SOFCOT

SoFCOT Hip Arthroplasty Register

Biennial Report 2024

2006-2023

Institut für Sozial- und Präventivmedizin ISPM
SwissRDL Medical Registries and Data Linkage

SWISSRDL

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Contents

Part I: Primary Total Hip Arthroplasty

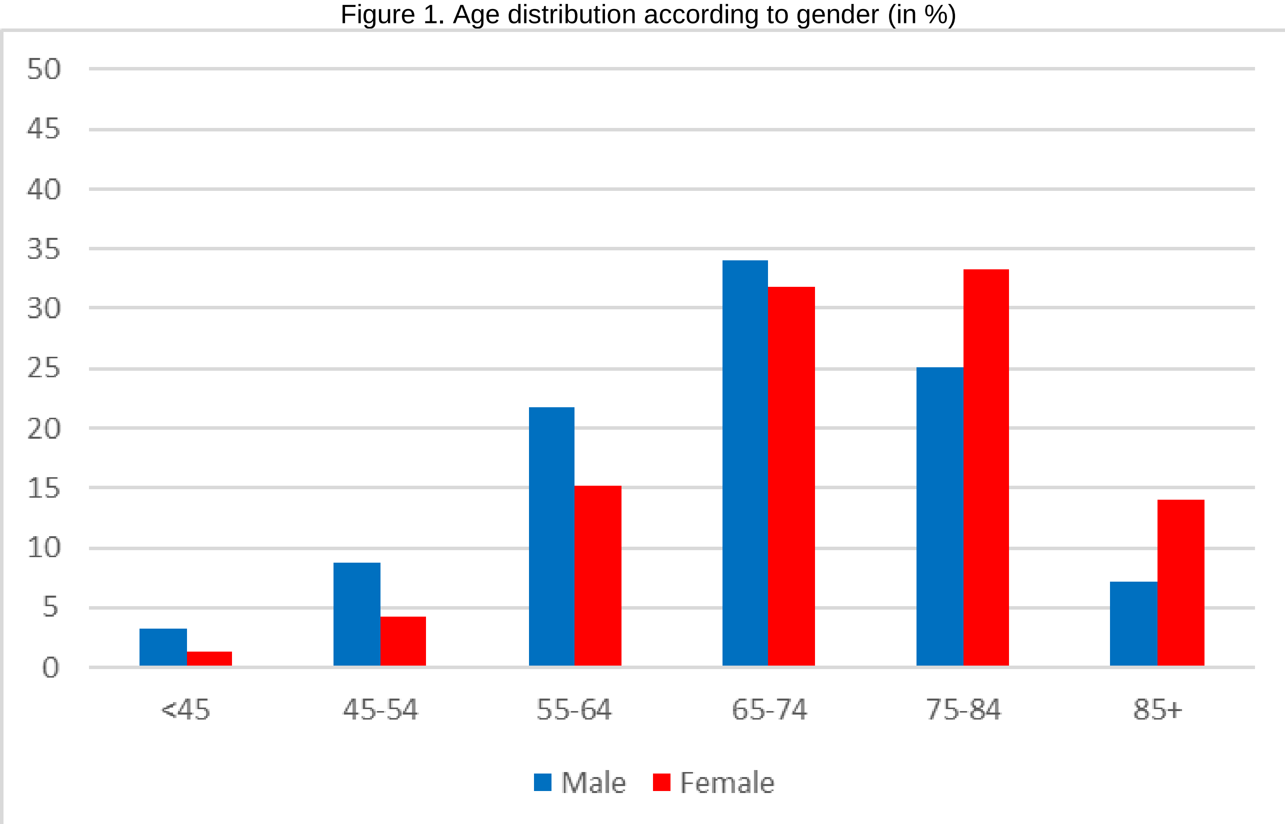
From January 1st, 2006 to December 31th 2023, a total of 55‘597 Total Hip arthroplasties (THA) and 2’717 Bipolar Hemi Hip arthroplasties were registered in the SOFCOT hip register. The annual number of primary registrations peaked in 2015 at over 5’600 procedures, then remained stable at a high level in 2016 and 2017. However, that number fell to just over 5’000 annually in 2018 and 2019. Annual registrations then declined further to under 4’000 in 2020 and to under 2000 in 2023. The average age of the patients was 71.0 years (SD, 11.6 years). A total of 33’305 patients (57%) were female with an average age of 72.9 years, and 24’972 were male with an average age of 68.5 years (Table 1, Figure 1).

Table 1. Patient age at operation

Gender	N	Min	Max	Average	Std Dev
Male	24972	15	105	68.5	11.8
Female	33305	13	113	72.9	11.1
Total	58277*	13	113	71.0	11.6

*37 with missing info

Figure 1. Age distribution according to gender (in %)



Osteoarthritis is the main indication for THA (76%), followed by acute fracture, osteonecrosis of the femoral head and hip dysplasia (Table 2).

Table 2. Underlying diagnoses

Diagnostics	Frequency	Percentage
Primary osteoarthritis	44 535	76.4
Recent fracture	4 880	8.4
Femoral head necrosis	2 378	4.1
Hip dysplasia	2 273	3.9
Rapid destructive arthritis	1 891	3.2
Traumatic sequelae	1 291	2.2
Others	657	1.1
Rheumatoid arthritis	280	0.5
Post-Perthes Calve	129	0.2

The postero-lateral approach was used in more than half of the interventions (52%). The distribution of the individual approaches was relatively stable between 2009 and 2015, but in recent years, the postero-lateral and the antero-lateral approaches have been on the increase (Figures 2a and 2b). “Other” responses declined to practically zero by 2020. Those responses consisted of minimally invasive variants of the other approaches (in particular antero-lateral and lateral) as well as Rottinger’s approach.

Figure 2a. Distribution of surgical approach (%)

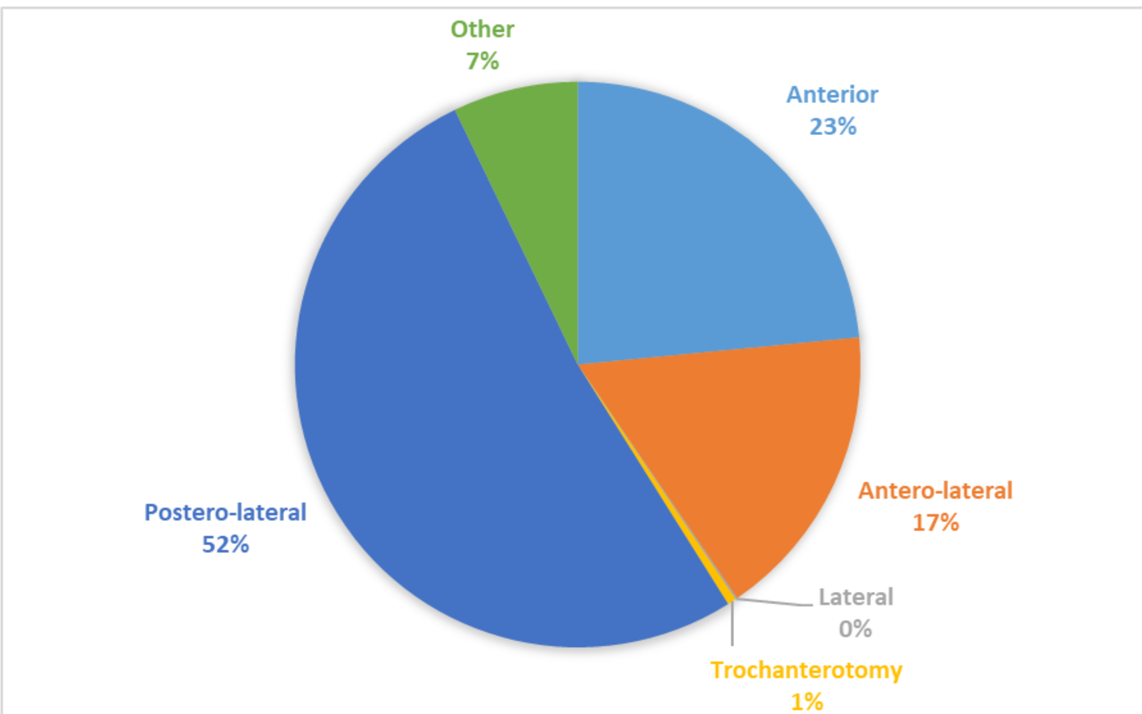


Figure 2b. Distribution of surgical approach: change over 18 years.

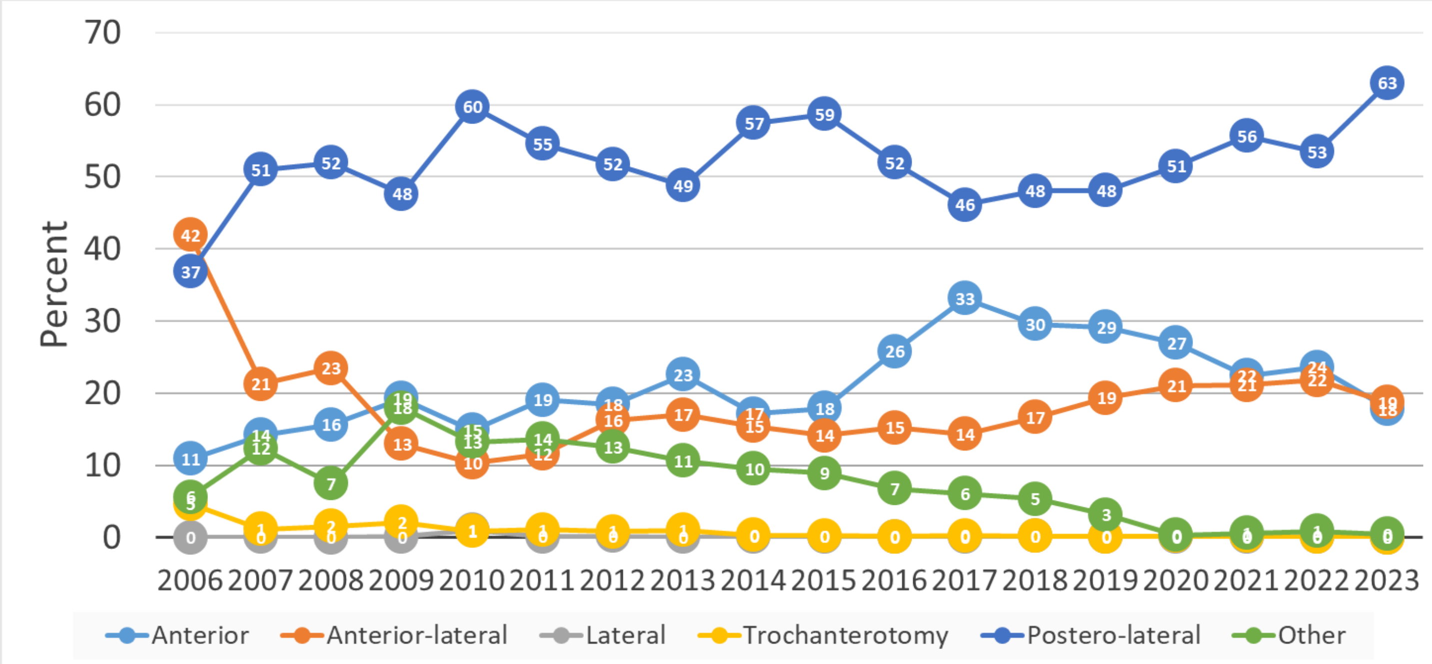


Table 3 shows that 84.8% of arthroplasties are done conventionally and that a dual mobility cup was used in 43.8% of cases. However, the share of dual mobility cups has increased steadily, and they are now the dominant form of cups currently registered (Figure 3a). More than two thirds of arthroplasties were fixed without cement (Figure 4a). A steady increase of the uncemented fixation type can be observed over 18 years, which occurs in parallel to the decline of the cemented fixation in particular since 2009 (Figure 4b). When cement is used, it is in most of the cases antibiotic-impregnated cement (up from 82% in 2006 to 97.5% in 2021) (Figure 5a/5b).

Table 3a. Types of arthroplasties for primary implantation

Type of Prosthesis*	Frequency	Percent
Conventional THA	49 419	84.8
THA with short femoral stem**	5 876	10.1
Femoral prosthesis with mobile cup (bipolar)	2 582	4.4
Total resurfacing	348	0.6
Other	74	0.1
THA with trans-cervical fixation	8	0.0
Femoral resurfacing	7	0.0
Total	58 314	100

Table 3b. Type of cups for primary implantation

Type of Cup*	Frequency	Percent
Conventional	30 179	51.8
Dual mobility cup	25 553	43.8
Mobile head	2 582	4.4

* Figures are provided after correcting for contradiction between form entries and implant registrations.
** The following stems were classified as short stems: Amistem (all variants), Ana.Nova alpha, Fitmore, Hype mini, Metha, Minihip, Minima S, Nanos, OK baby, Optimys, Rhino, SMS, Stemsys MI, Targos mini

Figure 3a. Share of registered dual-mobility cups: change over 18 years

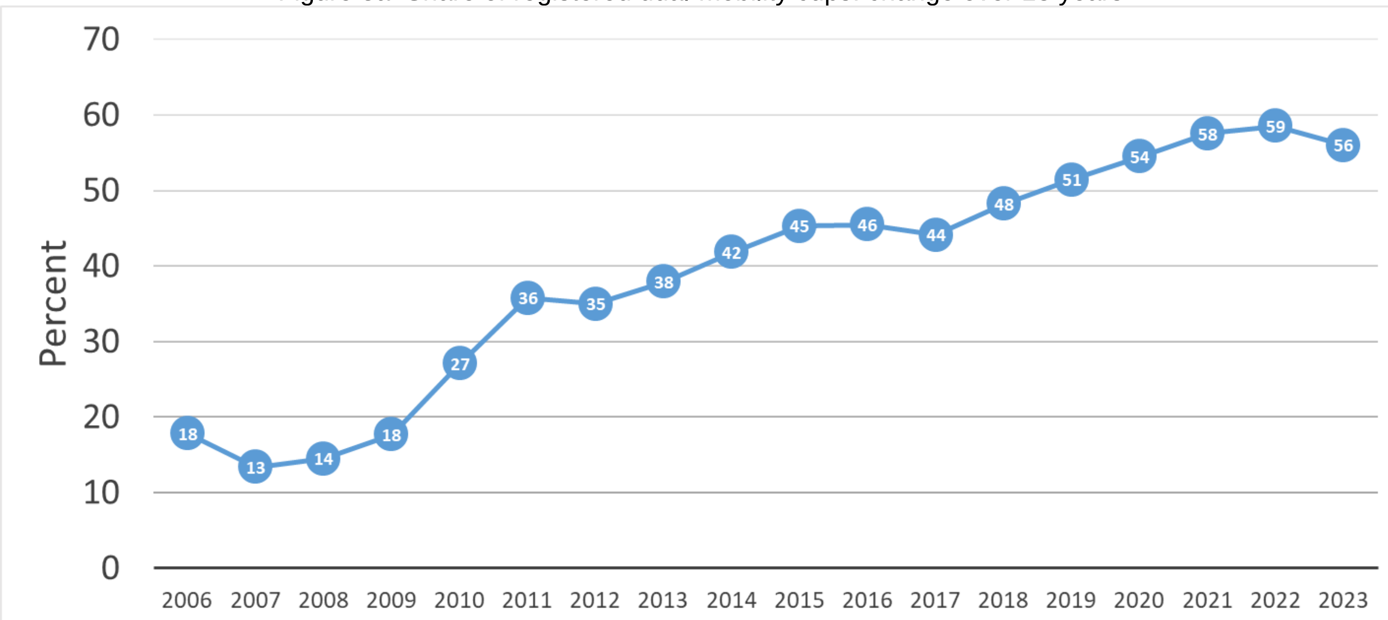


Figure 4a. Fixation of components (%)

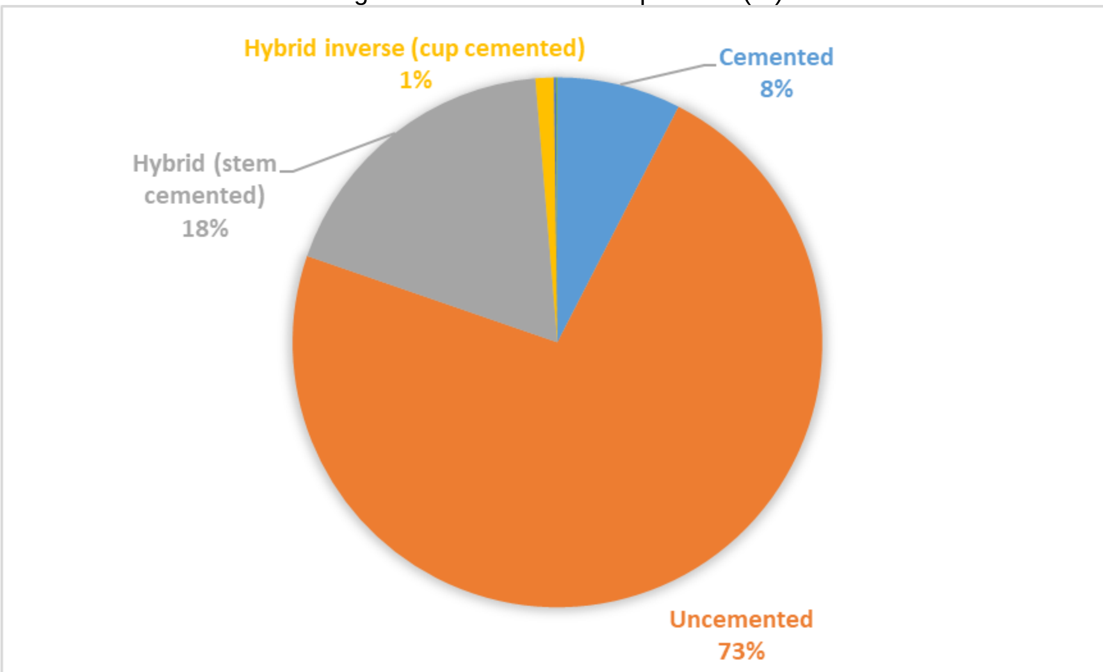


Figure 4b. Fixation of components: change over 18 years

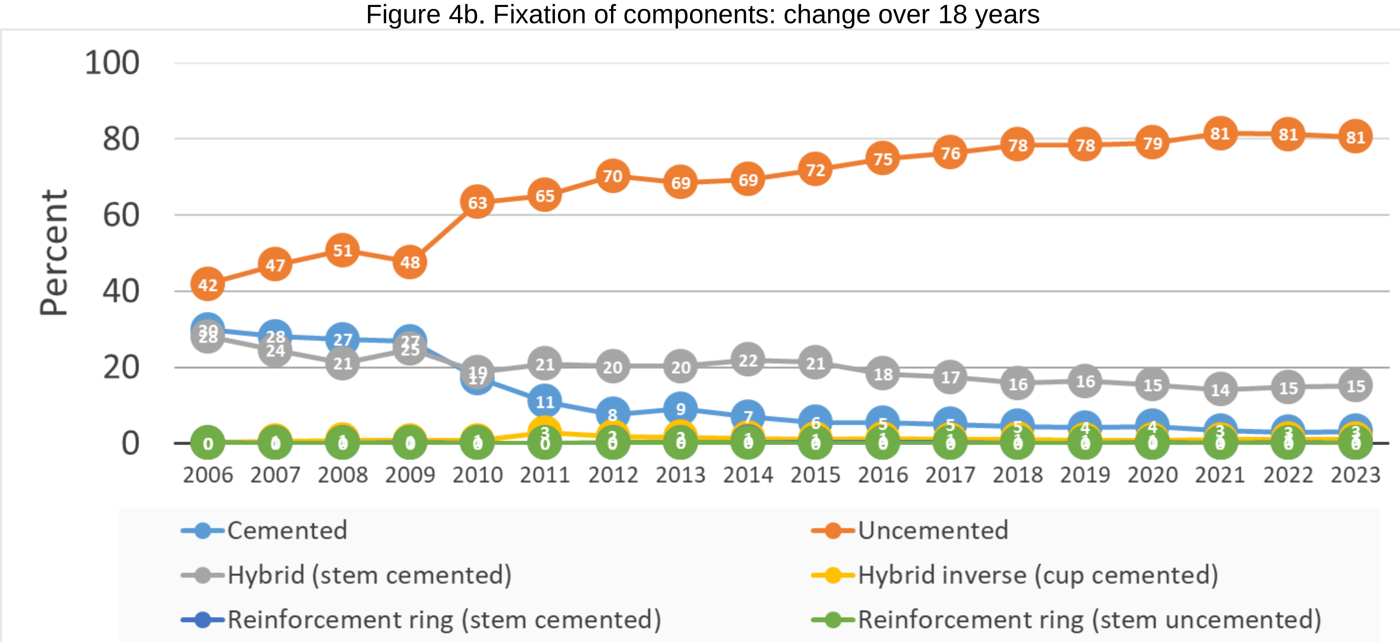


Figure 5a. Use of antibiotic-impregnated cement.

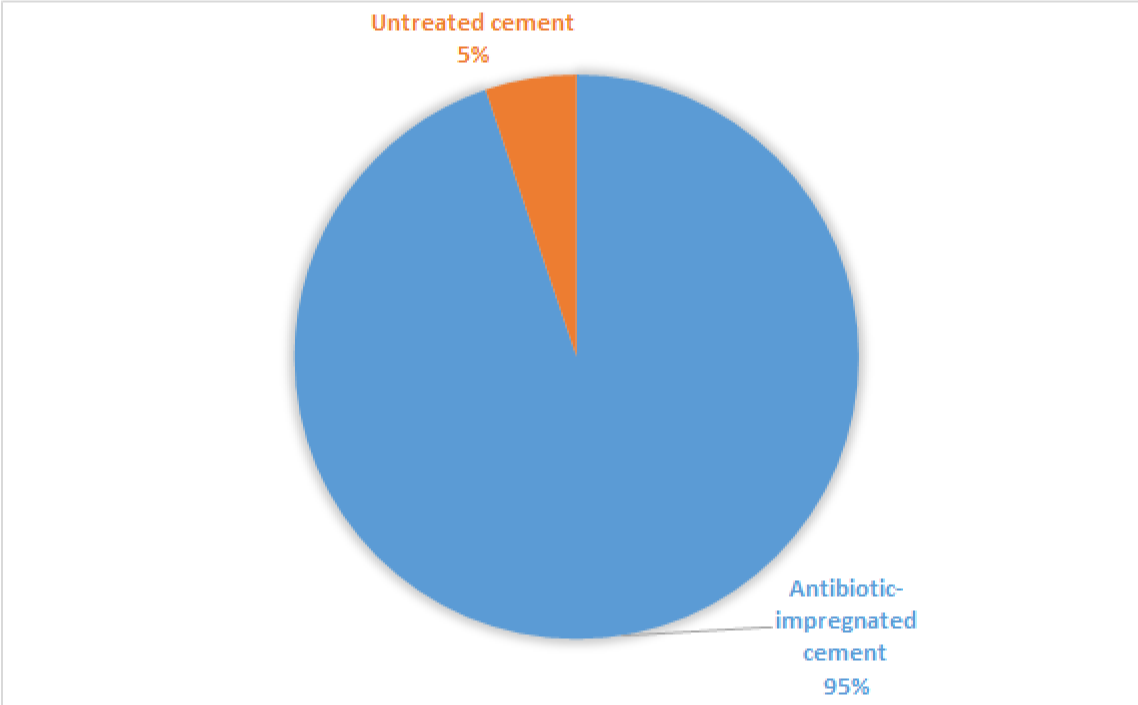
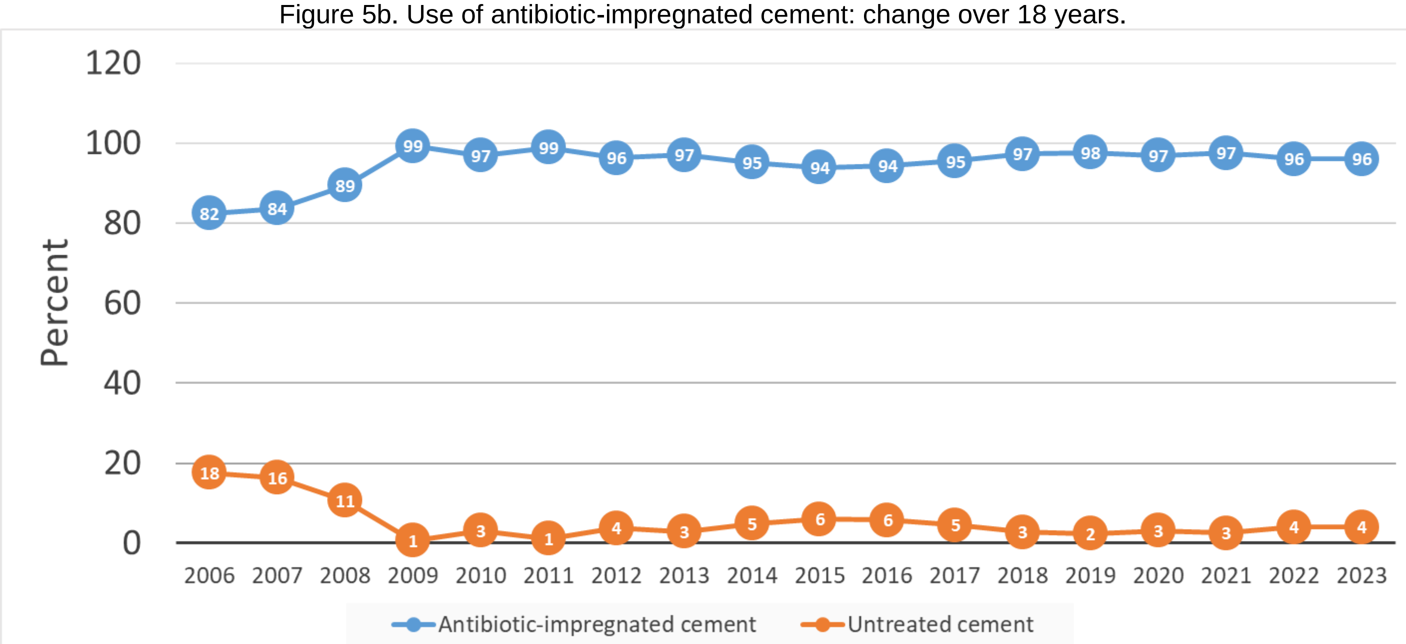


Figure 5b. Use of antibiotic-impregnated cement: change over 18 years.

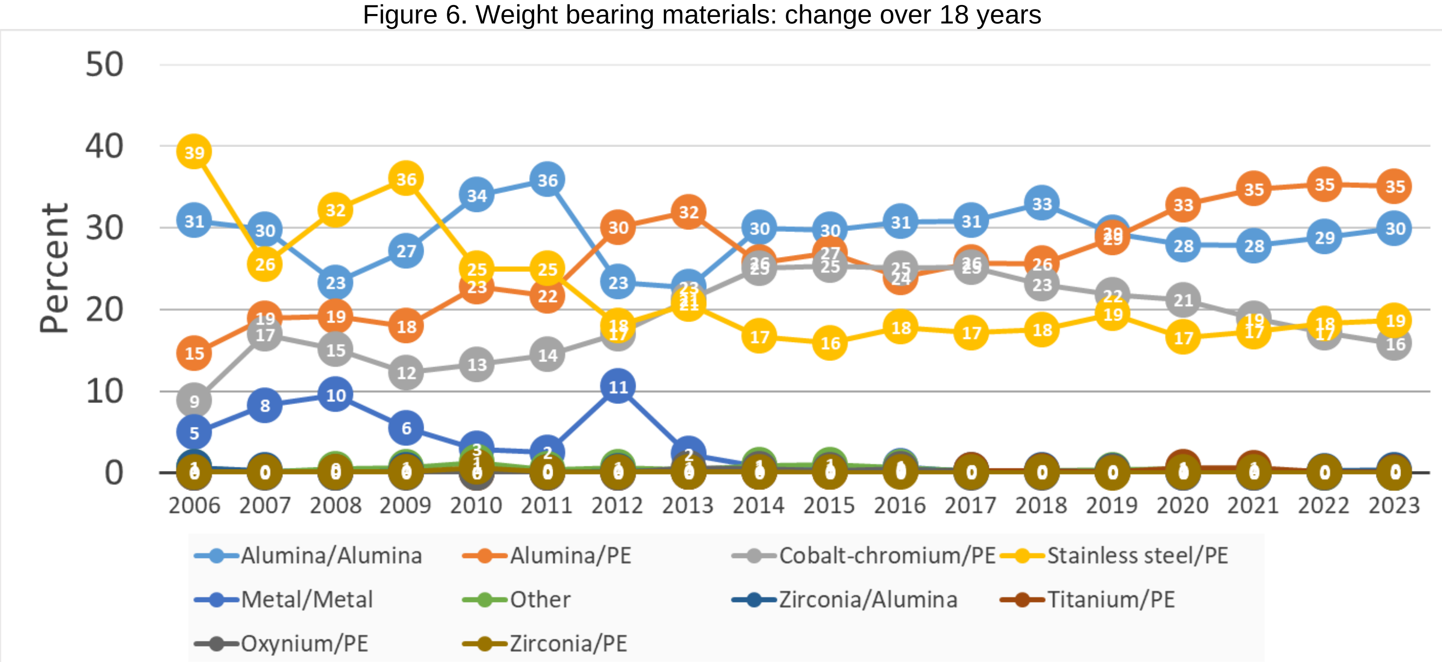


Four weight-bearing materials represent nearly 97% of arthroplasties (Table 4). The order of frequency of the bearing materials did not change significantly since 2011, except that the proportion of Stainless steel/PE was declining between 2009 and 2015 whilst Cobalt-chrome/PE was seeing a corresponding increase. In recent years, Alumina/PE became the dominant coupling (Figure 6).

Table 4. Weight bearing materials.

Material	Frequency	Percent
Alumina/Alumina	17 130	29.4
Alumina/PE	16 044	27.5
Cobalt-chromium/PE	12 278	21.1
Stainless steel/PE	11 253	19.3
Metal/Metal	955	1.6
Other	284	0.5
Zirconia/Alumina	131	0.2
Titanium/PE	111	0.2
Oxynium/PE	84	0.1
Zirconia/PE	40	0.1

Figure 6. Weight bearing materials: change over 18 years

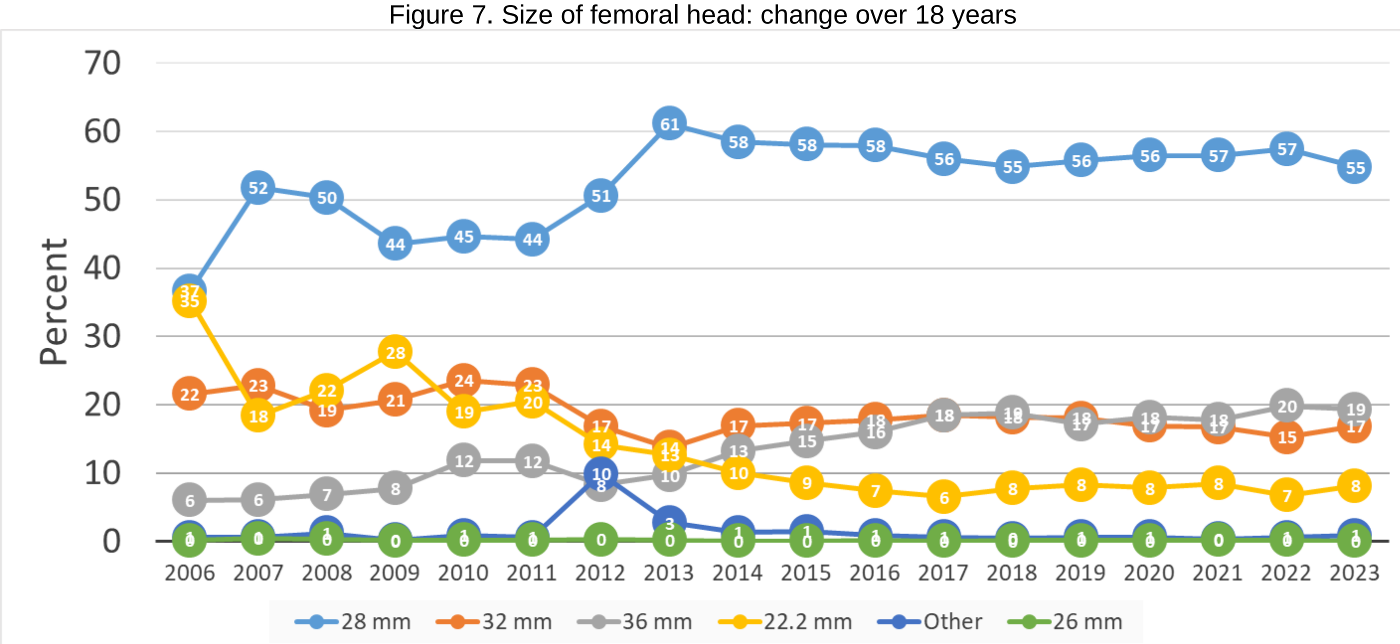


The use of 28mm heads increased steadily between 2006 and 2013 and thus remains the predominant femoral head size. There has been very little distributional change since 2013. 28mm, 32mm and 36mm heads account for the majority of heads registered (Table 5/ Figure 7).

Table 5. Size of femoral head

Size	Frequency	Percent
28 mm	32 131	55.1
32 mm	10 402	17.8
36 mm	8 787	15.1
22.2 mm	6 141	10.5
Other	772	1.3
26 mm	77	0.1

Figure 7. Size of femoral head: change over 18 years



The most commonly used primary implants are listed below by type of fixation and restricted to at least 50 primary implantations (Tables 6, 7, 8 & 9). Please note that this only covers implants that could be reliably identified in the SwissRDL/SoFCOT implant library (see methodological notes below).

Please note that some figures have changed compared to previous reports due to improvements in implant recognition and other data quality improvements. For instance, there were several misclassifications regarding dual mobility vs. standard cups and regarding cemented vs. uncemented implants. SwissRDL has also adapted numerous brand names to bring them in line with a unified SwissRDL implant library. Upon the release of a new report, all previous reports are to be considered superseded.

Table 6. Most frequently used cemented cups (>=50)

	Implant name	Frequency	Cumulative percent
1	Kerboull MKIII	862	29.3
2	Original Mueller	405	43.0
4	Initiale PE	333	54.4
3	Chirulen	289	64.2
5	Novae stick	255	72.8
6	Saturne	128	77.2
7	Ceraver cotyle PE	127	81.5
8	Tregor	90	84.5
9	Exafit	79	87.2
10	Symbol DM cem	62	89.3
11	Oceane	58	91.3
	Total (all cemented cups)	2944	100

Table 7. Most frequently used uncemented cups (>=50)

	Implant name	Frequency	Cumulative percent
1	Novae TH/Bi-Mentum	5918	12.5
2	Pinnacle	4303	21.5
3	Quattro	3164	28.2
4	Avantage	2282	33.0
5	Cerafit	1666	36.5
6	Saturne	1620	39.9
7	RM pressfit vitamys	1597	43.3
8	Saturne II	1596	46.6
9	Allofit	1384	49.5
10	Versafitcup trio/ccl.	1302	52.3
11	RM pressfit	1229	54.9
12	Restoration ADM	1074	57.1
13	Continuum	1042	59.3
14	Trident	1018	61.5
15	Hype	987	63.5
16	Xlfit	914	65.5
17	Gyros	870	67.3
18	Exclusif	815	69.0
19	Tregor	813	70.7
20	Symbol DMHA/DS evol.	785	72.4
21	Liberty	770	74.0
22	April ceramic	761	75.6
23	Ades DM	653	77.0
24	HNG	641	78.3
25	Capitole	598	79.6
26	ABG II	510	80.7
27	Cerafit DM	471	81.6
28	Corin DM	440	82.6
29	Horizon II	439	83.5
30	Dynacup	373	84.3
31	RM classic	352	85.0
32	X.Cup MOB	337	85.7
33	Stafit	322	86.4
34	Evora	316	87.1
35	Polarcup	303	87.7

	Implant name	Frequency	Cumulative percent
36	Exceed	294	88.3
37	Isis II	277	88.9
38	Must	258	89.5
39	Versafitcup DM	258	90.0
40	Atlas III	240	90.5
41	Atlas IV	234	91.0
42	Selene	226	91.5
43	Eternity	222	91.9
44	Novae evolution	205	92.4
45	Dynacup one-c	199	92.8
46	Delta PF	187	93.2
47	Alloclassic	186	93.6
48	Symbol NA	179	94.0
49	X.Cup	177	94.3
50	Plasmafit	167	94.7
51	Mpact DM	160	95.0
52	Serenity	155	95.3
53	Pavi	147	95.6
54	Trident II	145	96.0
55	HNG DM	136	96.2
56	Delta motion	128	96.5
57	Freeliner	109	96.7
58	Selexys DS	106	97.0
59	Anexys	103	97.2
60	Lagoon	100	97.4
61	Cargos	99	97.6
62	Quartz	94	97.8
63	Fixa	93	98.0
64	Atlante	91	98.2
65	Plasmacup	89	98.4
66	Horizon	79	98.5
67	Mixt	72	98.7
68	Tritanium	64	98.8
69	Jump system/JS traser	62	99.0
70	Maxera	62	99.1
71	MBA	53	99.2

	Implant name	Frequency	Cumulative percent
	Total (all uncemented cups)	47505	100

Table 8. Most frequently used cemented stems (>=50)

	Implant name	Frequency	Cumulative percent
1	Initiale modular	1532	11.4
2	Legend V40	1203	20.4
3	Avenir (cem)	1142	28.9
4	Exafit	925	35.8
5	PF	748	41.4
6	ABG II (cem)	732	46.8
7	Sterwen	725	52.3
8	Lemovice	605	56.8
9	Amistem-C	543	60.8
10	Osteal	463	64.3
11	Excia	461	67.7
12	Oceane+	424	70.9
13	Generic	388	73.8
14	CMK	352	76.4
15	CCA	337	78.9
16	Hype (cem)	324	81.3
17	Dedicace V40	289	83.5
18	Institution	241	85.3
19	Valmer	173	86.6
20	Tige Theos à cimenter	162	87.8
21	Corail (cem)	158	88.9
22	Harmony (cem)	155	90.1
23	Exception (cem)	120	91.0
24	Amis-K	110	91.8
25	Kerboull MKIII	110	92.6
26	Original Mueller	99	93.4
27	Naos	91	94.0
28	Silene	79	94.6
29	Centris	77	95.2
30	Polarstem (cem)	77	95.8
31	Twinsys (cem)	75	96.3

	Implant name	Frequency	Cumulative percent
32	Pavi	67	96.8
33	Arcad	62	97.3
34	Meije Duo	56	97.7
	Total (all cemented stems)	13411	100

Table 9. Most frequently used uncemented stems (>=50)

	Implant name	Frequency	Cumulative percent
1	Corail collared	4983	12.5
2	Avenir	4163	23.0
3	Corail	3244	31.2
4	Exception	2482	37.4
5	Cerafit	2022	42.5
6	Targos	2008	47.6
7	Hype	1716	51.9
8	Optimys	1714	56.2
9	Targos mini	1679	60.4
10	Integrale	1358	63.8
11	Thelios HAP	1247	67.0
12	HNG	755	68.9
13	Accolade II	672	70.5
14	Meije Duo	659	72.2
15	Amistem-H	625	73.8
16	Silene	616	75.3
17	Hactiv HAC	615	76.9
18	Alloclassic	570	78.3
19	Linea	527	79.6
20	Twinsys	468	80.8
21	SPS evolution	445	81.9
22	Avenir complete	439	83.0
23	Valmer	358	83.9
24	Naos	341	84.8
25	ABG II	337	85.6
26	Symbol	313	86.4
27	Evok	297	87.2
28	Hype mini	266	87.8

	Implant name	Frequency	Cumulative percent
29	Libra	252	88.5
30	Harmony	249	89.1
31	H-Max	235	89.7
32	Esop	228	90.3
33	Excia plasmapore	213	90.8
34	F2H	200	91.3
35	Louxor	197	91.8
36	Amistem-P	190	92.3
37	Cineos	188	92.8
38	SL-plus/SL-plus MIA	187	93.2
39	Optimum	186	93.7
40	ACOR modular	175	94.1
41	Aura	160	94.5
42	Fitmore	153	94.9
43	Quadra-H	151	95.3
44	OK baby	148	95.7
45	ACOR monobloc	142	96.0
46	Polarstem	130	96.4
47	Rhino	125	96.7
48	Respect	121	97.0
49	BHS	86	97.2
50	Hagap	85	97.4
51	Individual/custom hip	74	97.6
52	Stellaris	66	97.8
53	Stemsys MI	62	97.9
54	Anato	51	98.0
	Total (all uncemented stems)	39755	100

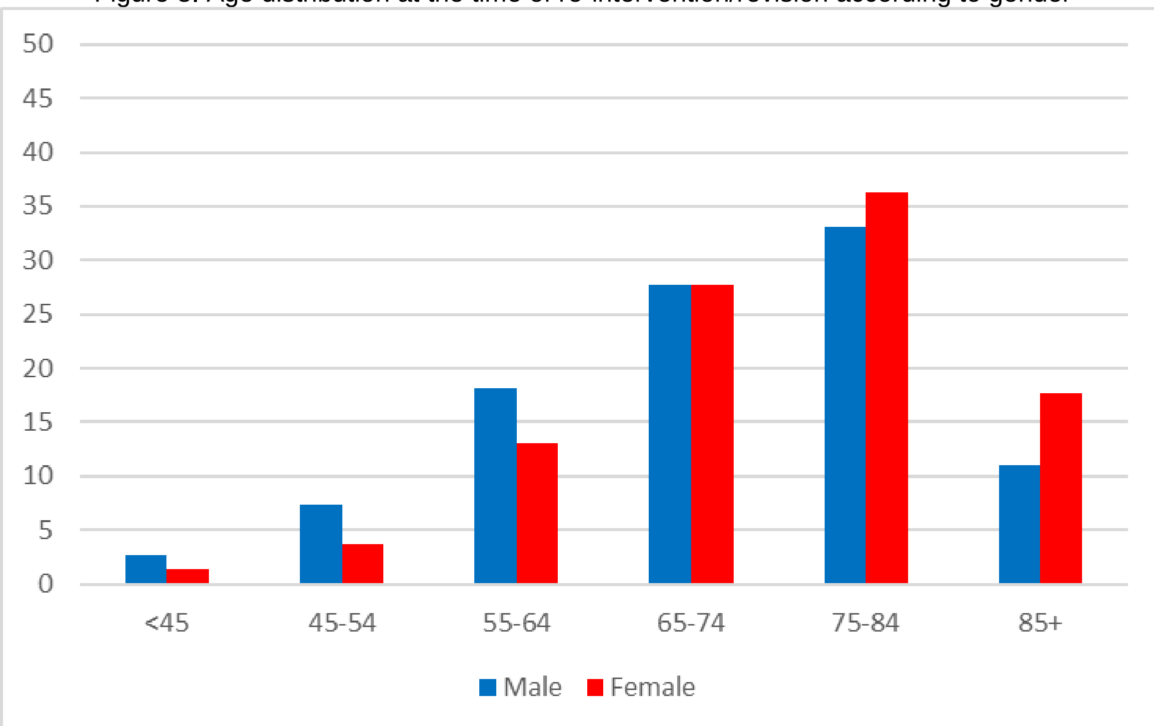
Part II: Re-intervention and Revision

Between January 1st 2006 and December 31th 2023, 5'853 re-interventions were registered in SOFCOT Register. The average patient age was 72.7 years (SD, 11.7) at revision. A total of 3'259 patients (56.7%) were female with an average age of 74.2 years, and 2'594 patients were male with an average age of 70.8 years (Table 10, Figure 8).

Table 10. Age of the patients at the re-intervention/revision

Gender	N	Min	Max	Mean	SD
Male	2594	21	99	70.8	12.1
Female	3259	24	113	74.2	11.2
Total	5853	21	113	72.7	11.7

Figure 8. Age distribution at the time of re-intervention/revision according to gender



Aseptic loosening remains the principal cause of re-interventions. However, it decreased from 53.4% in 2011 to 44.5% in 2021. Hip dislocation represents the second most common cause of re-interventions. Reinterventions due to wear and osteolysis have only marginally increased over the last years, and the same is true for the periprosthetic fractures. Other causes of re-interventions worth mentioning are acute infection, pain, septic loosening and fracture of the implant, with frequencies between 3.0% and 7.9% (Table 11).

Table 11. Causes of re-intervention and revisions

Diagnosis	Frequency	Percent
Aseptic loosening	2 628	44.9
Dislocation	687	11.7
Peri-prosthetic fracture	645	11.0
Septic Loosening - chronic infection	465	7.9
Wear and/or osteolysis	425	7.3
Deep acute infection	306	5.2
Pain	240	4.1
Other	225	3.8
Implant fracture	174	3.0
Peri-operative fracture	23	0.4
Head and neck resection	20	0.3
Calcifications	12	0.2
Removal of material	5	0.1

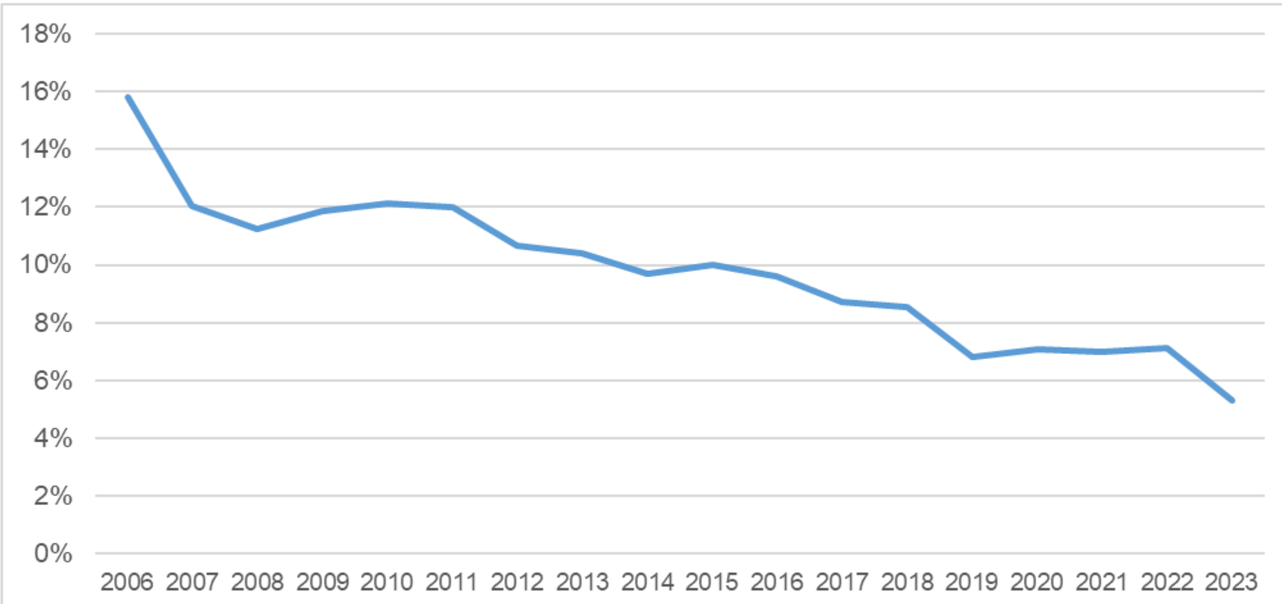
In accordance with the causes of revision, the most common reintervention remains the change of both the acetabular and femoral components, albeit with slightly decreasing frequency since 2009. The proportion of isolated replacement of acetabular or femoral components did not change significantly since the last report (Table 12).

Table 12. Types of re-interventions / revisions

Intervention	Frequency	Percent
Complete exchange	2 646	45.2
Acetabular implant only	1 798	30.7
Femoral implant only	797	13.6
Head and liner	279	4.8
Reimplantation after resection	113	1.9
Others	64	1.1
Totalisation	60	1.0
Head only	30	0.5
Implant removal+spacer	25	0.4
Liner only	19	0.3
Head-neck resection	11	0.2
Osteosynthesis	9	0.2
Prosthetic lavage	4	0.1

We can calculate an annual revision burden according to the formula “N annual revisions/ (N annual primaries + N annual revisions)”. Currently, with 5’855 revisions recorded compared with 58‘314 primary arthroplasties registered since January 1st, 2006, the overall 18-year revision burden is 9.1%. The annual revision burden between 2008 and 2011 was relatively stable at around 12%, but there appears to be a relatively steady decline in the revision burden since then (Figure 9). It should be noted that this statistic does not represent a true “revision rate” of the implants used, but merely provides an indication of the relative burden caused by revision procedures in participating services.

Figure 9. Annual revision burden during the 18-year period 2006 and 2023 (%)



Part II-A: Characteristics of the revised implants

Unsurprisingly, most of the revised arthroplasties are of the conventional type with a femoral stem and an acetabular component, either with conventional or dual mobility cups (DMC). Given the growing use of DMC in this register, their share of cups withdrawn is also growing steadily. The other arthroplasty types represent only 11% of the total arthroplasties revised (Table 13).

Table 13a. Characteristics of the revised implants

Revised	Frequency	Percent
THA with femoral stem	5 046	86.2
Femoral prosthesis with mobile cup	437	7.5
Others	198	3.4
Spacer	99	1.7
THA with short femoral stem	59	1.0
Femoral head resurfacing	9	0.2
Total resurfacing	6	0.1
THA a trans-cervical fixation	1	0.0

Table 13b. Type of cups withdrawn.

Cup type	Frequency	Percent
Conventional	4 070	72.3
Dual mobility cup	1 284	22.8
Mobile head	264	4.7
Other	15	0.3

Just over half of the implants revised were uncemented and that proportion has steadily increased over the last years (Figures 10a/10b).

Figure 10a. Fixation of the revised implants.

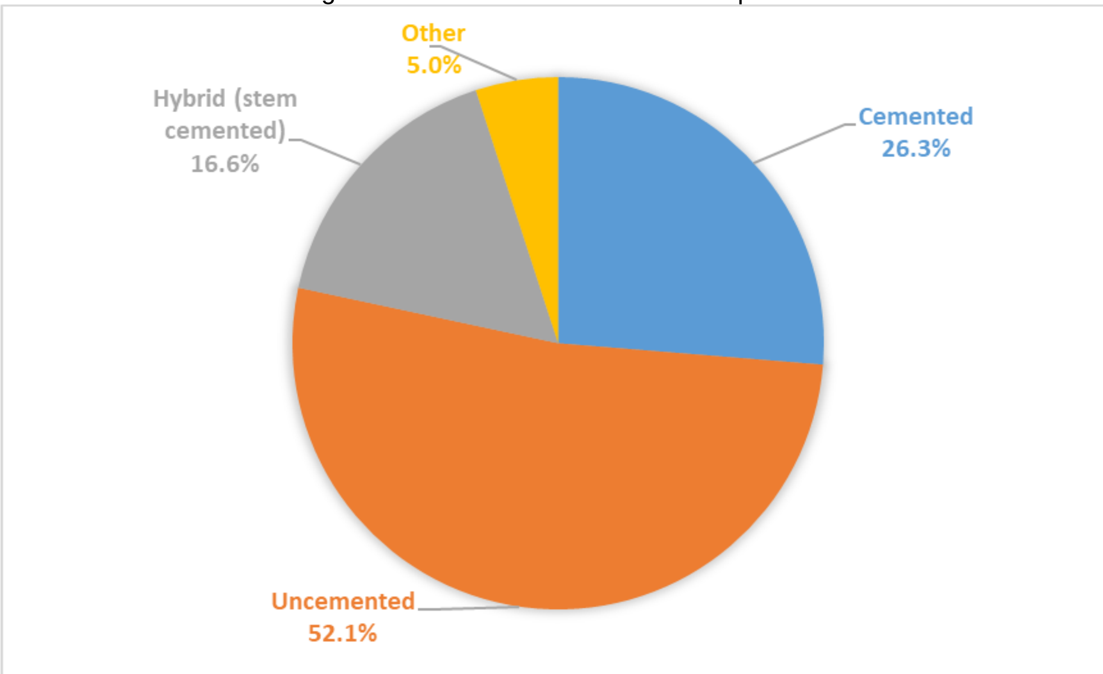
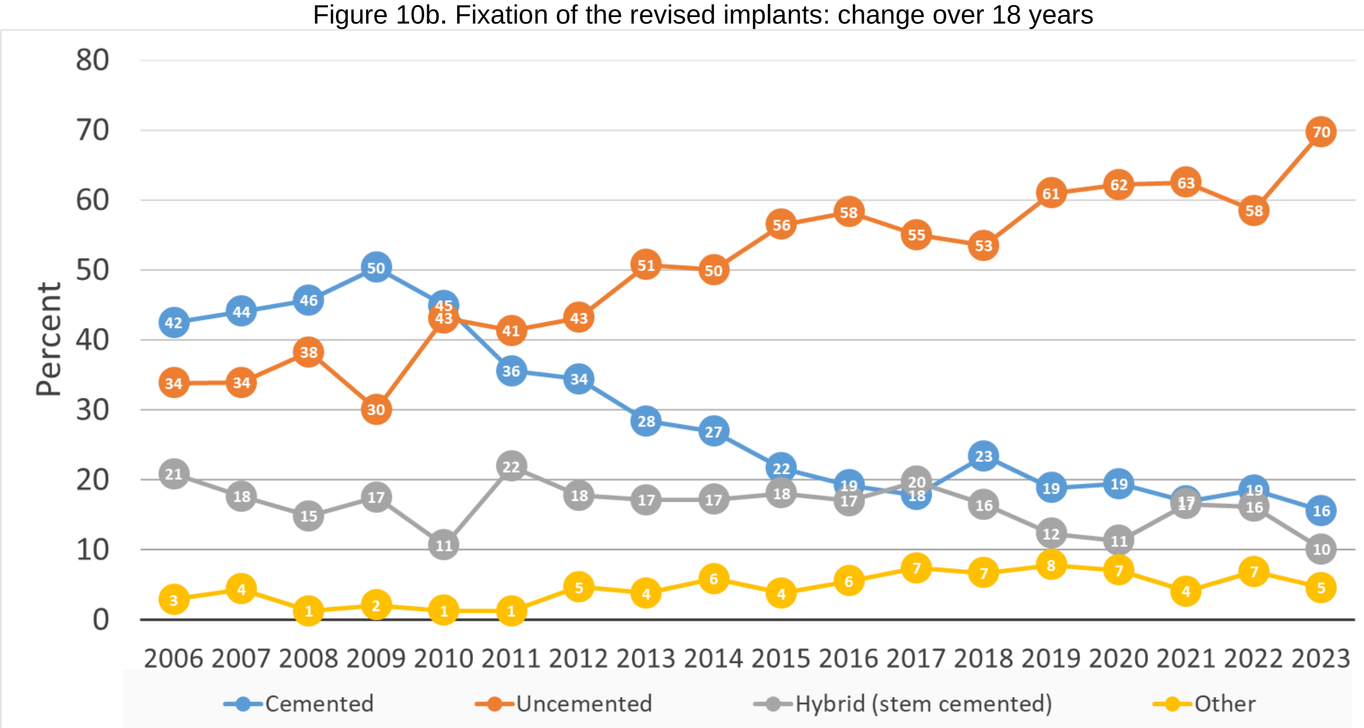


Figure 10b. Fixation of the revised implants: change over 18 years



Most of the revised acetabular cups or inlays are still made of conventional polyethylene (PE). Its proportion has marginally decreased over the last years, as have the proportions of the bulk alumina or Co-Cr sandwich cups (Table 14). Reflecting its growing market share in primary procedures, the share of highly cross-linked PE (HXLPE) is also growing in revised components.

Table 14. Material of revised cups or inlays

Insert	Frequency	Percent
Conventional PE	3 631	66.6
Bulk alumina	722	13.2
Highly cross-link PE	571	10.5
None	162	3.0
CoCr-sandwich	150	2.8
Alumina-sandwich	105	1.9
Others (or unclear)	70	1.3
Non-modular CoCr	42	0.8

In contrast to the revised inlays, the distribution of the replaced heads has seen more pronounced changes after 2011. Compared to 2011, the proportion of the revised stainless-steel heads decreased by 15 percentage points, down to a level of 15.4% in 2021. Alumina heads accounted for 46.5% of the replaced heads in 2021, and the proportion of the revised Co-Cr heads increased by more than 10 percentage points to its current level of 31.1%. However, as the absolute numbers per year are comparatively small, these figures are subject to some year-on-year random fluctuation as well. The proportions of all materials between 2006 and 2023 are shown in Table 15.

Table 15. Material of revised heads

Head	Frequency	Percent
Alumina	1 969	36.1
CoCr	1 486	27.3
Steel	1 434	26.3
Zirconia	421	7.7
Other	108	2.0
Titanium	30	0.6
Oxynium	3	0.1

Part II-B: Type of implant, fixation and cups used for revision.

In about one fifth of all acetabular revisions the implant was supported by a reinforcement ring. Another quarter of acetabular revisions were cemented, and slightly more than the half were uncemented (Figure 11). Femoral revisions were equally split between cemented and uncemented stems (Figure 12). In cases with cementation, an antibiotic-impregnated cement was used in over 93% of cases (Figure 13).

Figure 11. Implant fixation of acetabular revisions

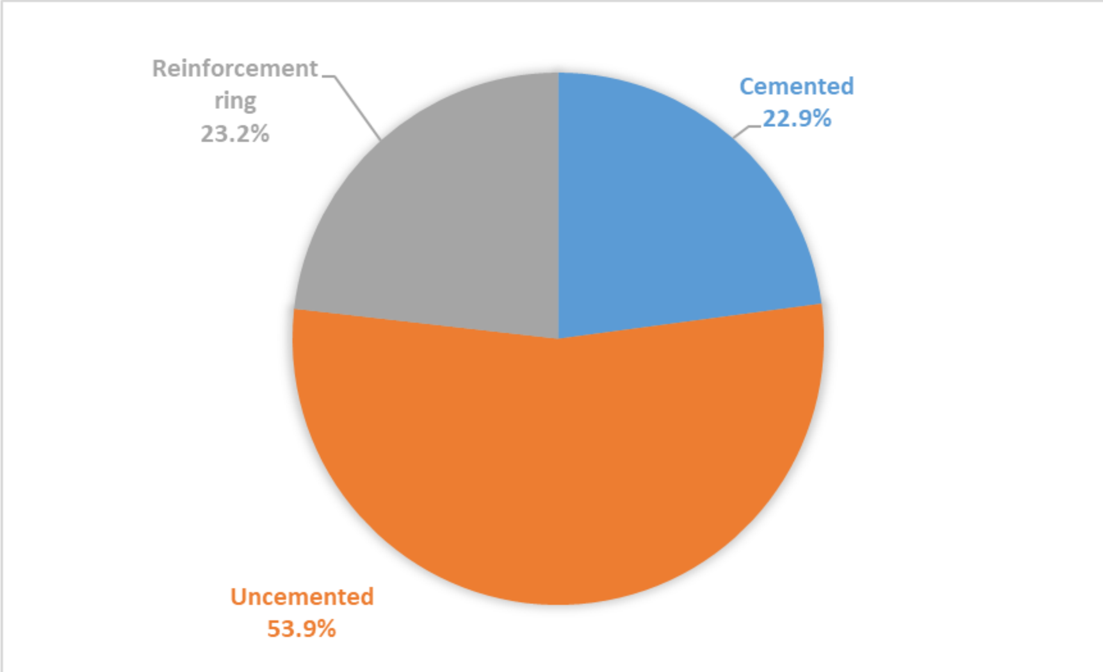


Figure 12. Use of cement in femoral revisions

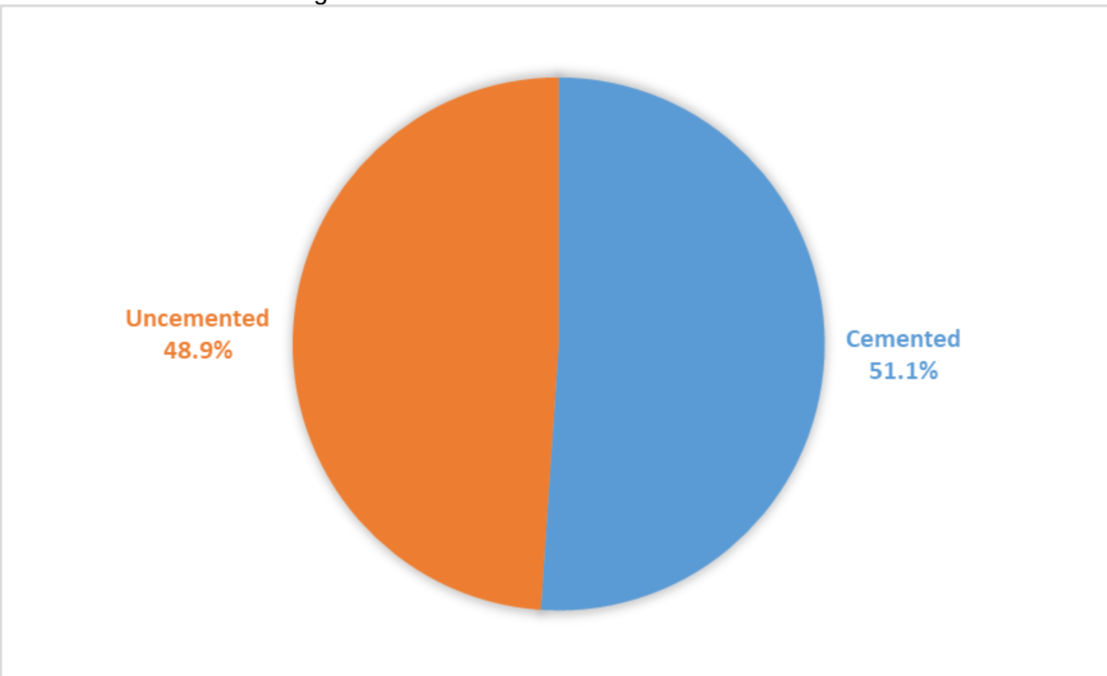
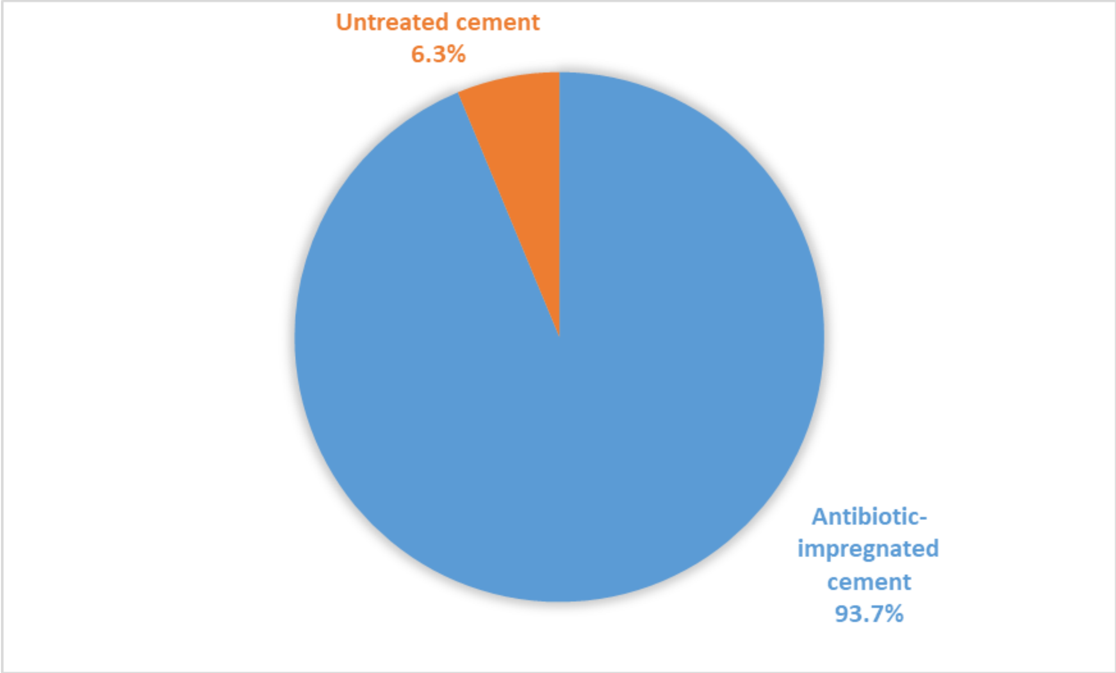
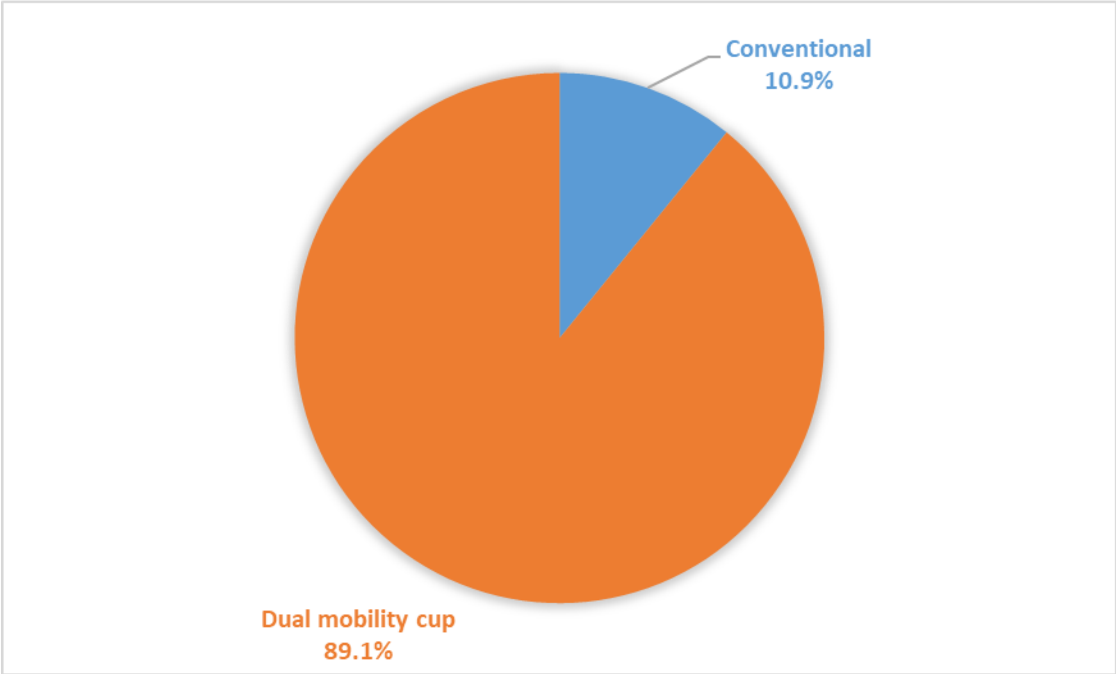


Figure 13. Cemented revisions with and without antibiotics



The vast majority (89.1%) of cups used in revisions since 2017 were of the dual mobility type, which, perhaps, is not surprising given the increasing use of DMC in primary procedures, but still exceeds the share of DMC in recent primary arthroplasties by a large margin.

Figure 14. Type of cup used in revision (data available since 2017)



Four weight-bearing materials are mainly used in revisions. The classic combination of stainless steel/PE is not the dominant anymore, losing that position to Cobalt-chrome/PE (Figure 15). Figure 16 shows a significant increase of the combination Co-Cr/PE since 2011, mainly at the cost of Stainless steel/PE. Sudden changes from one year to the next in Figure 16 may also be the result of changes in the composition of participants of the registry.

Figure 15. Weight bearing materials used in revisions

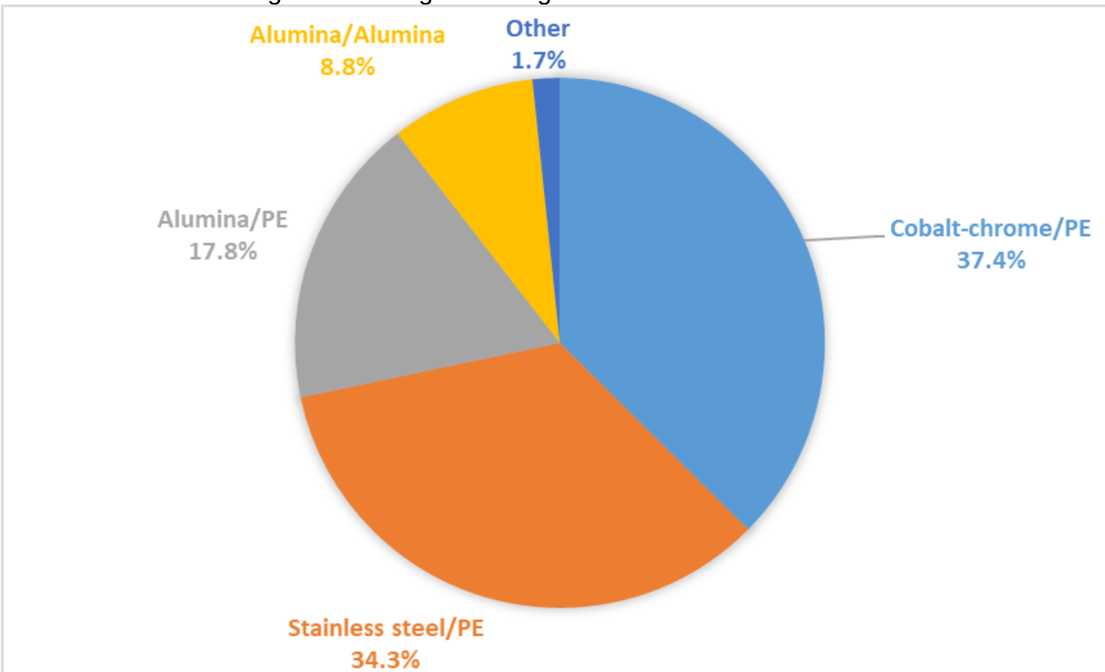
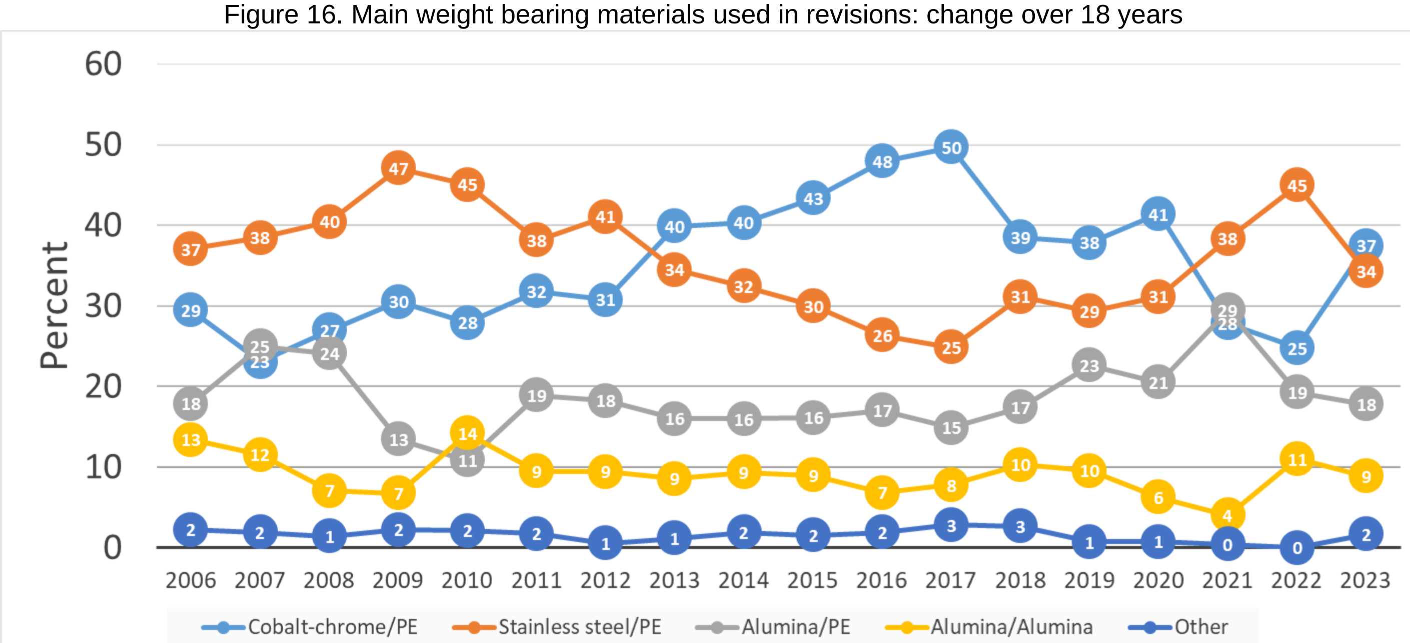


Figure 16. Main weight bearing materials used in revisions: change over 18 years



Part II-C: Analysis of the revision coefficients

The most important group of patients, those requiring a revision due to aseptic loosening, is composed of females in 57% of the cases. In contrast, other revision groups such as “deep infections” or “septic loosening” have more male patients in them. Intra-operative or periprosthetic fractures usually occur in patients of high age. One half of the revised implants due to aseptic loosening was cemented. Most other revised implants was uncemented (Table 16). Another type of fixation at revision was used in less than 5% of the patients.

Table 16. Patient characteristics and type of fixation in revised arthroplasties

Revision diagnosis	N	Age	% female	% cemented	% uncemented	% hybrid
Aseptic loosening	2 481	72.7	57.2	38.4	37.9	17.7
Deep acute infection	280	72.4	46.1	20.6	59.2	15.5
Dislocation	650	73.2	60.5	24.3	60.0	11.4
Perioperative fracture	23	71.5	56.5	8.7	73.9	13.0
Implant fracture	165	70.7	37.6	17.1	66.5	13.4
Peri-prosthetic fracture	603	78.1	63.7	12.9	74.5	11.3
Septic Loosening - chronic infection	412	69.8	38.6	21.0	38.1	27.8
Wear and/or osteolysis	410	71.8	52.0	14.9	56.6	27.6
Pain	225	65.7	65.3	10.7	76.9	10.7
Calcifications	10	70.8	50.0	10.0	80.0	0.0
Removal of material	4	74.0	50.0	0.0	100.0	0.0
Head and neck resection	19	68.9	47.4	60.0	0.0	20.0
Other	214	68.9	60.7	6.7	80.8	10.1
Total	**5 496**	**72.6**	**55.7**	**26.9**	**51.4**	**16.8**

Table 17 (a,b,c,d,e). Predictors influencing the 8 main causes for revision
(Odds ratio and 95% confidence intervals)

a / Influence of age and gender of the revised patients

Co-variables	Aseptic loosening	Dislocation	Wear and/or osteolysis	Periprosthetic fracture	Pain	Acute deep infection	Septic loosening/ chronic infection	Implant fracture
Age	n.s.	n.s.	n.s.	1.06 (1.05 - 1.07)	0.96 (0.95-0.97)	n.s.	0.98 (0.97-0.99)	n.s.
Female vs male	n.s.	1.28 (1.07 - 1.52)	n.s.	1.24 (1.02 - 1.50)	2.06 (1.52 - 2.80)	0.62 (0.46 - 0.82)	0.50 (0.40 - 0.63)	0.52 (0.37 - 0.73)

- Age is a significant risk factor, influencing the revisions due to periprosthetic fractures and pain: for each additional year of age, the risk of a periprosthetic fracture increases by approx. 6% while the risk of a revision due to pain decreases by approx. 4%.

- Gender significantly influences the risk of revision due to dislocation, pain, acute infection, septic loosening and implant fracture. Females are more prone to experience dislocation, and nearly twice as likely to require a revision due to pain than males, but somewhat less likely than males to require revision due to an acute infection, septic loosening and implant fracture.

b / Fixation of removed THA implants

Co-variables	Aseptic loosening	Dislocation	Wear and/or osteolysis	Periprosthetic fracture	Pain	Acute deep infection	Septic loosening/ chronic infection	Implant fracture
Support ring vs uncemented	1.84 (1.27 - 2.67)	n.s.	n.s.	0.09 (0.034 - 0.26)	n.s.	n.s.	7.12 (4.54 - 11.2)	n.s.
Cemented vs uncemented	3.08 (2.63 - 3.61)	0.75 (0.59 - 0.96)	0.21 (0.15 - 0.30)	0.21 (0.15 - 0.29)	0.33 (0.19 - 0.60)	n.s.	1.98 (1.41 - 2.78)	n.s.
Hybrid vs uncemented	1.48 (1.26 - 1.73)	0.58 (0.44 - 0.77)	n.s.	0.44 (0.33 - 0.57)	0.46 (0.29 - 0.74)	n.s.	2.97 (2.26 - 3.91)	n.s.
Reverse hybrid vs uncemented	3.05 (2.08 - 4.47)	n.s.	0.17 (0.053 - 0.55)	0.23 (0.098 - 0.53)	n.s.	n.s.	n.s.	n.s.

- The risk of a revision due to aseptic loosening is more than 3 times higher in primary arthroplasties with cemented fixation compared to uncemented fixation of the implants. However, cemented fixation compared to uncemented fixation reduces the risk for revision due to a dislocation, wear/osteolysis and periprosthetic fracture by factors 0.75, 0.21 and 0.21. It is also less associated with pain.

- Compared to uncemented fixation of both components, the standard hybrid fixation (cup uncemented, stem cemented) presents a 1.5 times higher risk of revision due to an aseptic loosening, while the risk due to periprosthetic fracture is 0.43-times lower.

- Compared to uncemented fixation of both components, the reverse hybrid fixation (cemented cup, uncemented stem) presents 3.2 times higher revision risk due to aseptic loosening, while the risk due to wear/osteolysis and periprosthetic fracture is 0.17 and 0.15-times lower.

- In most cases, the risk of septic loosening follows a similar pattern to aseptic loosening.

c / Type of removed acetabular implant

Co-variables	Aseptic loosening	Dislocation	Wear and/or osteolysis	Periprosthetic fracture	Pain	Acute deep infection	Septic loosening/ chronic infection	Implant fracture
Conventional (std & DM) vs other	2.66 (1.90 - 3.72)	n.s.	2.36 (1.06 - 5.24)	n.s.	n.s.	0.42 (0.26 - 0.68)	n.s.	n.s.
Dual mobility cup vs standard cup	n.s.	0.36 (0.27 - 0.47)	0.34 (0.25 - 0.47)	1.75 (1.39 - 2.19)	2.47 (1.64 - 3.73)	3.18 (2.30 - 4.40)	n.s.	n.s.

- Conventional arthroplasties carry a higher risk of aseptic loosening and wear and/or osteolysis. However, the risk of acute deep infection appears somewhat lower.
- Compared to standard cups, dual-mobility cups reduce the risk of revision for dislocation and for wear and osteolysis by a factor of 0.3-0.4. Conversely, the risk of revision for periprosthetic fracture and pain is 1.7 and 2.5 times higher with dual-mobility cups, as is the risk of acute deep infections.

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d / Type of removed acetabular insert

Co-variables	Aseptic loosening	Dislocation	Wear and/or osteolysis	Periprosthetic fracture	Pain	Acute deep infection	Septic loosening/ chronic infection	Implant fracture
Cross-linked PE (HXLPE) vs conventional PE	0.31 (0.25 - 0.38)	2.15 (1.63 - 2.85)	0.23 (0.12 - 0.43)	2.07 (1.58 - 2.72)	n.s.	1.64 (1.13 - 2.36)	3.07 (2.28 - 4.13)	n.s.
Bulk alumina vs conventional PE	0.43 (0.34 - 0.53)	1.70 (1.24 - 2.35)	0.014 (0.004 - 0.06)	2.42 (1.69 - 3.45)	2.14 (1.32 - 3.46)	1.72 (0.99 - 3.01)	2.51 (1.62 - 3.90)	5.30 (2.88 - 9.77)
Sandwich alumina vs conventional PE	0.40 (0.25 - 0.63)	1.82 (1.02 - 3.24)	0.051 (0.007 - 0.37)	3.31 (1.87 - 5.88)	n.s.	n.s.	n.s.	8.14 (3.83 - 17.3)
Bulk CoCr vs conventional PE	n.s.	n.s.	n.s.	n.s.	5.40 (1.69 - 17.3)	n.s.	n.s.	n.s.
Sandwich CoCr vs conventional PE	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

- Compared to conventional PE liner, cross-linked PE (HXLPE) reduce the risk of revision for Aseptic loosening and wear and osteolysis by a factor of 0.3 and 0.2, respectively, but may approximately double the risk of dislocation, chronic infection and peri-prosthetic fracture.
- Alumina liners are associated with an increased risk of revision due to periprosthetic fractures, pain, implant fractures and dislocation, but they are relatively rarely associated with aseptic loosening and wear and osteolysis. It should be noted that very small odds ratios are also indicative that hardly any revisions with this diagnosis were registered in the group of interest.
- Bulk CoCr liners are particularly associated with pain as a revision reason.
- The picture for removed femoral heads shows that all metal heads are associated with a higher risk of septic loosening and chronic infection, in particular CoCr heads, compared to ceramic heads. Zirconium heads, on the other hand, carry a higher risk of wear/osteolysis and implant fracture compared to alumina heads.

e / Type of removed femoral head

Co-variables	Aseptic loosening	Dislocation	Wear and/or osteolysis	Periprosthetic fracture	Pain	Acute deep infection	Septic loosening/ chronic infection	Implant fracture
Metal vs alumina	83 (0.71 - 0.96)	n.s.	n.s.	n.s.	0.58 (0.39 - 0.87)	n.s.	2.14 (1.52 - 3.02)	n.s.
CoCr vs alumina	0.74 (0.62 - 0.88)	n.s.	n.s.	n.s.	0.56 (0.35 - 0.89)	n.s.	3.41 (2.40 - 4.84)	0.42 (0.20 - 0.86)
Titanium vs alumina	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Zirconium vs alumina	n.s.	0.34 (0.20 - 0.57)	3.27 (2.31 - 4.63)	0.55 (0.33 - 0.91)	0.34 (0.13 - 0.87)	0.26 (0.079 - 0.86)	0.23 (0.083 - 0.67)	2.36 (1.23 - 4.52)

PE = polyethylene, n.s. = not significant

NB. The multivariable analyses could only adjust for covariates that were recorded in the SOFCOT registry. Other important co-factors may exist. The precision of some risk estimates needs to be interpreted with care, as the partially wide confidence intervals demonstrate.

Part III: Preliminary analysis of revisions of patients with documented primary arthroplasty

The social security number of the patient, gender and operated side allow establishing a link between the primary and revision interventions if a revision occurs in one of the participating hospitals. However, as this registry only covers a limited selection of hospitals in France it is very unlikely that documentation (or coverage) of external revisions occurring after included primaries is complete. Please see the methodological notes below.

By 31.12.2023, 777 first revisions could be linked to primary arthroplasties previously registered in SoFCOT. Not surprisingly, the first and most frequent causes of an early revision are hip dislocation, followed by periprosthetic fractures, acute deep infection, aseptic loosening, other causes, cobalt allergy, and implant fracture (Table 18).

Table 18. Characteristics of first revisions of patients with documented primary arthroplasty

	Demographics of re-operated patients					Fixation of the revised implants		
Revision cause	**N**	**%**	**Age**	**% female**	**Average interval (years)**	**% Cemented**	**% Uncemented**	**% Hybrid and reverse hybrid**
Dislocation	191	24.6	69.9	55.5	0.9	20.9	71.7	7.3
Peri-prosthetic fracture	175	22.5	74.6	63.4	0.8	2.9	82.3	12.6
Aseptic loosening	103	13.3	69.9	52.4	2.6	5.8	77.7	13.6
Deep acute infection	101	13.0	70.8	44.6	0.3	9.9	71.3	16.8
Pain	49	6.3	64.5	55.1	2.1	2.0	89.8	8.2
Septic Loosening - chronic infection	45	5.8	70.4	40.0	2.4	8.9	60.0	28.9
Implant fracture	20	2.6	64.7	40.0	4.0	20.0	70.0	10.0
Peri-operative fracture	10	1.3	70.9	60.0	0.2	10.0	80.0	0.0
Wear and/or osteolysis	6	0.8	71.6	33.3	6.3	16.7	83.3	0.0
Calcifications	3	0.4	67.1	33.3	3.1	0.0	100.0	0.0
Other	74	9.5	67.6	56.8	1.6	2.7	93.2	4.1
Total	**777**	**100**	**70.4**	**54.1**	**1.4**	**9.5**	**77.6**	**11.5**

Revision risk can be assessed by different means. Kaplan-Meier estimates of cumulative revision risk have become an internationally accepted method for reporting and comparing revision risks for different groups, especially if documentation rates are high and mortality information is available to improve the quality of reporting in the presence of so-called censoring (e.g. if a group of older patients due to their higher mortality risk are less and less at risk of implant revision over time).

An alternative way of expressing revision rates is to set them in relation to 100 observed component years (Rp100ocy).

The formula for the calculation of rp100ocy is:

$$\frac{\text{Number of cases of revision surgery for any reason x 100}}{\text{Number of observed components x observation time in years}}$$

The calculation of this index allows for some basic comparison of different implants even in the absence of more sophisticated survival-type analyses. A systematic review of reports from national registers and clinical studies analysed with respect to revision rates has established that, after primary hip replacement, a mean of 1.3 revision per 100 observed component years may be expected as a norm value[1].

Table 19. Cumulative annual revisions per 100 observed component years (Rp100ocy)

Year (t)	Total arthroplasties (up to year t)	Number Revised (up to year t)	Observed component Years (up to year t) (adjusted)*	For comparison: unadjusted component years	Rp100ocy	Exact 95% Confidence interval	
2008	3754	26	4869	5029	0.53	0.36	0.78
2009	4840	36	8319	9307	0.43	0.31	0.60
2010	6507	58	13112	14936	0.44	0.34	0.57
2011	8317	85	20160	22282	0.42	0.34	0.52
2012	11282	128	28831	32028	0.44	0.37	0.53
2013	14319	186	40478	44747	0.46	0.40	0.53
2014	18507	223	55608	60959	0.40	0.35	0.46
2015	24170	294	75125	81994	0.39	0.35	0.44
2016	29724	377	99592	108815	0.38	0.34	0.42
2017	35356	447	127657	141025	0.35	0.32	0.38
2018	40442	524	156808	178449	0.33	0.31	0.36
2019	45677	589	187016	221012	0.31	0.29	0.34
2020	49462	645	219232	268071	0.29	0.27	0.32
2021	53122	707	253923	318751	0.28	0.26	0.30
2022	56370	749	288661	372798	0.26	0.24	0.28
2023	58314	777	312805	429389	0.25	0.23	0.27

Note: Wilson score intervals were used to calculate the limits of 95% Confidence Intervals.
* Observations are assumed censored in certain situations. See methodological notes below.

At the end of 2023, after 18 years of observation, the average follow-up of the 58 314 primary procedures registered is 5.4 years.

[1] *G. Labek,M. Thaler,W. Janda,M. Agreiter,B. Stöckl. Revision rates after total joint replacement. CUMULATIVE RESULTS FROM WORLDWIDE JOINT REGISTER DATASETS. J Bone Joint Surg [Br] 2011;93-B:293-7.*

Table 20 presents the various Rp100ocy that can be calculated by creating different implant strata by type of implant and type of implant fixation. The difference between standard cups and dual mobility cups has been narrowing and is now statistically insignificant. All-cemented fixation arthroplasties show slightly better Rp100ocy than all uncemented ones and this difference is statistically significant. Hybrid fixation performs best.

Table 20. Overall Rp100ocy by implant type and fixation used in primary procedures.

By type of implant	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
By type of stem								
Conventional stem THA**	49419	669	273182	372822	5.5	**0.24**	0.23	0.26
Short stem THA**	5876	64	25978	35080	4.4	**0.25**	0.19	0.31
Full resurfacing	348	0	874	3997	2.5	**0.00**	0.00	0.44
By type of cup								
Standard cup	30179	451	179823	249726	6.0	**0.25**	0.23	0.28
Dual mobility cup	25553	284	120813	162969	4.7	**0.24**	0.21	0.26
Mobile cup (bipolar)	2717	43	12890	17567	4.7	**0.33**	0.25	0.45
By type of implant fixation	**Total arthroplasties**	**Number revised**	**Observed component years (adjusted)***	**For comparison: unadjusted component years**	**Average FU (years)**	**Rp100ocy**	**Exact 95% Confidence interval**	
Uncemented	42407	603	208010	292185	4.9	**0.29**	0.27	0.31
Hybrid (uncemented cup, stem cemented)	10721	89	65959	85842	6.2	**0.13**	0.11	0.17
Cemented	4410	74	34522	45451	7.8	**0.21**	0.17	0.27
Reverse hybrid (cemented cup, stem uncemented)	650	8	3508	4970	5.4	**0.23**	0.12	0.45

* Observations are assumed censored in certain situations. See methodological notes below.
** Defined as either registering a recognised short stem or declaring so on the SoFCOT proforma: “PTH à tige fémorale courte”

Table 21 shows the Rp100ocy by type of the five most common bearing combinations in primary THA. Note that Metal-Metal bearings (either conventional THA with 28 or 32mm head size and resurfacing) show a lower Rp100ocy than the other categories, despite the longer follow-up. This is likely due to a mixture of “survivor effect” and “censoring effect”. As the average follow-up time in years shows, these are rather old implants and many of the patients may not actually be at risk of revision anymore. Furthermore, as the cumulative risk curve is rather flat after a few years, the rp100ocy index tends to be considerably depressed compared to relatively young implants (as observation years are added much faster than additional revisions).

Table 21. Overall Rp100ocy by bearings used in primary THA by number of inclusions

By bearing type	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
Alumina / alumina	17130	254	87607	125260	5.1	**0.29**	0.26	0.33
Alumina / PE	16044	192	85292	109489	5.3	**0.23**	0.20	0.26
Cobalt-chrome / PE	12278	165	62770	87599	5.1	**0.26**	0.23	0.31
Stainless steel / PE	11253	150	67187	89721	6.0	**0.22**	0.19	0.26
Metal / metal**	612	7	5944	8312	9.7	**0.12**	0.06	0.24

* Observations are assumed censored in certain situations. See methodological notes below.
** Excluding full resurfacing metal on metal couplings (343)

A different perspective can be gained by comparing cumulative revision risks.

Figure 15 shows that the risk of revision is initially very similar for dual mobility cups and standard cups. However, from the second year after implantation onwards standard cups show a steeper increase in cumulative revision risk, leading to a relatively pronounced difference by year six after primary implantation.

In Figure 16, we see that the revision risk of bipolar femoral prostheses (hemi-arthroplasties) in acute fractures appears to be initially much higher than that of conventional THAs in acute fractures. By year 5, however, this difference has shrunk considerably as conventional THAs appear to catch up, rendering the initial difference entirely statistically insignificant.

However, caution must be applied to the interpretation of both figures as the groups differ in their age distribution. Both DM cups and bipolar cups are used in older patients than conventional cups. In the absence of group-specific mortality data, the “older” groups will show an increasing downward bias due to the disproportionate loss of members that are not at risk of revision anymore at some point. In other words, if a patient dies, his or her implant cannot be revised anymore.

Figure 17 highlights that there is no apparent difference in the revision risk associated with conventional PE liners versus cross-linked (HXLPE) PE. In terms of raw figures, HXLPE liners are slightly above conventional PE liners, but the difference is not statistically significant at any time point after primary operation.

Table 22 contains the relevant point estimates at selected time points.

Figure 15. KM estimate of cumulative revision risk for standard cups vs. dual mobility cups

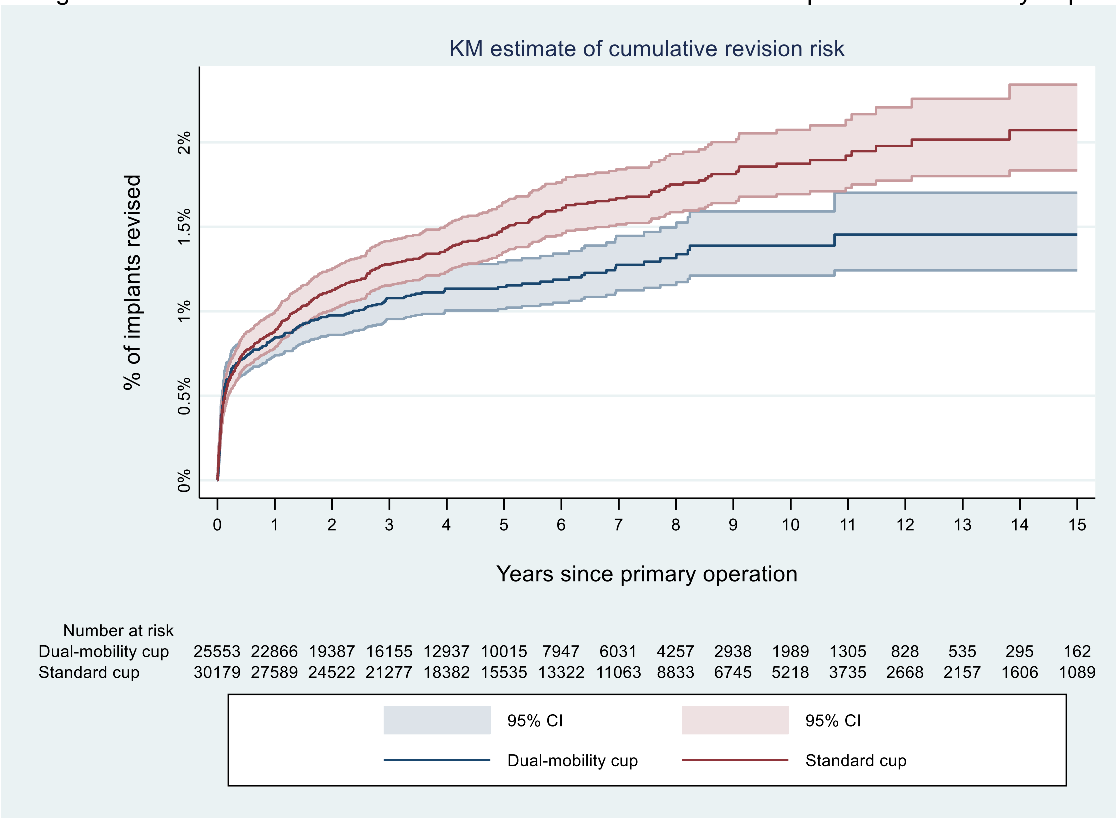


Figure 16. KM estimate of cumulative revision risk for THA vs. Hemi-arthroplasty with mobile cups in acute fractures

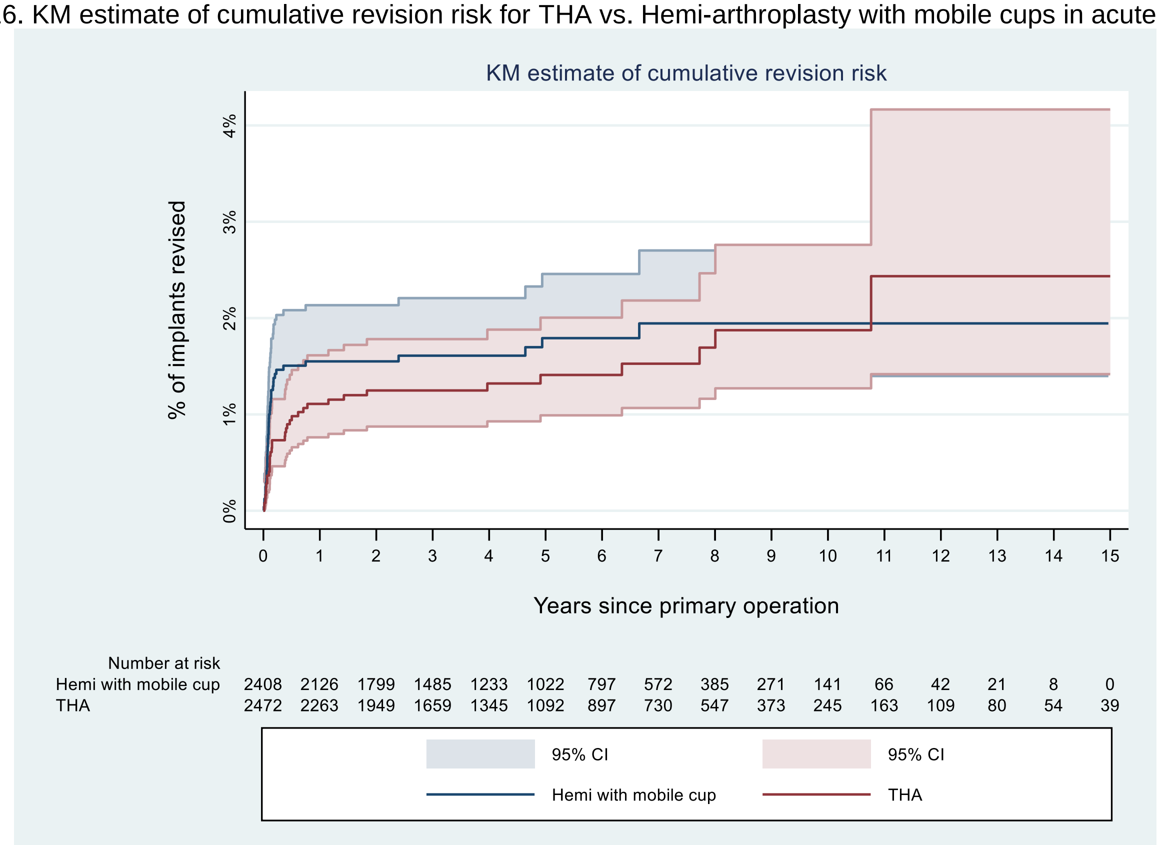
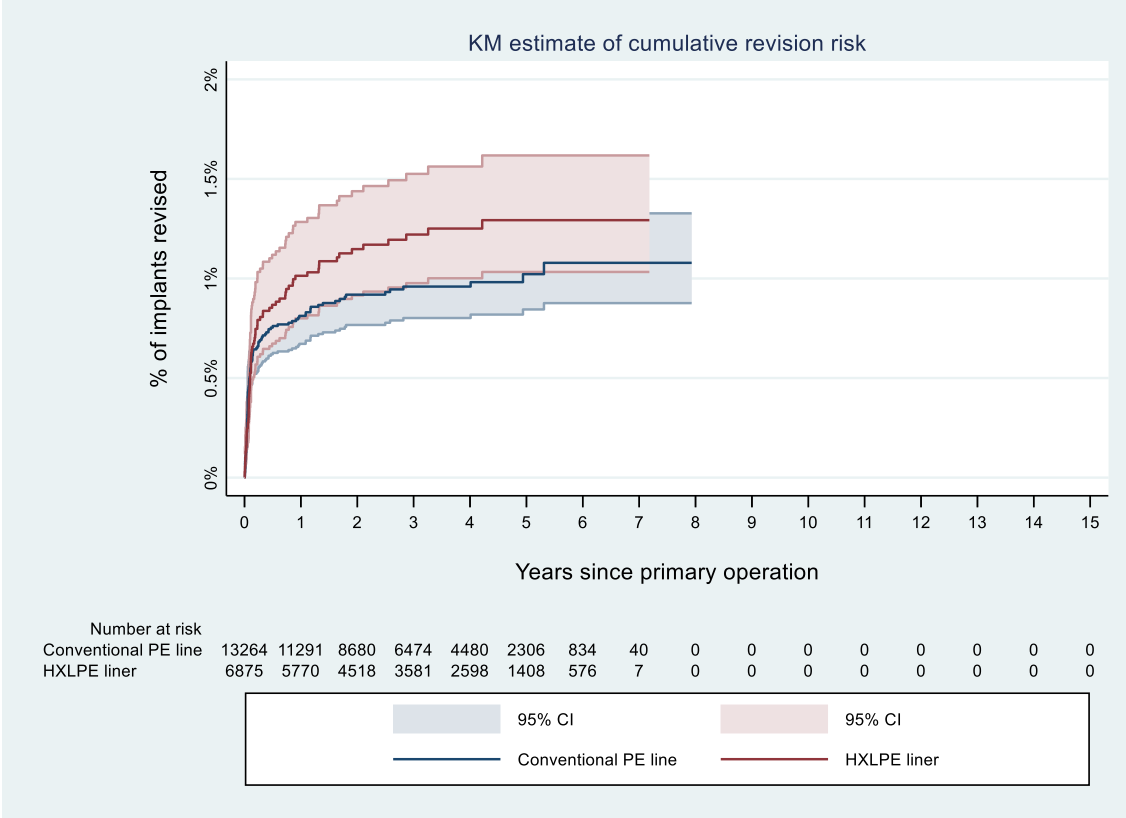


Figure 17. KM estimate of cumulative revision risk for different types of acetabular PE liner material *



* Data available since 2016

Table 22. Kaplan-Meier estimates

Estimated cumulative revision rates	**1-year**	**2-year**	**3-year**	**5-year**	**10-year**	**15-year**
Standard cup	0.9 (0.8-1.0)	1.1 (1.0-1.2)	1.3 (1.1-1.4)	1.5 (1.3-1.6)	1.9 (1.7-2.1)	2.1 (1.8-2.3)
Dual mobility cup	0.8 (0.7-1.0)	1.0 (0.9-1.1)	1.1 (1.0-1.2)	1.1 (1.0-1.3)	1.4 (1.2-1.6)	1.5 (1.2-1.7)
THA	1.2 (0.8-1.7)	1.3 (0.9-1.9)	1.3 (0.9-1.9)	1.5 (1.1-2.2)	2.0 (1.4-3.0)	2.6 (1.5-4.5)
Femoral stem with mobile cup (Bipolar)	1.5 (1.1-2.0)	1.5 (1.1-2.0)	1.5 (1.1-2.1)	1.7 (1.2-2.3)	1.8 (1.3-2.6)	
Conventional PE liner	0.8 (0.7-1.0)	0.9 (0.8-1.1)	1.0 (0.8-1.2)	1.0 (0.9-1.2)		
HXLPE liner	1.0 (0.8-1.3)	1.1 (0.9-1.4)	1.2 (1.0-1.5)	1.3 (1.0-1.6)		

We conducted an analysis for all implant brands used in primary THA. **Components with less than 100 primary implantations were excluded from the Rp100ocy calculation.**

Table 23. Rp100ocy of standard acetabular implants used in primary THA by decreasing order

Standard CUP cemented	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
Kerboull MKIII	862	11	6666	11525	7.7	0.17	0.09	0.30
Original Mueller	405	4	4378	4699	10.8	0.09	0.04	0.23
Initiale PE	333	4	3318	3622	10.0	0.12	0.05	0.31
Chirulen	289	7	1313	1313	4.5	0.53	0.26	1.10
Ceraver cotyle P	127	5	1381	1534	10.9	0.36	0.15	0.85

Standard CUP uncemented	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
Pinnacle	4303	37	24005	32777	5.6	0.15	0.11	0.21
Cerafit	1666	33	10607	15023	6.4	0.31	0.22	0.44
RM pressfit vita	1597	13	9196	10198	5.8	0.14	0.08	0.24
Allofit	1384	16	7603	11913	5.5	0.21	0.13	0.34
Versafitcup trio	1302	19	5630	8833	4.3	0.34	0.22	0.53
RM pressfit	1229	30	8694	10671	7.1	0.35	0.24	0.49
Continuum	1042	16	4541	5113	4.4	0.35	0.22	0.57
Trident	1018	8	8054	10674	7.9	0.10	0.05	0.20
Hype	987	10	3894	4261	3.9	0.26	0.14	0.47
Xlfit	914	19	3224	3417	3.5	0.59	0.38	0.92
Exclusif	815	13	4032	5047	4.9	0.32	0.19	0.55
April ceramic	761	12	2808	3201	3.7	0.43	0.24	0.75
HNG	641	0	2051	2071	3.2	0.00	0.00	0.19
ABG II	510	31	3742	5704	7.3	0.83	0.58	1.17
Horizon II	439	8	1671	2452	3.8	0.48	0.24	0.94
Dynacup	373	6	1378	2599	3.7	0.44	0.20	0.95
RM classic	352	1	762	2162	2.2	0.13	0.02	0.74
Exceed	294	5	1882	2543	6.4	0.27	0.11	0.62
Must	258	7	1719	1986	6.7	0.41	0.20	0.84
Atlas III	240	6	1245	1664	5.2	0.48	0.22	1.05
Atlas IV	234	9	1178	2158	5.0	0.76	0.40	1.45
Selene	226	6	1914	3453	8.5	0.31	0.14	0.68
Eternity	222	8	1416	2486	6.4	0.56	0.29	1.11
Dynacup one-c	199	3	814	858	4.1	0.37	0.13	1.08
Delta PF	187	1	546	1668	2.9	0.18	0.03	1.03
Alloclassic	186	5	2545	2545	13.7	0.20	0.08	0.46
Symbol NA	179	3	368	1114	2.1	0.81	0.28	2.37
X.Cup	177	1	297	1176	1.7	0.34	0.06	1.88
Plasmafit	167	5	578	966	3.5	0.87	0.37	2.01

Pavi	147	2	647	1070	4.4	0.31	0.08	1.12
Trident II	145	2	171	439	1.2	1.17	0.32	4.17
Delta motion	128	2	660	1078	5.2	0.30	0.08	1.10
Freeliner	109	2	286	425	2.6	0.70	0.19	2.51
Anexys	103	0	196	236	1.9	0.00	0.00	1.93
Lagoon	100	0	958	1698	9.6	0.00	0.00	0.40

* Observations are assumed censored in certain situations. See methodological notes below.

Table 24. Rp100ocy of Dual Mobility acetabular components used in primary THA by decreasing order

Double mobility CUP cemented	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
Novae stick	255	4	1301	1530	5.1	0.31	0.12	0.79
Saturne	128	5	716	862	5.6	0.70	0.30	1.62
Double mobility CUP uncemented	**Total arthroplasties**	**Number revised**	**Observed component years (adjusted)***	**For comparison: unadjusted component years**	**Average FU (years)**	**Rp100ocy**	**Exact 95% Confidence interval**	
Novae TH/Bi-Ment	5918	48	23439	30939	4.0	0.20	0.15	0.27
Quattro	3164	18	17109	20542	5.4	0.11	0.07	0.17
Avantage	2282	56	10828	15118	4.7	0.52	0.40	0.67
Saturne	1620	17	9841	13933	6.1	0.17	0.11	0.28
Saturne II	1596	9	3802	4496	2.4	0.24	0.12	0.45
Restoration ADM	1074	18	5306	7513	4.9	0.34	0.21	0.54
Gyros	870	17	7657	8248	8.8	0.22	0.14	0.36
Tregor	813	4	8003	9395	9.8	0.05	0.02	0.13
Symbol DMHA/DS e	785	4	2207	4129	2.8	0.18	0.07	0.47
Liberty	770	14	3685	4849	4.8	0.38	0.23	0.64
Ades DM	653	7	4072	4714	6.2	0.17	0.08	0.35
Capitole	598	5	1828	3555	3.1	0.27	0.12	0.64
Cerafit DM	471	6	1707	2152	3.6	0.35	0.16	0.76
Corin DM	440	3	2229	2513	5.1	0.13	0.05	0.40
X.Cup MOB	337	5	582	2012	1.7	0.86	0.37	1.99
Stafit	322	3	3236	3514	10.0	0.09	0.03	0.27
Evora	316	1	1320	2647	4.2	0.08	0.01	0.43
Polarcup	303	4	649	2431	2.1	0.62	0.24	1.57
Isis II	277	7	749	749	2.7	0.93	0.45	1.92
Versafitcup DM	258	0	681	937	2.6	0.00	0.00	0.56
Novae evolution	205	2	1127	2509	5.5	0.18	0.05	0.64
Mpact DM	160	0	420	841	2.6	0.00	0.00	0.91
Serenity	155	2	195	262	1.3	1.03	0.28	3.67
HNG DM	136	4	353	768	2.6	1.13	0.44	2.87
Selexys DS	106	1	574	1091	5.4	0.17	0.03	0.98

* Observations are assumed censored in certain situations. See methodological notes below.

Table 25. Rp100ocy of Femoral components used in primary THA by decreasing order

STEM cemented	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
Initiale modular	1532	6	10844	12087	7.1	0.06	0.03	0.12
Legend V40	1203	8	11760	15238	9.8	0.07	0.03	0.13
Avenir (cem)	1142	6	5887	6721	5.2	0.10	0.05	0.22
Exafit	925	7	7397	10978	8.0	0.09	0.05	0.20
PF	748	3	7180	8980	9.6	0.04	0.01	0.12
ABG II (cem)	732	8	4044	5344	5.5	0.20	0.10	0.39
Sterwen	725	7	8328	9031	11.5	0.08	0.04	0.17
Lemovice	605	11	1921	1924	3.2	0.57	0.32	1.02
Amistem-C	543	7	2288	3650	4.2	0.31	0.15	0.63
Osteal	463	5	2728	4164	5.9	0.18	0.08	0.43
Excia	461	11	2097	2147	4.5	0.52	0.29	0.94
Oceane+	424	2	2774	3984	6.5	0.07	0.02	0.26
Generic	388	7	1613	1788	4.2	0.43	0.21	0.89
CMK	352	3	1783	1967	5.1	0.17	0.06	0.49
CCA	337	8	2621	2742	7.8	0.31	0.15	0.60
Hype (cem)	324	1	1191	1492	3.7	0.08	0.01	0.47
Dedicace V40	289	6	1150	3656	4.0	0.52	0.24	1.13
Institution	241	1	805	2120	3.3	0.12	0.02	0.70
Valmer	173	3	1040	1410	6.0	0.29	0.10	0.84
Tige theos à cim	162	1	374	414	2.3	0.27	0.05	1.50
Corail (cem)	158	2	601	723	3.8	0.33	0.09	1.21
Harmony (cem)	155	0	529	636	3.4	0.00	0.00	0.72
Exception (cem)	120	3	619	792	5.2	0.48	0.16	1.41
Amis-K	110	0	389	481	3.5	0.00	0.00	0.98
Kerboull MKIII	110	2	1449	1571	13.2	0.14	0.04	0.50

* Observations are assumed censored in certain situations. See methodological notes below.

STEM uncemented	Total arthroplasties	Number revised	Observed component years (adjusted)*	For comparison: unadjusted component years	Average FU (years)	Rp100ocy	Exact 95% Confidence interval	
Corail collared	4983	37	24240	35212	4.9	0.15	0.11	0.21
Avenir	4163	68	23960	30157	5.8	0.28	0.22	0.36
Corail	3244	53	13908	18859	4.3	0.38	0.29	0.50
Exception	2482	47	15846	20555	6.4	0.30	0.22	0.39
Cerafit	2022	38	11713	16577	5.8	0.32	0.24	0.44
Targos	2008	12	14283	15572	7.1	0.08	0.05	0.15
Hype	1716	22	6537	8116	3.8	0.34	0.22	0.51
Optimys	1714	14	6347	8190	3.7	0.22	0.13	0.37
Targos mini	1679	12	10492	11286	6.2	0.11	0.07	0.20
Integrale	1358	20	6059	7314	4.5	0.33	0.21	0.51
Thelios HAP	1247	12	5902	11060	4.7	0.20	0.12	0.36
HNG	755	6	3523	4140	4.7	0.17	0.08	0.37
Accolade II	672	22	2143	2730	3.2	1.03	0.68	1.55
Meije Duo	659	5	2249	3298	3.4	0.22	0.10	0.52
Amistem-H	625	13	3346	4896	5.4	0.39	0.23	0.66
Silene	616	10	2469	3142	4.0	0.41	0.22	0.74
Hactiv HAC	615	7	2716	4430	4.4	0.26	0.12	0.53
Alloclassic	570	9	6150	6164	10.8	0.15	0.08	0.28
Linea	527	12	3068	6526	5.8	0.39	0.22	0.68
Twinsys	468	7	3042	3313	6.5	0.23	0.11	0.47
SPS evolution	445	6	1445	1628	3.2	0.42	0.19	0.90
Avenir complete	439	3	815	815	1.9	0.37	0.13	1.08
Valmer	358	7	1903	2736	5.3	0.37	0.18	0.76
Naos	341	1	542	2117	1.6	0.18	0.03	1.04
ABG II	**337**	**35**	**2252**	**3570**	**6.7**	**1.55**	**1.12**	**2.15**
Symbol	313	5	555	1926	1.8	0.90	0.39	2.09
Evok	297	3	647	817	2.2	0.46	0.16	1.35
Hype mini	266	2	641	708	2.4	0.31	0.09	1.13
Libra	252	0	1587	2294	6.3	0.00	0.00	0.24
Harmony	249	5	1048	1147	4.2	0.48	0.20	1.11
H-Max	235	0	880	1837	3.7	0.00	0.00	0.43
Esop	**228**	**11**	**828**	**1877**	**3.6**	**1.33**	**0.74**	**2.36**
Excia plasmapore	213	5	913	1678	4.3	0.55	0.23	1.28
F2H	200	2	199	199	1.0	1.00	0.28	3.58
Louxor	197	0	938	1535	4.8	0.00	0.00	0.41
Amistem-P	190	3	332	646	1.7	0.90	0.31	2.62
Cineos	188	2	292	935	1.6	0.68	0.19	2.46
SL-plus/SL-plus	187	4	1408	2075	7.5	0.28	0.11	0.73

Optimum	186	7	1352	1435	7.3	0.52	0.25	1.06
ACOR modular	175	3	513	1143	2.9	0.58	0.20	1.71
Aura	160	6	818	1580	5.1	0.73	0.34	1.59
Fitmore	153	0	327	1334	2.1	0.00	0.00	1.16
Quadra-H	151	0	338	351	2.2	0.00	0.00	1.12
OK baby	**148**	**5**	**292**	**761**	**2.0**	**1.71**	**0.73**	**3.95**
ACOR monobloc	142	1	261	595	1.8	0.38	0.07	2.14
Polarstem	130	1	347	1123	2.7	0.29	0.05	1.61
Rhino	125	2	654	696	5.2	0.31	0.08	1.11
Respect	121	1	530	1126	4.4	0.19	0.03	1.06

* Observations are assumed censored in certain situations. See methodological notes below.

Methodological notes

Register coverage/documentation rate: The SOFCOT THA register covers a relatively small fraction of all hip arthroplasties done in France each year. At present, its participants represent a gradually shrinking group of mostly very experienced orthopaedic surgeons in currently 37 hospitals (2023) that have made a commitment to entering all relevant primary and revision procedures.

Implant library: Implants are registered as individual components, e.g. femoral stems, acetabular cups/inserts etc., allowing for detailed analyses of relevant components or component combinations (e.g. a stem/cup combination). Since 2020, the SwissRDL implant library, which the SOFCOT registry contributes to, has only allowed entering (or scanning) implants that are already recognised by the data entry system. If an implant is unknown, it directs the user to a formal procedure for registering new implants. Prior to this new arrangement, entering new implants was a much more flexible business that led to an abundance of individual implant entries that were often inconsistent and incomplete. This made grouping and analysing implants a more difficult task and especially the implants registered in the earlier days of the register suffer from relatively low recognition rates, by which we mean that they could not be reliably assigned to named brands as analysed in SOFCOT report. However, building the SwissRDL implant library is an ongoing project and we keep adding manufacturers' catalogue information to the library and we write ever more refined "implant recognition scripts" to pick out previously unrecognised implants. Therefore, recognition rates could still improve even for older implants.

Estimation of revision rates: The first requirement for estimating revision rates is that revision procedures are actually captured by the register. Revisions undertaken by the same orthopaedic surgeon who did the primary implant should generally find their way into the SOFCOT register. We do not know, however, how likely it is in the case of the participating surgeons that a patient will undergo a revision procedure elsewhere. From the Swiss hip and knee register SIRIS we do know that on average 78% of revisions are undertaken in the same hospital that provided the primary operation. In the absence of national coverage of all hip arthroplasties, we can thus be certain that the revision rates reported in this report represent a certain underestimate of unknown extent. It should be noted that a general underestimation bias in revision rates does not necessarily invalidate relative comparisons between procedures and implants, as all observations are most likely affected to the same degree by this bias. However, cross-register comparisons should be made with great caution. Another factor affecting revision rates is patient mortality. If a patient dies, a revision of his or her implant cannot be observed anymore. If mortality data is not linked to a register, observed long-term revision rates of a cohort of patients will become increasingly underestimates of the true revision rate because the denominator (number of patients in cohort) will increasingly be made up of individuals that are not at risk of revision anymore. When using Kaplan-Meier estimates of cumulative revision risk this can result in misleading comparisons between patient groups with different age distributions, unless death or other reasons for loss-to-follow-up are entered as censoring events into the analysis (and even then, high mortality figures may require so-called competing risk analyses). We do not currently link mortality data to the SOFCOT register, but we do draw on the Swiss SIRIS data for comparison purposes. This allows us to make informed choices on whether to present or not to present certain group comparisons and for which time spans. It also allows us to make informed choices on assuming or "imputing" certain censoring events.

Imputed censoring events: As the population captured in the SOFCOT register is ageing it is reasonable to assume that a growing share of that population has in fact passed away by the time reports are produced. Based on known demographic data we know that it is of course relatively unlikely for patients to reach the age of 100. From known registry data we also know that it is exceedingly unlikely to still undergo revision surgery at the age of 100 or above (not unheard of, but rare). We therefore censor all observations at the end of the calendar year in which a registered patient reaches the age of 100 (except if still revised at a later point). We also censor all observations from a particular hospital one year after the last procedure of that hospital was registered. This is necessary because over the years, several hospitals have dropped out of the registry. Revisions therefore cannot be registered anymore, and it would be quite wrong to assume that the primary implants from such hospitals never get revised. By early 2024, approx. 57% percent of all previously captured primary implants were considered censored (= not anymore under observation) for either reason.

The steering group of the SOFCOT HA register would like to extend its sincere gratitude to all french orthopaedic surgeons who have collaborated or are still collaborating regularly to keep this register updated.

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