro*
438	Palacos R*	222	Simplex HV*	235	Simplex P	344	Cemex System GENTA FAST*	335	Cemex System GENTA FAST*
369	CMW 3 G*	176	Cemex System GENTA FAST*	229	Palacos MV+G Pro*	259	Simplex P	286	Palacos Fast R+G*
147	Palacos E*	176	Refobacin Plus*	211	Simplex HV*	224	Palacos Fast R+G*	221	Simplex P
139	Palamed G*	146	CMW 3 G*	182	Refobacin Plus*	193	Simplex HV*	219	Simplex HV*
132	CMW 3 Plain	108	Copal G+C*	181	Palacos Fast R+G*	145	Refobacin Plus*	126	Refobacin Plus*
<b>10 Most Used</b>									
11160	(10) 93.5%	21556	(10) 98.2%	21112	(10) 98.2%	22209	(10) 98.2%	22167	(10) 98.3%
<b>Remainder</b>									
771	(19) 6.5%	397	(14) 1.8%	393	(18) 1.8%	409	(15) 1.8%	391	(14) 1.7%
<b>TOTAL</b>									
11931	(29) 100.0%	21953	(24) 100.0%	21505	(28) 100.0%	22618	(25) 100.0%	22558	(24) 100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures

**Table C2 10 Most Used Cement Types for Acetabular Prostheses in Primary Hip Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
470	Simplex Tobra*	591	Simplex Tobra*	459	Simplex Tobra*	396	Simplex Tobra*	328	Simplex Tobra*
409	CMW 1 Plain	252	Palacos R+G*	208	Palacos R+G*	195	Palacos R+G*	187	Palacos R+G*
315	Simplex P	98	CMW 2 G*	111	Palacos Fast R+G*	113	Palacos Fast R+G*	128	Palacos Fast R+G*
275	Antibiotic Simplex*	94	Palacos Fast R+G*	70	CMW 2 G*	77	CMW 2 G*	52	Palacos MV+G*
265	CMW 1 G*	61	Palacos MV+G*	57	Palacos MV+G*	58	Palacos MV+G*	50	CMW 2 G*
245	Palacos R*	35	Simplex HV*	17	Palacos R+G Pro*	37	Simplex HV*	47	Simplex HV*
183	CMW 2 G*	33	Palacos R+G Pro*	14	Copal G+V*	22	Copal G+V*	26	Copal G+V*
102	CMW 2 Plain	15	Copal G+V*	10	CMW 2	21	Palacos R+G Pro*	22	Palacos R+G Pro*
80	Palamed G*	15	SmartSet GHV*	10	Simplex HV*	8	CMW 2	11	Copal G+C*
33	Refobacin Plus*	13	CMW 3 G*	5	SmartSet GHV*	7	Copal G+C*	5	CMW 2
<b>10 Most Used</b>									
2377	(10) 97.1%	1207	(10) 97.4%	961	(10) 98.1%	934	(10) 98.9%	856	(10) 99.3%
<b>Remainder</b>									
71	(11) 2.9%	32	(6) 2.6%	19	(10) 1.9%	10	(5) 1.1%	6	(5) 0.7%
<b>TOTAL</b>									
2448	(21) 100.0%	1239	(16) 100.0%	980	(20) 100.0%	944	(15) 100.0%	862	(15) 100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures



**Table C3 10 Most Used Cement Types for Femoral Prostheses in Revision Hip Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
192	Simplex Tobra*	566	Simplex Tobra*	534	Simplex Tobra*	492	Simplex Tobra*	496	Simplex Tobra*
166	Antibiotic Simplex*	119	Palacos R+G*	126	Copal G+V*	158	Copal G+V*	185	Copal G+V*
74	Simplex P	113	Copal G+V*	110	Palacos R+G*	101	Palacos R+G*	93	Palacos R+G*
70	CMW 1 G*	77	Copal G+C*	78	Palacos MV+G*	75	Palacos R+G Pro*	86	Palacos MV+G*
37	Palacos R*	69	Palacos R+G Pro*	77	Palacos R+G Pro*	60	Palacos MV+G*	74	Palacos R+G Pro*
33	Palamed G*	67	Palacos MV+G*	60	Copal G+C*	49	Copal G+C*	68	Copal G+C*
21	CMW 3 G*	24	CMW 2 G*	30	Palacos Fast R+G*	21	Palacos Fast R+G*	23	Palacos Fast R+G*
17	CMW 1 Plain	16	Palacos Fast R+G*	21	CMW 2 G*	15	CMW 2 G*	13	Palacos MV+G Pro*
9	Refobacin Plus*	14	Palacos LV+G*	12	Palacos LV+G*	12	Palacos MV+G Pro*	10	CMW 2 G*
8	Palacos E*	12	CMW 3 G*	5	Refobacin Plus*	6	Simplex P	8	Palacos LV+G*
<b>10 Most Used</b>									
627	(10) 95.0%	1077	(10) 96.3%	1053	(10) 97.6%	989	(10) 97.6%	1056	(10) 97.3%
<b>Remainder</b>									
33	(11) 5.0%	41	(11) 3.7%	26	(9) 2.4%	24	(10) 2.4%	29	(10) 2.7%
<b>TOTAL</b>									
660	(21) 100.0%	1118	(21) 100.0%	1079	(19) 100.0%	1013	(20) 100.0%	1085	(20) 100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures

**Table C4 10 Most Used Cement Types for Acetabular Prostheses in Revision Hip Replacement**

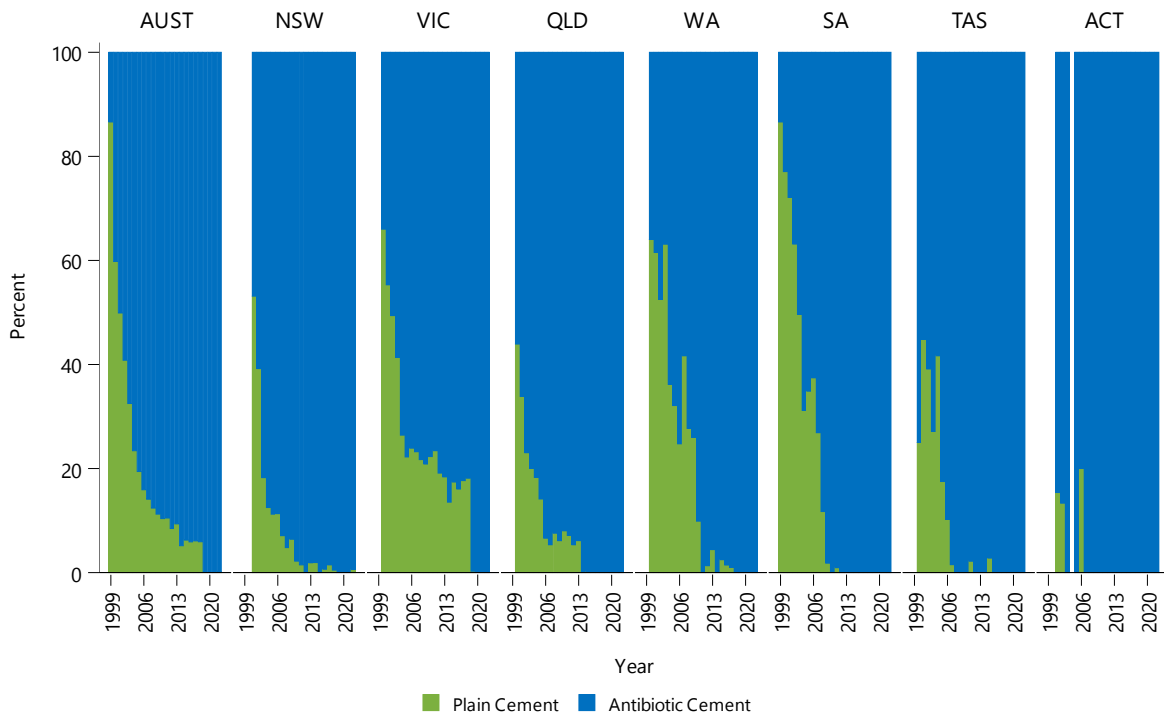
2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
197	CMW 1 G*	155	Palacos R+G*	136	Palacos R+G*	146	Copal G+V*	142	Copal G+V*
144	Simplex Tobra*	128	Simplex Tobra*	118	Simplex Tobra*	132	Palacos R+G*	128	Palacos R+G*
115	Antibiotic Simplex*	97	Copal G+V*	94	Copal G+V*	97	Simplex Tobra*	120	Simplex Tobra*
85	Palacos R*	86	CMW 2 G*	74	CMW 2 G*	71	Palacos Fast R+G*	88	Palacos Fast R+G*
51	CMW 2 G*	58	Copal G+C*	62	Palacos Fast R+G*	56	CMW 2 G*	57	CMW 2 G*
48	CMW 1 Plain	56	Palacos Fast R+G*	45	Copal G+C*	48	Copal G+C*	56	Copal G+C*
44	Palamed G*	32	Palacos MV+G*	38	Palacos MV+G*	29	Palacos MV+G*	36	Palacos MV+G*
40	Simplex P	12	SmartSet GHV*	10	Palacos R+G Pro*	12	Simplex HV*	8	Palacos R+G Pro*
20	CMW 2 Plain	10	Palacos R+G Pro*	7	Simplex HV*	7	Palacos R+G Pro*	5	Simplex HV*
15	Refobacin Plus*	10	Refobacin Plus*	4	Optipac*	3	CMW 2	3	SmartSet GHV*
<b>10 Most Used</b>									
759	(10) 97.9%	644	(10) 96.6%	588	(10) 97.7%	601	(10) 98.4%	643	(10) 98.3%
<b>Remainder</b>									
16	(8) 2.1%	23	(7) 3.4%	14	(5) 2.3%	10	(6) 1.6%	11	(8) 1.7%
<b>TOTAL</b>									
775	(18) 100.0%	667	(17) 100.0%	602	(15) 100.0%	611	(16) 100.0%	654	(18) 100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures

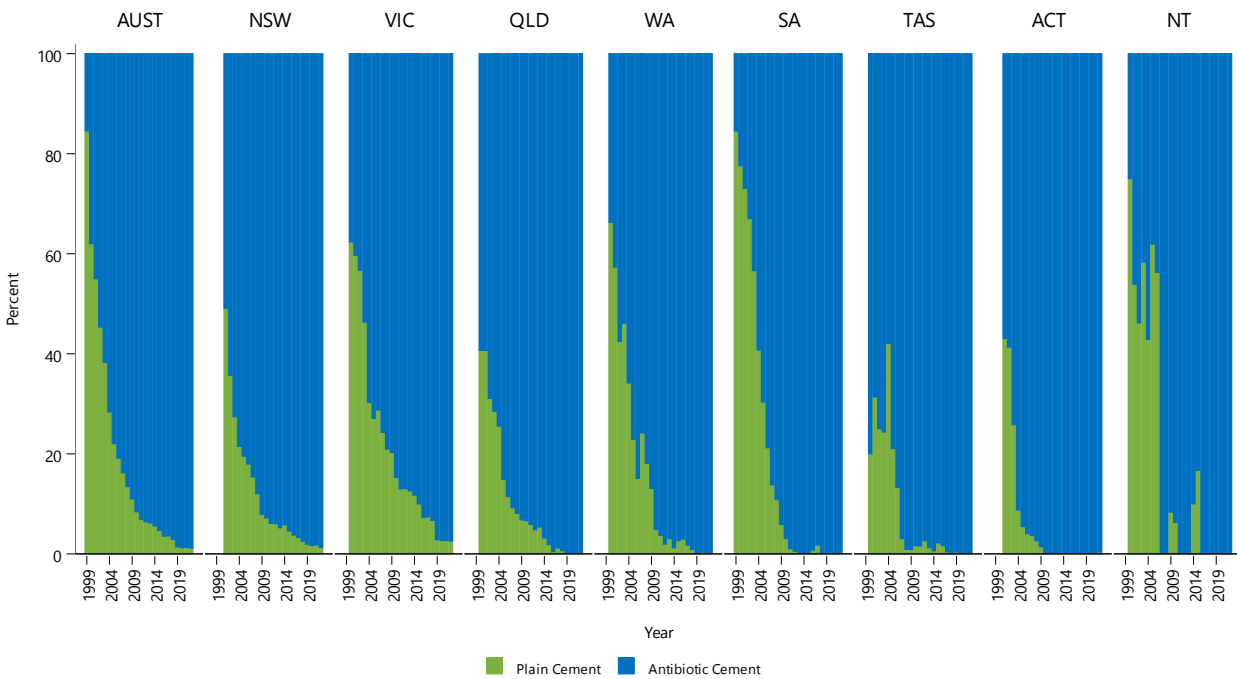
## CEMENTED PRIMARY TOTAL CONVENTIONAL HIP REPLACEMENT

**Figure C1** Trends in Usage of Cemented Primary Total Conventional Hip Replacement by State/Territory and Year



Note: There were no cemented primary total conventional hips undertaken in ACT in 2004  
NT has been excluded due to low procedure numbers

**Figure C2** Trends in Usage of Femur Cemented Primary Total Conventional Hip Replacement by State/Territory and Year



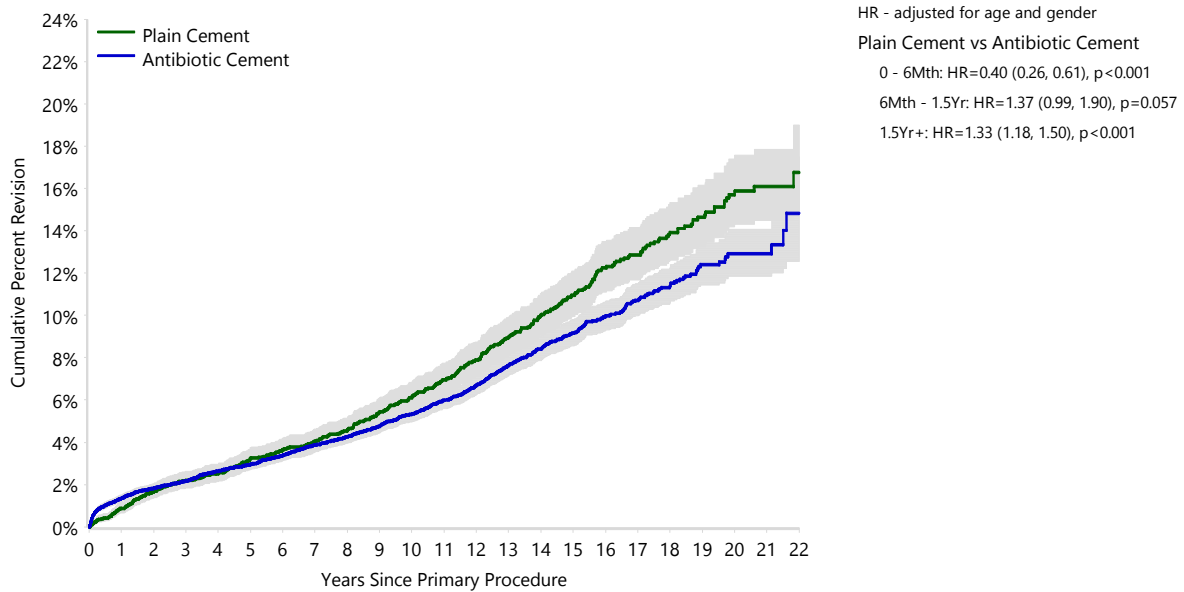
**Table C5 Cumulative Percent Revision of Cemented Primary Total Conventional Hip Replacement by Cement Type and Location (Primary Diagnosis OA)**

Cement Femur	Cement Acetabular	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	Plain Cement	475	5639	0.9 (0.7, 1.2)	2.2 (1.8, 2.6)	3.2 (2.8, 3.8)	6.1 (5.4, 6.8)	11.0 (9.9, 12.1)	15.7 (14.2, 17.4)
	Antibiotic Cement	65	858	0.9 (0.5, 1.9)	2.2 (1.4, 3.4)	3.1 (2.1, 4.5)	6.3 (4.8, 8.4)	10.8 (8.4, 14.0)	
Antibiotic Cement	Plain Cement	28	340	2.4 (1.2, 4.7)	3.4 (1.9, 6.0)	3.7 (2.1, 6.5)	7.9 (5.2, 12.0)	12.6 (8.3, 18.8)	
	Antibiotic Cement	1043	19342	1.3 (1.2, 1.5)	2.2 (2.0, 2.4)	2.9 (2.7, 3.2)	5.2 (4.9, 5.6)	9.0 (8.4, 9.7)	12.9 (11.8, 14.1)
<b>TOTAL</b>		<b>1611</b>	<b>26179</b>						

**Table C6 Cumulative Percent Revision of Cemented Primary Total Conventional Hip Replacement by Cement Type (Primary Diagnosis OA)**

Cement Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	475	5639	0.9 (0.7, 1.2)	2.2 (1.8, 2.6)	3.2 (2.8, 3.8)	6.1 (5.4, 6.8)	11.0 (9.9, 12.1)	15.7 (14.2, 17.4)
Antibiotic Cement	1136	20540	1.3 (1.2, 1.5)	2.2 (2.0, 2.4)	3.0 (2.7, 3.2)	5.3 (5.0, 5.7)	9.2 (8.6, 9.8)	12.9 (11.8, 14.1)
<b>TOTAL</b>	<b>1611</b>	<b>26179</b>						

**Figure C3 Cumulative Percent Revision of Cemented Primary Total Conventional Hip Replacement by Cement Type (Primary Diagnosis OA)**

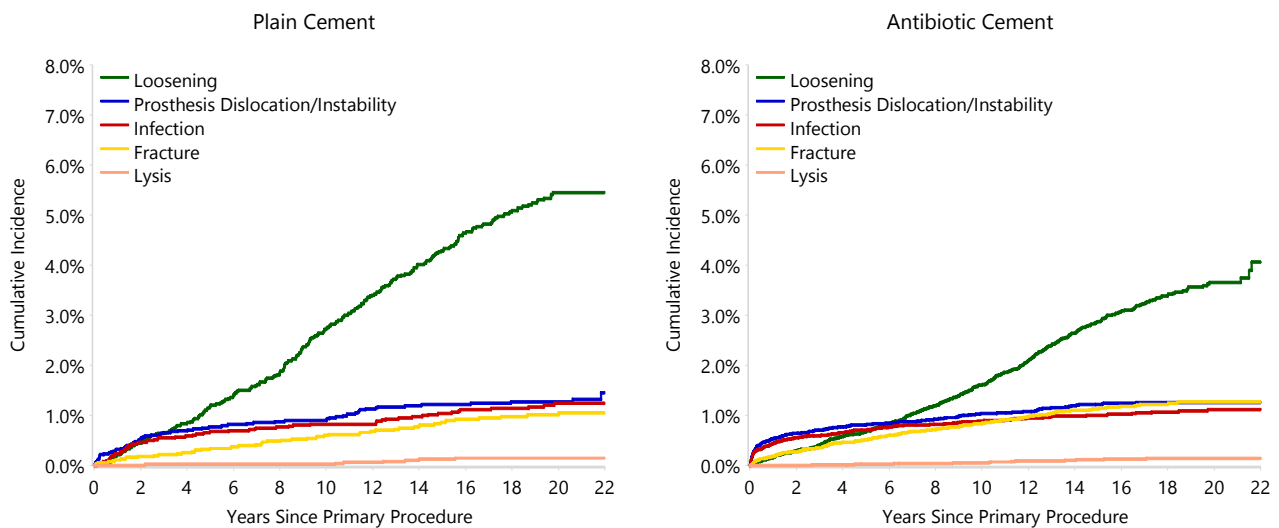


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	5639	5486	5138	4684	3161	1658	525
Antibiotic Cement	20540	19361	17119	14607	8153	3301	560

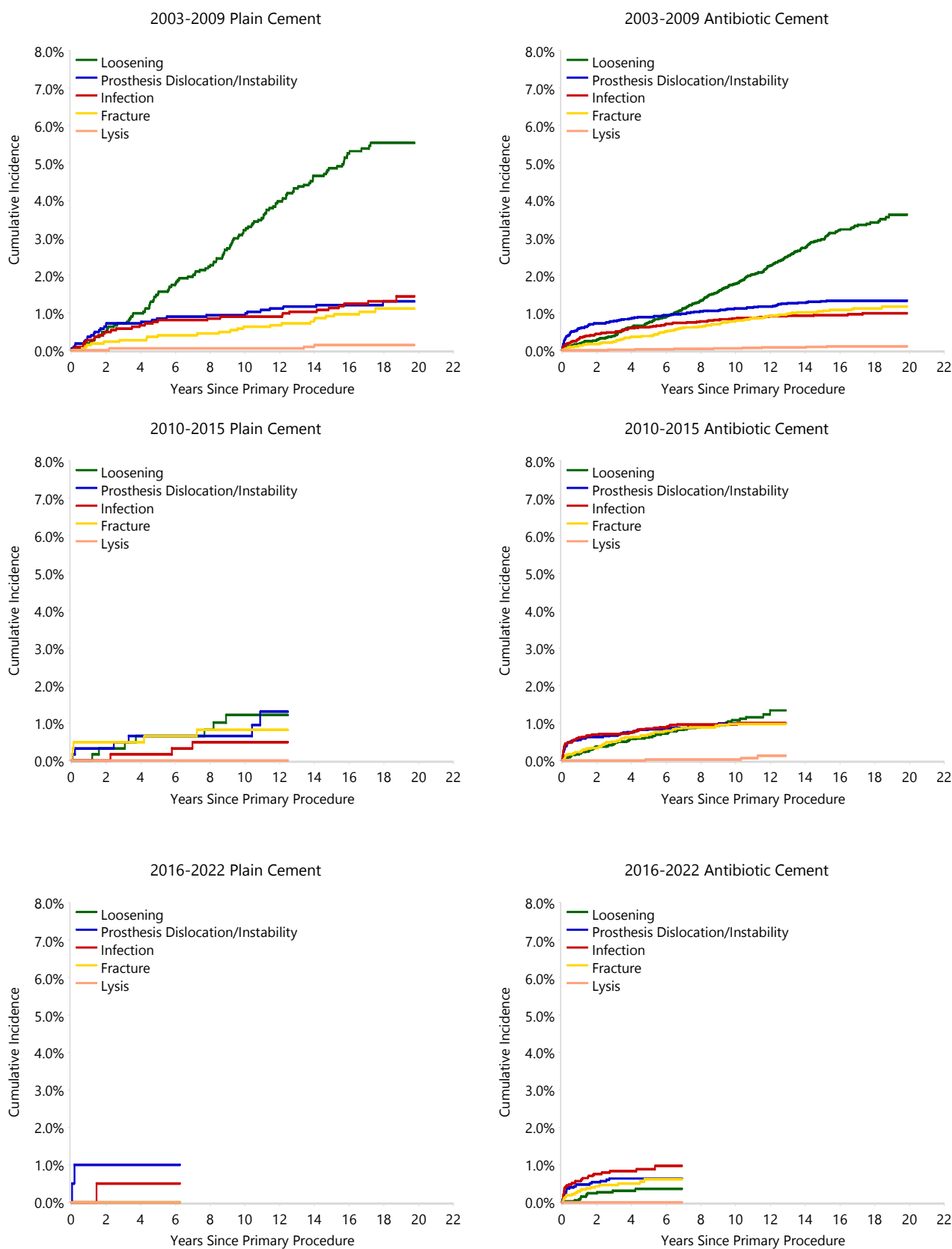
**Table C7** Yearly Cumulative Incidence Revision Diagnosis of Cemented Primary Total Conventional Hip Replacement by Cement Type (Primary Diagnosis OA)

Cement Type	Event	N Events	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	Loosening	268	0.2 (0.1, 0.4)	0.6 (0.5, 0.9)	1.2 (0.9, 1.5)	2.7 (2.3, 3.2)	4.3 (3.8, 4.9)	5.5 (4.8, 6.1)
Plain Cement	Prosthesis Dislocation/Instability	70	0.3 (0.2, 0.5)	0.7 (0.5, 0.9)	0.8 (0.6, 1.0)	0.9 (0.7, 1.2)	1.2 (0.9, 1.5)	1.3 (1.0, 1.6)
Plain Cement	Infection	63	0.2 (0.1, 0.4)	0.5 (0.4, 0.8)	0.7 (0.5, 0.9)	0.8 (0.6, 1.1)	1.0 (0.8, 1.3)	1.2 (1.0, 1.6)
Plain Cement	Fracture	52	0.1 (0.0, 0.2)	0.2 (0.1, 0.4)	0.3 (0.2, 0.5)	0.6 (0.4, 0.8)	0.9 (0.6, 1.1)	1.0 (0.8, 1.3)
Plain Cement	Lysis	7	0.0 (0.0, 0.0)	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.1 (0.1, 0.3)	0.1 (0.1, 0.3)
Plain Cement	Other	15	0.0 (0.0, 0.0)	0.1 (0.0, 0.2)	0.1 (0.0, 0.2)	0.2 (0.1, 0.3)	0.3 (0.2, 0.5)	0.3 (0.2, 0.5)
Plain Cement	Deceased	3455	1.8 (1.5, 2.2)	6.8 (6.1, 7.4)	12.9 (12.0, 13.7)	33.5 (32.2, 34.8)	54.1 (52.7, 55.5)	69.1 (67.7, 70.5)
Plain Cement	All Revision	475	0.9 (0.7, 1.1)	2.1 (1.8, 2.5)	3.1 (2.6, 3.5)	5.2 (4.6, 5.8)	7.8 (7.1, 8.6)	9.4 (8.6, 10.2)
Antibiotic Cement	Loosening	469	0.2 (0.1, 0.2)	0.4 (0.3, 0.5)	0.7 (0.6, 0.8)	1.6 (1.4, 1.8)	2.9 (2.6, 3.2)	3.7 (3.3, 4.0)
Antibiotic Cement	Prosthesis Dislocation/Instability	220	0.5 (0.4, 0.6)	0.7 (0.6, 0.8)	0.8 (0.7, 0.9)	1.0 (0.9, 1.2)	1.2 (1.1, 1.4)	1.3 (1.1, 1.4)
Antibiotic Cement	Infection	189	0.4 (0.4, 0.5)	0.6 (0.5, 0.7)	0.7 (0.6, 0.8)	0.9 (0.8, 1.0)	1.0 (0.9, 1.1)	1.1 (1.0, 1.3)
Antibiotic Cement	Fracture	194	0.2 (0.1, 0.2)	0.4 (0.3, 0.4)	0.5 (0.4, 0.6)	0.8 (0.7, 1.0)	1.1 (1.0, 1.3)	1.3 (1.1, 1.5)
Antibiotic Cement	Lysis	18	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.1)	0.1 (0.0, 0.1)	0.1 (0.1, 0.2)	0.1 (0.1, 0.2)
Antibiotic Cement	Other	46	0.0 (0.0, 0.1)	0.1 (0.0, 0.1)	0.1 (0.1, 0.1)	0.2 (0.1, 0.2)	0.3 (0.2, 0.3)	0.4 (0.3, 0.5)
Antibiotic Cement	Deceased	9286	2.1 (1.9, 2.3)	7.6 (7.3, 8.0)	14.2 (13.7, 14.7)	35.2 (34.5, 36.0)	55.6 (54.8, 56.5)	70.8 (69.8, 71.8)
Antibiotic Cement	All Revision	1136	1.3 (1.2, 1.5)	2.1 (1.9, 2.3)	2.8 (2.6, 3.1)	4.6 (4.3, 4.9)	6.6 (6.2, 7.0)	7.8 (7.3, 8.3)

**Figure C4** Cumulative Incidence Revision Diagnosis of Cemented Primary Total Conventional Hip Replacement by Cement Type (Primary Diagnosis OA)



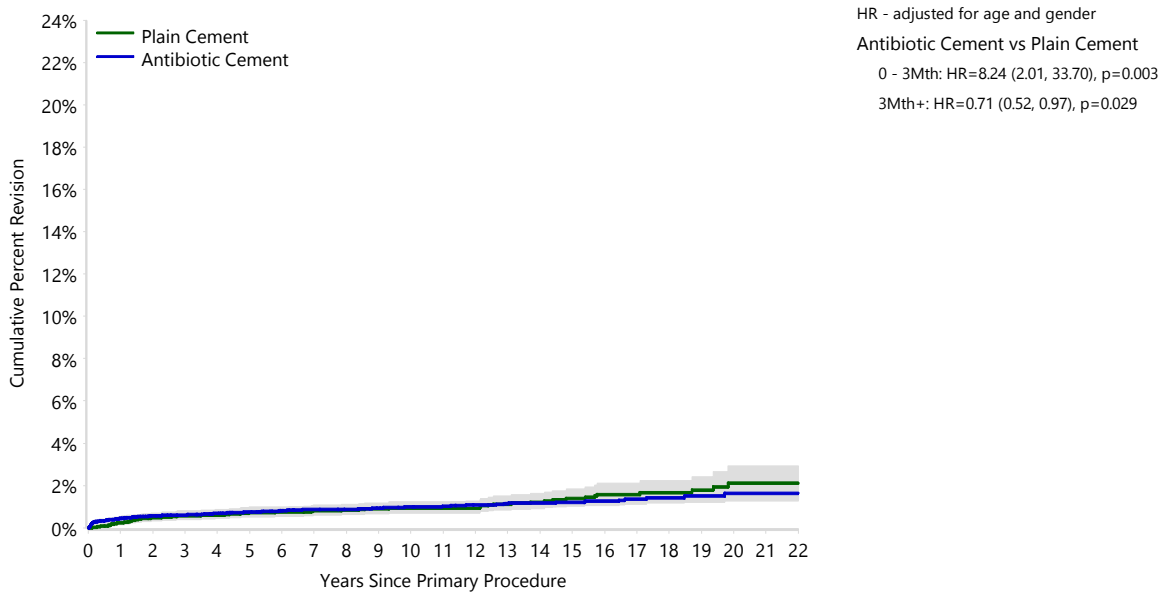
**Figure C5 Cumulative Incidence Revision Diagnosis of Cemented Primary Total Conventional Hip Replacement by Year of Implant and Cement Type (Primary Diagnosis OA)**



**Table C8 Cumulative Percent Revision of Cemented Primary Total Conventional Hip Replacement by Cement Type (Primary Diagnosis OA, Revision for Infection)**

Cement Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	63	5639	0.2 (0.1, 0.4)	0.6 (0.4, 0.8)	0.7 (0.5, 1.0)	0.9 (0.7, 1.2)	1.4 (1.0, 1.8)	2.1 (1.5, 2.9)
Antibiotic Cement	189	20540	0.4 (0.4, 0.5)	0.6 (0.5, 0.7)	0.7 (0.6, 0.9)	1.0 (0.8, 1.1)	1.2 (1.0, 1.4)	1.6 (1.3, 2.1)
<b>TOTAL</b>	<b>252</b>	<b>26179</b>						

**Figure C6 Cumulative Percent Revision of Cemented Primary Total Conventional Hip Replacement by Cement Type (Primary Diagnosis OA, Revision for Infection)**



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	5639	5486	5138	4684	3161	1658	525
Antibiotic Cement	20540	19361	17119	14607	8153	3301	560

# Knee Replacement

## CEMENT TRENDS IN KNEE REPLACEMENT

**Table C9 10 Most Used Cement Types for Femoral Prostheses in Primary Knee Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
2215	CMW 1 G*	15547	Palacos R+G*	14604	Palacos R+G*	14659	Palacos R+G*	12878	Palacos R+G*
1744	Simplex P	8324	Palacos R+G Pro*	8543	Palacos R+G Pro*	9802	Palacos R+G Pro*	9886	Palacos R+G Pro*
1733	CMW 1 Plain	4774	Simplex Tobra*	3864	Simplex Tobra*	3823	Simplex Tobra*	3715	Palacos Fast R+G*
1686	Antibiotic Simplex*	3464	Palacos MV+G*	3123	Palacos MV+G*	3593	Palacos Fast R+G*	3441	Simplex Tobra*
1468	Simplex Tobra*	2800	Palacos Fast R+G*	2878	Palacos Fast R+G*	3193	Palacos MV+G*	2959	Palacos MV+G*
1352	Palacos R*	2169	CMW 2 G*	1924	CMW 2 G*	1848	CMW 2 G*	1640	CMW 2 G*
996	CMW 2 Plain	1612	Copal G+C*	1022	Copal G+C*	873	Copal G+C*	828	Copal G+C*
936	CMW 2 G*	739	Optipac*	488	Palacos MV+G Pro*	673	Palacos MV+G Pro*	693	Palacos MV+G Pro*
935	Palamed G*	671	SmartSet GHV*	468	Simplex HV*	564	SmartSet GHV*	406	Optipac*
296	Refobacin Plus*	603	Simplex HV*	415	Cemex System GENTA FAST*	429	Simplex HV*	396	SmartSet GHV*
<b>10 Most Used</b>									
13361 (10)	97.0%	40703 (10)	95.9%	37329 (10)	94.9%	39457 (10)	95.9%	36842 (10)	96.1%
<b>Remainder</b>									
417 (18)	3.0%	1741 (17)	4.1%	2010 (14)	5.1%	1675 (16)	4.1%	1514 (15)	3.9%
<b>TOTAL</b>									
13778 (28)	100.0%	42444 (27)	100.0%	39339 (24)	100.0%	41132 (26)	100.0%	38356 (25)	100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures

**Table C10 10 Most Used Cement Types for Tibial Prostheses in Primary Knee Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
3020	CMW 1 G*	18446	Palacos R+G*	16900	Palacos R+G*	17049	Palacos R+G*	15022	Palacos R+G*
2661	CMW 1 Plain	9337	Palacos R+G Pro*	9248	Palacos R+G Pro*	10364	Palacos R+G Pro*	10557	Palacos R+G Pro*
2658	Simplex P	5778	Simplex Tobra*	4635	Simplex Tobra*	5504	Palacos Fast R+G*	5457	Palacos Fast R+G*
2270	Antibiotic Simplex*	4911	Palacos Fast R+G*	4570	Palacos Fast R+G*	4794	Simplex Tobra*	4381	Simplex Tobra*
1981	Simplex Tobra*	4089	Palacos MV+G*	3648	Palacos MV+G*	3941	Palacos MV+G*	3743	Palacos MV+G*
1870	CMW 2 Plain	3630	CMW 2 G*	3130	CMW 2 G*	3032	CMW 2 G*	2670	CMW 2 G*
1672	Palacos R*	1839	Copal G+C*	1227	Copal G+C*	1419	Copal G+C*	1482	Copal G+C*
1411	CMW 2 G*	952	Optipac*	758	Optipac*	701	Palacos MV+G Pro*	754	Optipac*
1126	Palamed G*	913	Simplex HV*	642	Cemex System GENTA FAST*	687	Optipac*	720	Palacos MV+G Pro*
350	Refobacin Plus*	752	SmartSet GHV*	622	Simplex HV*	628	SmartSet GHV*	454	SmartSet GHV*
<b>10 Most Used</b>									
19019 (10)	96.8%	50647 (10)	95.9%	45380 (10)	94.8%	48119 (10)	95.4%	45240 (10)	95.7%
<b>Remainder</b>									
628 (19)	3.2%	2164 (19)	4.1%	2513 (15)	5.2%	2345 (17)	4.6%	2009 (17)	4.3%
<b>TOTAL</b>									
19647 (29)	100.0%	52811 (29)	100.0%	47893 (25)	100.0%	50464 (27)	100.0%	47249 (27)	100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures

**Table C11 10 Most Used Cement Types for Patella Prostheses in Primary Knee Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
1305	Antibiotic Simplex*	12497	Palacos R+G*	12276	Palacos R+G*	12983	Palacos R+G*	11657	Palacos R+G*
1172	CMW 1 G*	7311	Palacos R+G Pro*	7491	Palacos R+G Pro*	8672	Palacos R+G Pro*	8655	Palacos R+G Pro*
1059	CMW 1 Plain	4858	Palacos Fast R+G*	5545	Palacos Fast R+G*	6882	Palacos Fast R+G*	7196	Palacos Fast R+G*
1053	CMW 2 Plain	3989	CMW 2 G*	4077	CMW 2 G*	4842	CMW 2 G*	4907	CMW 2 G*
1002	Simplex P	3975	Simplex Tobra*	3299	Simplex Tobra*	3612	Simplex Tobra*	3460	Simplex Tobra*
982	Simplex Tobra*	2658	Palacos MV+G*	2488	Palacos MV+G*	2853	Palacos MV+G*	2829	Palacos MV+G*
694	Palacos R*	1659	Copal G+C*	1141	Copal G+C*	1097	Copal G+C*	1354	Copal G+C*
630	Palamed G*	849	Simplex HV*	742	CMW 2	783	CMW 2	783	CMW 2
591	CMW 2 G*	723	Optipac*	659	Simplex HV*	766	Simplex HV*	647	Optipac*
188	Refobacin Plus*	714	CMW 2	630	Optipac*	615	Palacos MV+G Pro*	607	Palacos MV+G Pro*
<b>10 Most Used</b>									
8676	(10) 96.8%	39233	(10) 95.3%	38348	(10) 94.8%	43105	(10) 95.4%	42095	(10) 95.9%
<b>Remainder</b>									
290	(14) 3.2%	1945	(17) 4.7%	2124	(15) 5.2%	2060	(16) 4.6%	1804	(16) 4.1%
<b>TOTAL</b>									
8966	(24) 100.0%	41178	(27) 100.0%	40472	(25) 100.0%	45165	(26) 100.0%	43899	(26) 100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures

**Table C12 10 Most Used Cement Types for Femoral Prostheses in Revision Knee Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
254	CMW 1 G*	807	Palacos R+G*	655	Palacos R+G*	670	Palacos R+G*	587	Palacos R+G*
187	Antibiotic Simplex*	413	Copal G+V*	427	Copal G+V*	553	Copal G+V*	536	Copal G+V*
152	Simplex Tobra*	371	Palacos R+G Pro*	363	Palacos R+G Pro*	363	Palacos R+G Pro*	345	Palacos R+G Pro*
134	Palacos R*	359	Simplex Tobra*	294	Simplex Tobra*	262	Copal G+C*	278	Simplex Tobra*
100	CMW 2 G*	233	Copal G+C*	208	Copal G+C*	255	Simplex Tobra*	233	Copal G+C*
81	Palamed G*	205	Palacos Fast R+G*	179	Palacos Fast R+G*	216	Palacos Fast R+G*	218	Palacos Fast R+G*
68	Simplex P	185	CMW 2 G*	151	Palacos MV+G*	168	Palacos MV+G*	135	Palacos MV+G*
50	CMW 1 Plain	185	Palacos MV+G*	118	CMW 2 G*	108	CMW 2 G*	81	CMW 2 G*
41	CMW 2 Plain	51	SmartSet GHV*	35	SmartSet GHV*	31	SmartSet GHV*	38	Palacos MV+G Pro*
38	Refobacin Plus*	39	Optipac*	27	Refobacin Plus*	21	Palacos MV+G Pro*	27	Simplex HV*
<b>10 Most Used</b>									
1105	(10) 96.3%	2848	(10) 96.3%	2457	(10) 95.9%	2647	(10) 97.1%	2478	(10) 97.0%
<b>Remainder</b>									
42	(9) 3.7%	108	(13) 3.7%	104	(14) 4.1%	80	(14) 2.9%	77	(13) 3.0%
<b>TOTAL</b>									
1147	(19) 100.0%	2956	(23) 100.0%	2561	(24) 100.0%	2727	(24) 100.0%	2555	(23) 100.0%

Note: \*denotes antibiotic cement

More than one cement type was used in some procedures



**Table C13 10 Most Used Cement Types for Tibial Prostheses in Revision Knee Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
307	CMW 1 G*	859	Palacos R+G*	675	Palacos R+G*	708	Palacos R+G*	607	Palacos R+G*
215	Antibiotic Simplex*	416	Copal G+V*	414	Copal G+V*	537	Copal G+V*	521	Copal G+V*
165	Simplex Tobra*	379	Palacos R+G Pro*	378	Palacos R+G Pro*	360	Palacos R+G Pro*	350	Palacos R+G Pro*
145	Palacos R*	365	Simplex Tobra*	271	Simplex Tobra*	279	Copal G+C*	274	Simplex Tobra*
126	CMW 2 G*	236	Copal G+C*	218	Copal G+C*	262	Simplex Tobra*	255	Palacos Fast R+G*
97	Palamed G*	235	Palacos Fast R+G*	206	Palacos Fast R+G*	224	Palacos Fast R+G*	246	Copal G+C*
74	CMW 1 Plain	206	CMW 2 G*	149	Palacos MV+G*	167	Palacos MV+G*	136	Palacos MV+G*
73	Simplex P	190	Palacos MV+G*	136	CMW 2 G*	126	CMW 2 G*	112	CMW 2 G*
71	CMW 2 Plain	57	SmartSet GHV*	32	SmartSet GHV*	34	SmartSet GHV*	41	Palacos MV+G Pro*
29	Refobacin Plus*	39	Optipac*	30	Simplex HV*	25	Simplex HV*	26	Simplex HV*
<b>10 Most Used</b>									
1302	(10) 95.9%	2982	(10) 95.9%	2509	(10) 95.6%	2722	(10) 96.7%	2568	(10) 96.8%
<b>Remainder</b>									
56	(11) 4.1%	126	(15) 4.1%	116	(16) 4.4%	92	(13) 3.3%	84	(13) 3.2%
<b>TOTAL</b>									
1358	(21) 100.0%	3108	(25) 100.0%	2625	(26) 100.0%	2814	(23) 100.0%	2652	(23) 100.0%

Note: \*denotes antibiotic cement  
 More than one cement type was used in some procedures

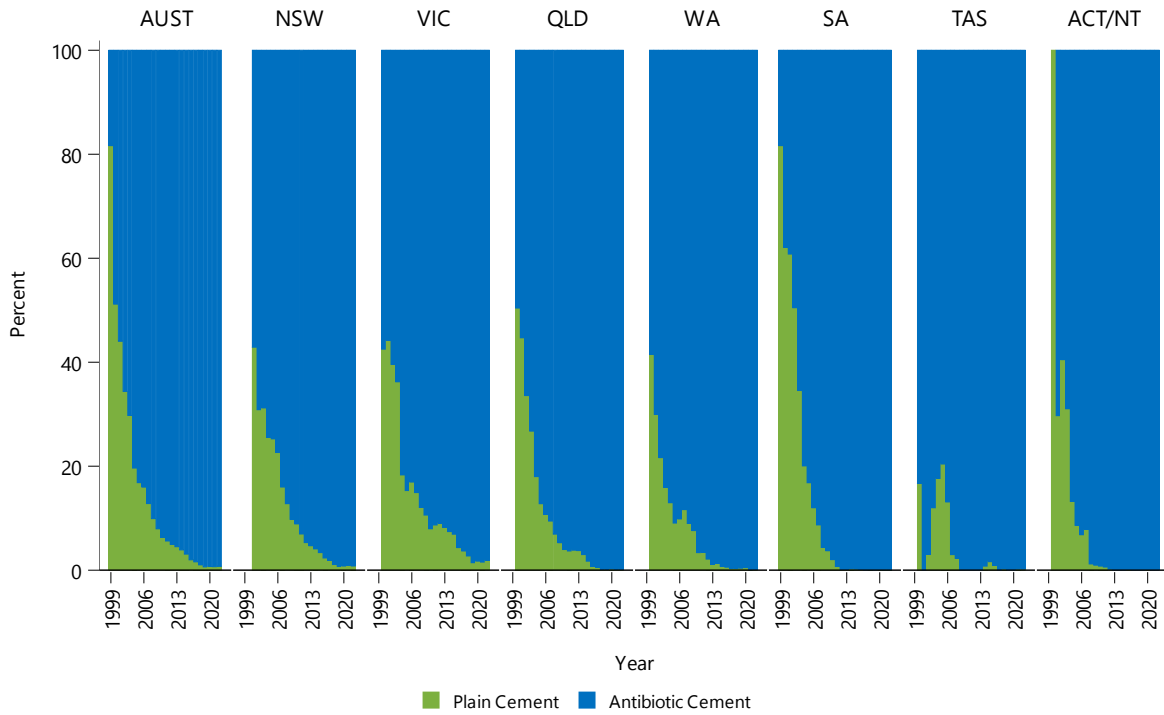
**Table C14 10 Most Used Cement Types for Patella Prostheses in Revision Knee Replacement**

2003		2019		2020		2021		2022	
N	Model	N	Model	N	Model	N	Model	N	Model
179	CMW 1 G*	607	Palacos R+G*	502	Palacos R+G*	535	Palacos Fast R+G*	512	Palacos Fast R+G*
150	CMW 2 Plain	455	Palacos Fast R+G*	427	Palacos Fast R+G*	523	Palacos R+G*	390	Palacos R+G*
130	Antibiotic Simplex*	367	CMW 2 G*	251	CMW 2 G*	332	CMW 2 G*	306	CMW 2 G*
114	CMW 2 G*	209	Palacos R+G Pro*	189	Palacos R+G Pro*	189	Copal G+V*	203	Palacos R+G Pro*
113	Simplex Tobra*	174	Simplex Tobra*	150	Simplex Tobra*	187	Palacos R+G Pro*	189	Copal G+V*
85	Simplex P	157	Copal G+V*	146	Copal G+V*	139	Simplex Tobra*	150	Simplex Tobra*
78	Palacos R*	108	Palacos MV+G*	89	Copal G+C*	115	Copal G+C*	89	Copal G+C*
59	Palamed G*	102	Copal G+C*	88	Palacos MV+G*	108	Palacos MV+G*	84	Palacos MV+G*
56	CMW 1 Plain	34	SmartSet GHV*	35	CMW 2	31	CMW 2	22	Palacos MV+G Pro*
17	Refobacin Plus*	28	Optipac*	20	Simplex HV*	20	SmartSet GHV*	20	Simplex HV*
<b>10 Most Used</b>									
981	(10) 96.1%	2241	(10) 96.2%	1897	(10) 95.6%	2179	(10) 96.5%	1965	(10) 96.8%
<b>Remainder</b>									
40	(10) 3.9%	88	(11) 3.8%	88	(13) 4.4%	80	(12) 3.5%	65	(9) 3.2%
<b>TOTAL</b>									
1021	(20) 100.0%	2329	(21) 100.0%	1985	(23) 100.0%	2259	(22) 100.0%	2030	(19) 100.0%

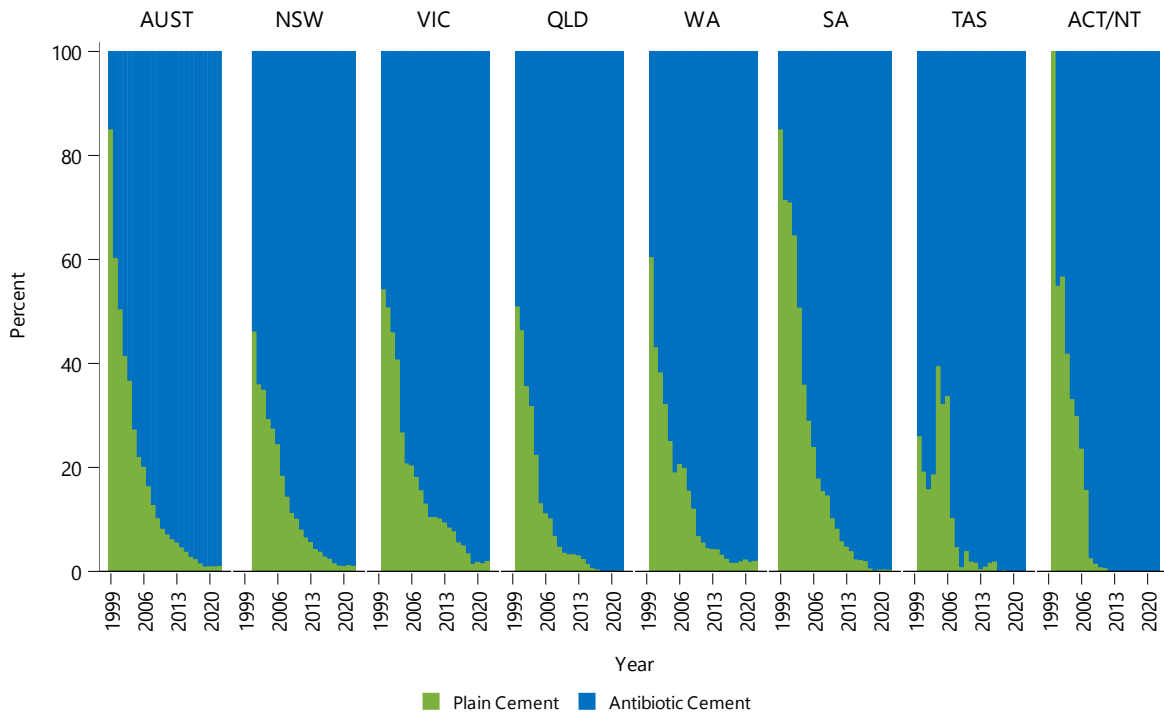
Note: \*denotes antibiotic cement  
 More than one cement type was used in some procedures  
 This includes patella prostheses that have been revised and de novo patella in revision procedures

## CEMENTED PRIMARY TOTAL KNEE REPLACEMENT

**Figure C7** Trends in Usage of Cemented Primary Total Knee Replacement by State/Territory and Year



**Figure C8** Trends in Usage of Tibia Cemented Primary Total Knee Replacement by State/Territory and Year



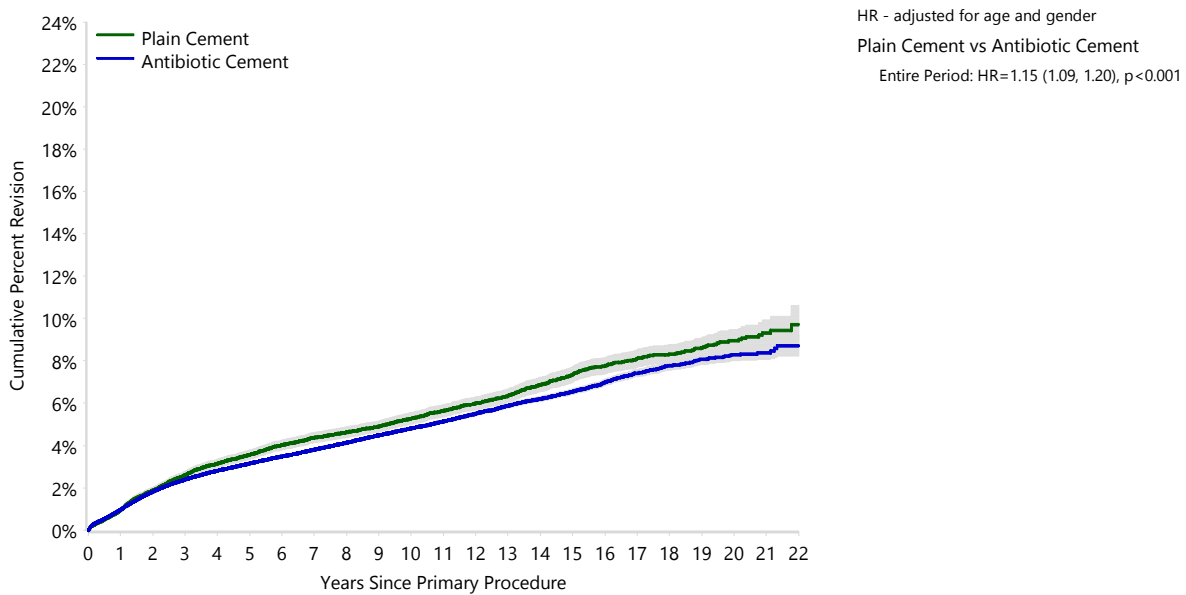
**Table C15 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type and Location (Primary Diagnosis OA)**

Cement Femur	Cement Tibia	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	Plain Cement	1786	30142	0.9 (0.8, 1.1)	2.6 (2.4, 2.8)	3.6 (3.4, 3.8)	5.3 (5.0, 5.5)	7.3 (7.0, 7.7)	8.9 (8.5, 9.5)
	Antibiotic Cement	34	493	1.4 (0.7, 3.0)	3.2 (1.9, 5.2)	4.4 (2.9, 6.8)	6.4 (4.4, 9.4)	9.6 (6.5, 13.9)	
Antibiotic Cement	Plain Cement	36	648	0.6 (0.2, 1.7)	2.3 (1.4, 3.8)	3.2 (2.1, 5.0)	5.4 (3.8, 7.7)	7.1 (5.0, 9.9)	
	Antibiotic Cement	17369	480796	1.0 (0.9, 1.0)	2.4 (2.3, 2.4)	3.1 (3.1, 3.2)	4.8 (4.7, 4.9)	6.5 (6.4, 6.7)	8.3 (8.0, 8.5)
<b>TOTAL</b>		<b>19225</b>	<b>512079</b>						

**Table C16 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)**

Cement Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	1786	30142	0.9 (0.8, 1.1)	2.6 (2.4, 2.8)	3.6 (3.4, 3.8)	5.3 (5.0, 5.5)	7.3 (7.0, 7.7)	8.9 (8.5, 9.5)
Antibiotic Cement	17439	481937	1.0 (0.9, 1.0)	2.4 (2.3, 2.4)	3.2 (3.1, 3.2)	4.8 (4.7, 4.9)	6.5 (6.4, 6.7)	8.3 (8.0, 8.5)
<b>TOTAL</b>	<b>19225</b>	<b>512079</b>						

**Figure C9 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)**

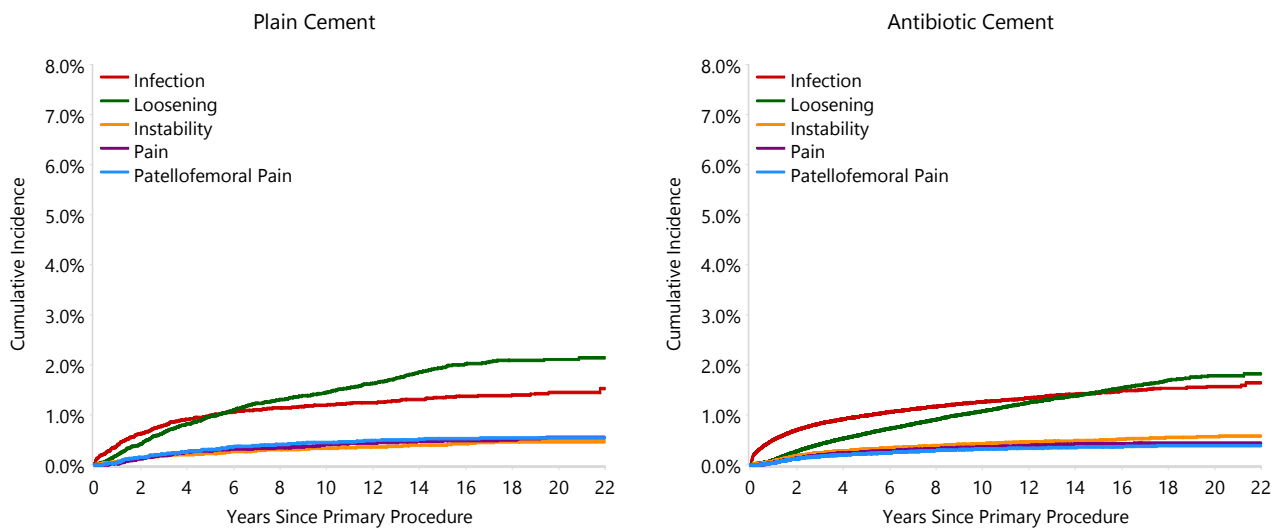


Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	30142	29329	27523	25461	17132	8398	1788
Antibiotic Cement	481937	440571	356013	271241	111454	30650	2823

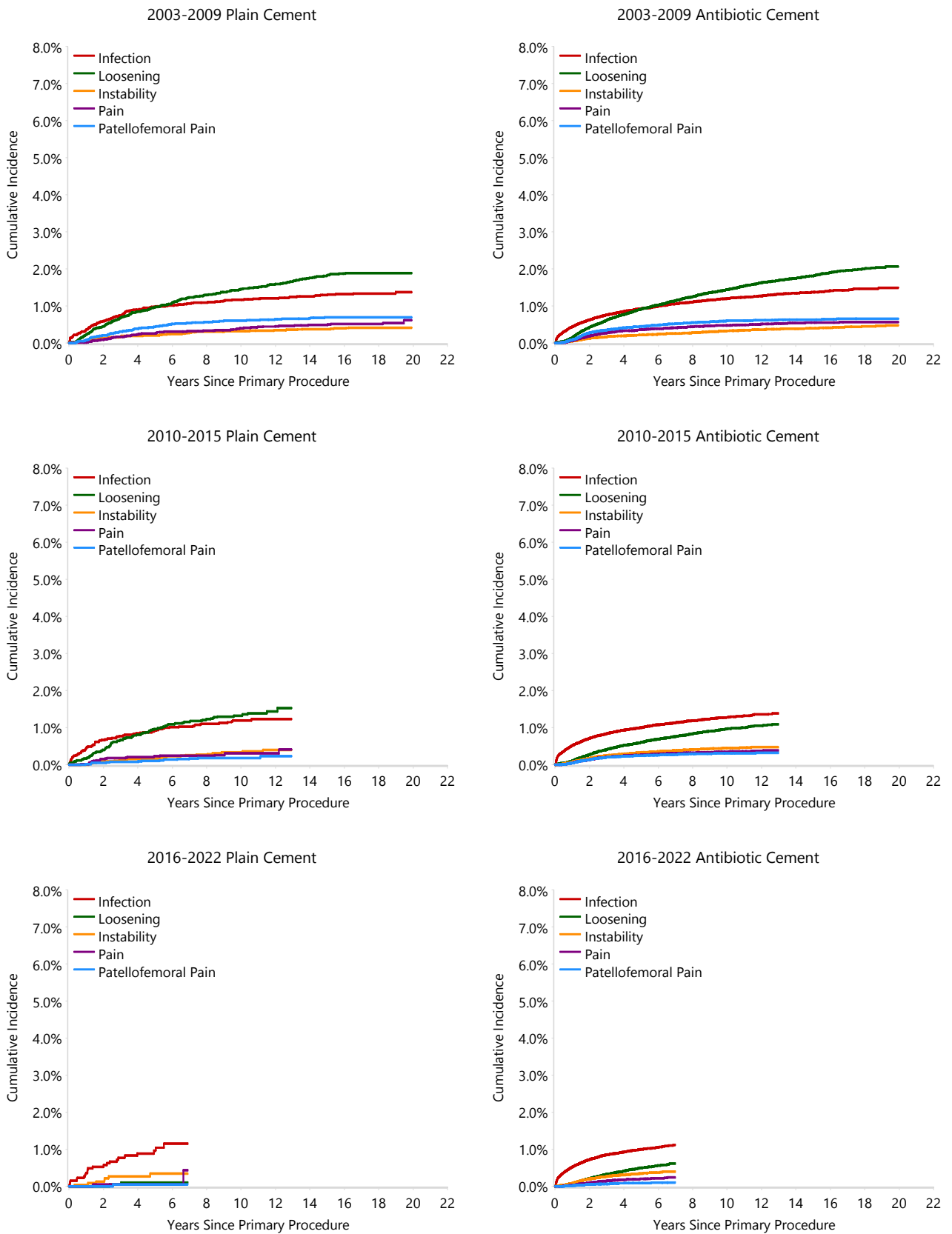
**Table C17** Yearly Cumulative Incidence Revision Diagnosis of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)

Cement Type	Event	N Events	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	Infection	393	0.4 (0.3, 0.5)	0.8 (0.7, 0.9)	1.0 (0.9, 1.1)	1.2 (1.1, 1.3)	1.3 (1.2, 1.5)	1.4 (1.3, 1.6)
	Loosening	542	0.2 (0.2, 0.3)	0.6 (0.6, 0.7)	1.0 (0.9, 1.1)	1.4 (1.3, 1.6)	1.9 (1.8, 2.1)	2.1 (1.9, 2.3)
	Instability	119	0.1 (0.0, 0.1)	0.2 (0.1, 0.2)	0.2 (0.2, 0.3)	0.3 (0.3, 0.4)	0.4 (0.3, 0.5)	0.5 (0.4, 0.6)
	Pain	138	0.0 (0.0, 0.0)	0.2 (0.1, 0.2)	0.3 (0.2, 0.3)	0.4 (0.3, 0.5)	0.5 (0.4, 0.6)	0.5 (0.5, 0.6)
	Patellofemoral Pain	146	0.1 (0.0, 0.1)	0.2 (0.2, 0.3)	0.3 (0.2, 0.4)	0.4 (0.4, 0.5)	0.5 (0.4, 0.6)	0.5 (0.4, 0.6)
	Other	448	0.2 (0.2, 0.3)	0.5 (0.5, 0.6)	0.7 (0.6, 0.8)	1.1 (1.0, 1.2)	1.5 (1.4, 1.7)	1.9 (1.7, 2.1)
	Deceased	13008	0.9 (0.8, 1.1)	3.8 (3.6, 4.0)	8.0 (7.7, 8.3)	23.9 (23.4, 24.5)	43.8 (43.2, 44.5)	62.0 (61.2, 62.8)
	All Revision	1786	0.9 (0.8, 1.1)	2.6 (2.4, 2.7)	3.5 (3.3, 3.7)	4.9 (4.7, 5.2)	6.2 (5.9, 6.5)	7.0 (6.6, 7.3)
Antibiotic Cement	Infection	5091	0.5 (0.5, 0.5)	0.8 (0.8, 0.9)	1.0 (1.0, 1.0)	1.3 (1.2, 1.3)	1.4 (1.4, 1.5)	1.6 (1.5, 1.6)
	Loosening	3956	0.1 (0.1, 0.1)	0.4 (0.4, 0.4)	0.6 (0.6, 0.7)	1.1 (1.0, 1.1)	1.5 (1.4, 1.5)	1.8 (1.7, 1.9)
	Instability	1618	0.1 (0.1, 0.1)	0.2 (0.2, 0.3)	0.3 (0.3, 0.3)	0.4 (0.4, 0.4)	0.5 (0.5, 0.5)	0.6 (0.5, 0.6)
	Pain	1332	0.0 (0.0, 0.0)	0.2 (0.2, 0.2)	0.3 (0.2, 0.3)	0.4 (0.3, 0.4)	0.4 (0.4, 0.4)	0.4 (0.4, 0.5)
	Patellofemoral Pain	1165	0.0 (0.0, 0.0)	0.2 (0.2, 0.2)	0.2 (0.2, 0.2)	0.3 (0.3, 0.3)	0.4 (0.3, 0.4)	0.4 (0.4, 0.4)
	Other	4277	0.2 (0.2, 0.2)	0.5 (0.5, 0.5)	0.7 (0.7, 0.7)	1.1 (1.1, 1.1)	1.6 (1.5, 1.6)	1.9 (1.8, 1.9)
	Deceased	78595	0.7 (0.7, 0.7)	3.0 (2.9, 3.0)	6.5 (6.4, 6.5)	20.6 (20.4, 20.7)	39.7 (39.4, 40.0)	59.0 (58.4, 59.5)
	All Revision	17439	1.0 (0.9, 1.0)	2.4 (2.3, 2.4)	3.1 (3.0, 3.1)	4.5 (4.5, 4.6)	5.7 (5.6, 5.8)	6.6 (6.4, 6.7)

**Figure C10** Cumulative Incidence Revision Diagnosis of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA)



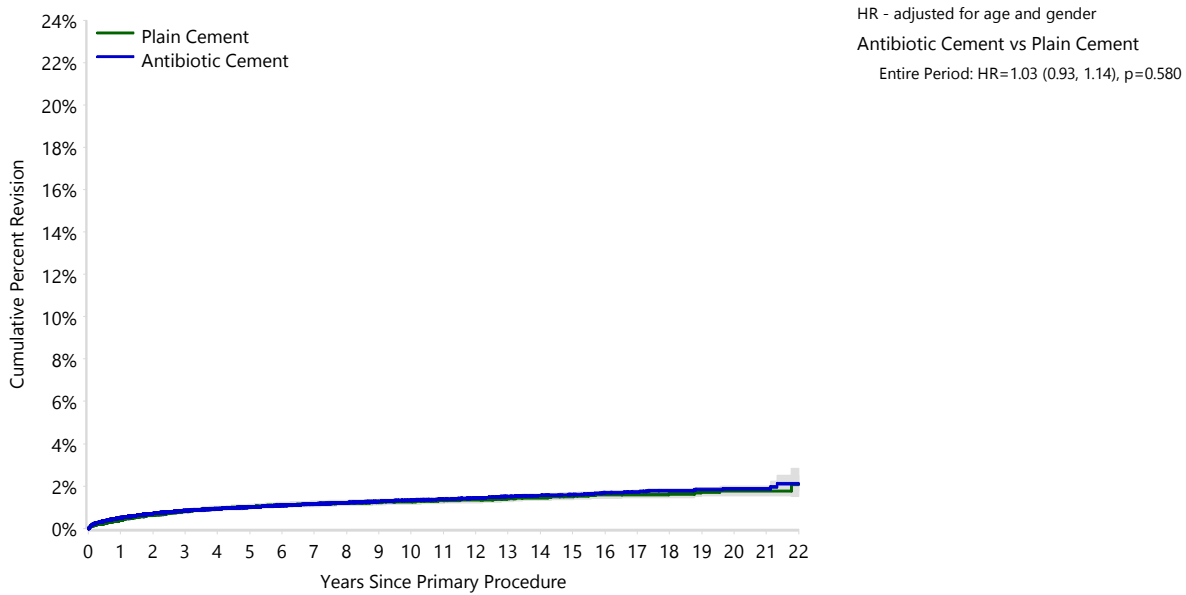
**Figure C11 Cumulative Incidence Revision Diagnosis of Cemented Primary Total Knee Replacement by Year of Implant and Cement Type (Primary Diagnosis OA)**



**Table C18 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA, Revision for Infection)**

Cement Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	393	30142	0.4 (0.3, 0.5)	0.8 (0.7, 0.9)	1.0 (0.9, 1.1)	1.3 (1.1, 1.4)	1.5 (1.4, 1.7)	1.8 (1.5, 2.0)
Antibiotic Cement	5091	481937	0.5 (0.5, 0.5)	0.8 (0.8, 0.9)	1.0 (1.0, 1.0)	1.3 (1.3, 1.4)	1.6 (1.5, 1.7)	1.9 (1.8, 2.0)
<b>TOTAL</b>	<b>5484</b>	<b>512079</b>						

**Figure C12 Cumulative Percent Revision of Cemented Primary Total Knee Replacement by Cement Type (Primary Diagnosis OA, Revision for Infection)**



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Plain Cement	30142	29329	27523	25461	17132	8398	1788
Antibiotic Cement	481937	440571	356013	271241	111454	30650	2823

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