ANNUAL REPORT 2004

The Swedish National Hip Arthroplasty Register

242 393
PRIMARY THR
1979-2004

28 045
REOPERATIONS
1979-2004
(closed reduction excl.)

22 840
REVISIONS
1979-2004

2 000
ENVIRONMENTAL PROFILES
1979-2004

10 145
PATIENT OUTCOME
2002-2004

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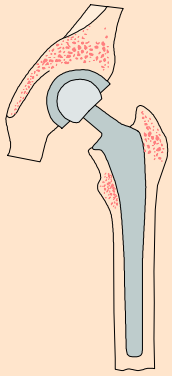
Alingsås
Arvika
Bollnäs
Borås
Carlanderska
Danderyd
Eksjö
Elisabeth-sjukhuset
Enköping
Eskilstuna
Falköping
Falun
Frölunda Specialist-sjukhus
Gothenburg Medical Center
Gällivare
Gävle
Halmstad
Helsingborg
Huddinge
Hudiksvall
Hässleholm-Kristianstad
Jönköping
Kalix
Kalmar
Karlshamn
Karlskoga
Karlskrona
Karlstad
Karolinska
Katrineholm
Kungälv
Köping
Landskrona
Lidköping
Lindesberg
Linköping
Ljungby
Lund
Lycksele
Malmö
Mora
Motala
Movement
Norrköping
Norrtälje
Nyköping
Ortopediska Huset
Oskarshamn
Piteå
S:t Göran
Sabbatsberg Närsjukhuset
Simrishamn
Skellefteå
Skene
Skövde
Sollefteå
Sophiahemmet
Stockholms Specialist-vård
SU/Mölndal
SU/Sahlgrenska
SU/Östra
Sunderby
Sundsvall
Södersjukhuset
Södertälje
Torsby
Trelleborg
Uddevalla
Umeå
Uppsala
Varberg
Visby
Värnamo
Västervik
Västerås
Växjö
Ystad
Ängelholm
Örebro
Örnsköldsvik
Östersund



Department of Orthopaedics
Sahlgrenska University Hospital
May 2005

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Foreword

Swedish health care is currently undergoing major reorganisation in endeavour to increase efficiency and reduce costs. Elective units are being created for high production of total hip replacement. There is an obvious risk that medical control of the activities and their quality will be greatly reduced. The National Hip Arthroplasty Register provides a unique opportunity to follow these developments and describe their effects on accessibility and quality. This year's report includes the first study of the effect of the free patient flow and continued evaluation of the possibility of cost-utility analyses for more detailed comparison of activities in different parts of the country. The purpose of the register is, as before, to ensure equal quality throughout Sweden and to identify risks of a poorer outcome for patients, the health service and society as a whole at an early stage.

All units in the country (81 hospitals altogether in 2004, 79 hospitals in 2005), both public and private, which perform primary total hip replacement (THR) participate in the register. The coverage is complete for primary THR but for reoperations (including revisions) there is a limited data loss. Records for 91 out of 101 reoperations reported via the Internet from Lund and 25 of 73 from Malmö are lacking. The total number of reoperations and revisions is therefore lower this year than in recent years. This will be corrected for in next year's report.

Receiving reports

All clinics except three report via the Internet today. More than 90% of primary replacements and reoperations are reported on-line, i.e. within 1-2 weeks. Copies of records from reoperations have been submitted with varying delay during the year. They are necessary for the analyses included in the report and for further studies.

Reporting

All publications, annual reports and scientific exhibitions are shown on our website (www.jru.orthop.gu.se). Confidential reporting to each clinic also takes place from this. Individual registration was introduced in 1992. Reoperations, including revisions, have been registered individually since the start in 1979. Starting with last year's annual report (2003), all results are presented according to the Kaplan-Meier survival method using the exact date of death (from the Register of Deaths). In the long-term results, since 1979, survival is calculated with the aid of statistical approximations. The definition of failure is, as previously, revision: replacement or removal of part of or the whole prosthesis. The revision burden **RB** (revisions /(primary THR + revisions)) is the key figure in national and international comparisons.

Demographic data for primary THR are presented as age, sex and diagnosis. The choice of implant and method of fixation and surgical technique are analysed in order to permit continuous discussion of suitable developments and trends. This information also forms the basis for the learning process which reported data generates at each unit. The individual health outcome is now documented for half of the country's hospitals and regions. All units are expected to be included within one year. The register's model for cost-utility analysis has attracted much interest in other medical disciplines and enables health-economic comparisons to be made with other specialities.

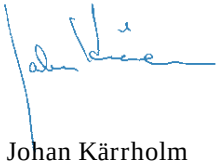
The open reporting for the individual units is summarised in two tables. The units have this year been classified as rural, county, regional (including university hospitals) and private hospitals in the tables. Comparisons should only be made within the respective groups as there are significant differences in the composition of the patient material with respect to age sex and diagnosis (the case-mix). The confidential information to the individual units includes detailed information about the causes of their own failures during the last five years and a case-mix profile, thereby providing a basis for local efforts to achieve improvement. Each unit's own results are compared with the national average. Patients' subjective health measures for each hospital will be officially reported within a year or two, when the registration coverage is a hundred per cent for the whole country.

The register's directors are Peter Herberts, Johan Kärrholm and Göran Garellick. The members of the management committee are appointed by the Swedish Orthopaedic Society and, apart from the directors, are currently Lars Linder, Arne Lundberg and Anders Wykman.

Many thanks to all contact secretaries and doctors for your input during the past year.

Göteborg, May 2005

Peter Herberts



Johan Kärrholm

Göran Garellick

Primary THR

The register shows primary total hip replacements performed in Sweden since 1979. Up until 1991, the number of primary operations and number and type of implants at each unit were reported. From 1992, individual-based information on the primary procedure has been used. The patient's personal identity number automatically shows his or her sex and age. The diagnosis is shown with the ICD-9 code and since 1997 with the ICD-10 code. The type of prosthesis is shown separately for cup and stem as well as the method of fixation and type of cement. The web application was introduced on January 1, 1999 and it uses article numbers to ensure correct identification of individual implant components and cements. The type of incision is also registered. 78 of the 81 hospitals (approximately 96%) report via the Internet and the majority report on-line within a week after the operation. Reporting is one hundred per cent.

During the period 1979-2004, 242 393 primary hip arthroplasties have been registered. The number of primary procedures has increased compared to 2003. 13 366 operations were performed in 2004. The 15 most common implant combinations during the last 10 years are presented in tabular form. In the acetabulum, 92% of the components have been cemented and 8% uncemented during this period. On the femoral side, 95% have been cemented and 5% uncemented. The first table shows the most common implant combinations and their market shares. This year the figures are based on use during the last 10 years, whereas they were previously based on the entire period since 1979. All 15 most frequently used implant systems during the last 10 years are fully cemented. Five implant systems dominate the cemented market: Lubinus SPII (32.9%), Charnley (15.2% - three combinations), Exeter (11.7% - two combinations), Spectron EF Primary (4.7%) and the combination Charnley Elite-cup and polished Exeter stem (3.9%). Among the stem components, Lubinus SPII dominates and continues to increase, to 6 667 cases in 2004. It is followed by the Exeter stem (3 291 cases) and the Spectron stem (1 040 cases). The most common cup components are Lubinus (5 456), Exeter Duration (1 470) and Charnley Elite (1 447). The figures show that the components are used in various combinations to make up the total prosthesis.

Among the 15 most common uncemented prosthesis systems, there is continuing concentration to those with well-documented function in the medium-term perspective. CLS Spotorno, with two cup variants, was used in 157 cases and the Trilogy cup + /- HA was used in 322 cases with six stem concepts. The group "Other implants" is large and has grown to 242 cases. Several new uncemented implant systems are currently being introduced onto the Swedish market, warranting continued thorough quality control. For the hybrid implants, the situation is unchanged.

The sex distribution for primary THR is unchanged, 60.6% women and 39.4% men. The age-specific procedure frequency per 100 000 inhabitants in the age interval 45-54 years has increased by 81% during the last nine years and that in the age interval 85+ has increased by 53% among men. There is a less pronounced increase among women of 37% and 13% respectively in these age intervals. These figures indicate a continued indication shift and that we operate upon ever younger patients, particularly among men, and older patients have greater access to this procedure than previously. Rural hospitals continue to increase their share, to 5 636 cases in 2004. County hospitals had 5 536 cases and regional hospitals (including university units) 1 534. Private hospitals have an unchanged, very limited production, 600-700 cases the last three years. The dramatic increase in the rural hospitals' THR operations reflects the politicians' ambition to concentrate prosthetic surgery to elective units. During the last 10 years this type of hospital has almost doubled its production.

The number of primary hip arthroplasties and revisions per year with the three fixation principles cemented, uncemented and hybrid is given on page 10. The number of cemented primary arthroplasties has been relatively constant the last four years but the number of uncemented prostheses has almost doubled during this period. Very good results for certain uncemented implant systems with up to 10 years' follow-up are available (see table showing survival per implant type).

RB in the figures stands for revision burden, which is a key figure in national and international comparisons. The total revision burden for the period 1992-2004 is 10.7%, 9.8% for cemented implants, 26.4% for uncemented implants and 11.8% for hybrids. A small reduction in the revision burden for uncemented implant systems can be noted, indicating that the procedure is steadily becoming safer. It is interesting to note that the revision burden has been higher for men than for women in the large cemented implant cohort but significantly higher for women in the younger cohort. The quality, measured as revision burden, is essentially constant in spite of an increased number of patients with hip implants in the population, indicating the continued high safety of the operation.

The diagnosis distribution has been surprisingly constant during recent years and primary osteoarthritis accounts for 75.7% during the whole study period. The number of primary hip fractures has not increased, which means that most cervical hip fractures are operated upon with hemiprostheses in Sweden. In the younger age-groups primary osteoarthritis accounts for only 53.5% and in this group 17.3% are operated upon owing to inflammatory joint diseases and 13.7% owing to sequelae to childhood disease. Younger patients, below 50 years, are increasingly treated with uncemented implant systems (26.2%), hybrid fixation (21.9%) or reversed hybrid (6.0%), an interesting trend which constitutes the basis for an ongoing special study of the outcome in younger patients after THR.

15 Most Common Implants

most used during the past 10 years

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share [1)]
Lubinus All-Poly (Lubinus SP II)	28,384	3,530	4,208	4,584	4,706	5,382	50,794	32.9%
Charnley (Charnley)	50,886	1,615	1,600	926	281	81	55,389	12.9%
Exeter Duration (Exeter Polished)	838	1,393	1,514	1,545	1,416	1,329	8,035	7.1%
Reflection All-Poly (Spectron EF Primary)	1,579	586	674	693	889	870	5,291	4.7%
Exeter All-Poly (Exeter Polished)	6,313	136	24	23	8	10	6,514	4.6%
Charnley Elite (Exeter Polished)	401	434	600	911	1,059	990	4,395	3.9%
FAL (Lubinus SP II)	21	211	347	810	832	706	2,927	2.6%
OPTICUP (Scan Hip II Collar)	793	389	383	279	125	10	1,979	1.7%
Charnley (Charnley Elite Plus)	1,236	160	105	14	2	0	1,517	1.3%
Contemporary Hooded Duration (Exeter Polished)	0	1	17	277	561	513	1,369	1.2%
Biomet Müller (RX90-S)	1,248	197	7	0	0	0	1,452	1.2%
Charnley (Exeter Polished)	527	28	103	159	281	432	1 530	1.1%
Charnley Elite (Charnley Elite Plus)	752	254	151	10	0	0	1,167	1.0%
Scan Hip (Scan Hip Collar)	6,485	12	0	0	0	0	6,497	1.0%
Cenator (Cenator)	1,084	134	0	0	0	0	1,218	0.9%
Others (total of 932)	79,540	2,261	2,485	2,467	2,523	3,043	92,319	
Total	180,087	11,341	12,218	12,698	12,683	13,366	242,393	

1) Refers to the proportion of the total number of primary THRs performed during the past 10 years.

15 Most Common Uncemented Implants

most used during the past 10 years

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share [1)]
CLS Spotorno (CLS Spotorno)	355	42	37	56	70	70	630	12.1%
Allofit (CLS Spotorno)	0	0	35	90	94	87	306	8.2%
Romanus HA (Bi-Metric HA uncem.)	195	26	18	4	1	5	249	6.6%
Trilogy HA (Versys)	2	9	16	41	80	75	223	6.0%
Trilogy (CLS Spotorno)	33	4	15	24	58	78	212	5.7%
ABG II HA (ABG uncem.)	25	35	31	53	19	14	177	4.7%
ABG HA (ABG uncem.)	303	0	0	0	0	0	303	4.6%
Trilogy HA (Bi-Metric HA uncem.)	4	9	18	31	61	28	151	4.0%
Trilogy (Cone uncem.)	38	15	18	15	15	35	136	3.6%
Trilogy HA (CLS Spotorno)	0	4	6	19	24	80	133	3.6%
ABG II HA (Meridian)	10	12	20	31	32	9	114	3.0%
Secur-Fit (Omnifit)	104	0	0	0	0	0	104	2.8%
Trilogy (SL plus uncem.)	20	7	10	15	17	26	95	2.5%
Romanus (Bi-Metric HA uncem.)	145	0	0	0	0	0	145	2.1%
SL Ti (CLS Spotorno)	16	8	15	5	13	9	66	1.8%
Others (total of 178)	4,620	101	77	42	95	242	5,177	
Total	5,870	272	316	426	579	758	8,221	

1) Refers to the proportion of the total number of primary THRs performed during the past 10 years.

15 Most Common Hybrid Implants

most used during the past 10 years

Uncemented cup (cemented stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share [1)]
Trilogy HA (Spectron EF Primary)	247	151	174	169	127	107	975	18.2%
Trilogy HA (Lubinus SP II)	203	116	139	131	144	114	847	15.8%
ABG HA (Lubinus SP II)	336	0	0	0	0	0	336	4.4%
ABG II HA (Lubinus SP II)	95	53	31	14	5	6	204	3.8%
BHR (BHR)	2	7	16	45	44	75	189	3.5%
Reflection HA (Lubinus SP II)	87	19	12	19	15	23	175	3.3%
Romanus (RX90-S)	175	7	0	0	0	0	182	3.0%
Romanus (Bi-Metric cem.)	557	0	0	0	0	0	557	2.6%
TOP Pressfit HA (Lubinus SP II)	0	8	25	32	24	31	120	2.2%
Duralock uncem. (Spectron EF Primary)	102	10	0	0	0	0	112	2.1%
Biomex HA (Lubinus SP II)	0	19	18	33	30	3	103	1.9%
Trilogy HA (Optima)	97	0	0	0	0	0	97	1.8%
Mallory-Head uncem. (Lubinus SP II)	77	4	4	6	2	2	95	1.8%
Durom (Durom)	0	0	0	23	25	33	81	1.5%
Allofit (MS30 Polished)	20	14	14	22	4	0	74	1.4%
Others (total of 212)	3,977	131	95	87	81	58	4,429	
Total	5,975	539	528	581	501	452	8,576	

1) Refers to the proportion of the total number of primary THRs performed during the past 10 years.

15 Most Common Cup Components

most used during the past 10 years

Cup	1979-1999	2000	2001	2002	2003	2004	Total	Share[1)]
Lubinus All-Poly	50,483	3,542	4,226	4,599	4,739	5,456	73,045	33.5%
Charnley	53,878	1,824	1,862	1,202	616	662	60,044	16.2%
Exeter Duration	909	1,442	1,592	1,628	1,533	1,470	8,574	7.5%
Charnley Elite	2,099	961	1,073	1,255	1,500	1,447	8,335	7.0%
Reflection All-Poly	3,078	606	703	718	913	887	6,905	5.1%
Exeter All-Poly	6,536	139	24	25	8	10	6,742	4.7%
OPTICUP	2,292	426	422	312	181	87	3,720	3.2%
FAL	21	212	348	819	843	728	2,971	2.6%
Biomet Müller	3,553	439	286	257	234	205	4,974	2.5%
Trilogy HA	767	293	387	439	487	467	2,840	2.5%
Cenator	2,071	373	195	3	3	6	2,651	2.1%
Scan Hip	8,424	41	13	2	0	0	8,480	1.5%
Contemporary Hooded Duration	0	1	17	277	565	560	1,420	1.2%
Müller All-Poly	4,901	102	116	72	70	89	5,350	1.1%
Weber All-Poly	45	139	120	150	260	361	1,075	0.9%
Others (total of 149)	41,030	801	834	940	731	931	45,267	
Total	180,087	11,341	12,218	12,698	12,683	13,366	242,393	

1) Refers to the proportion of the total number of primary THRs performed during the past 10 years.

15 Most Common Stem Components

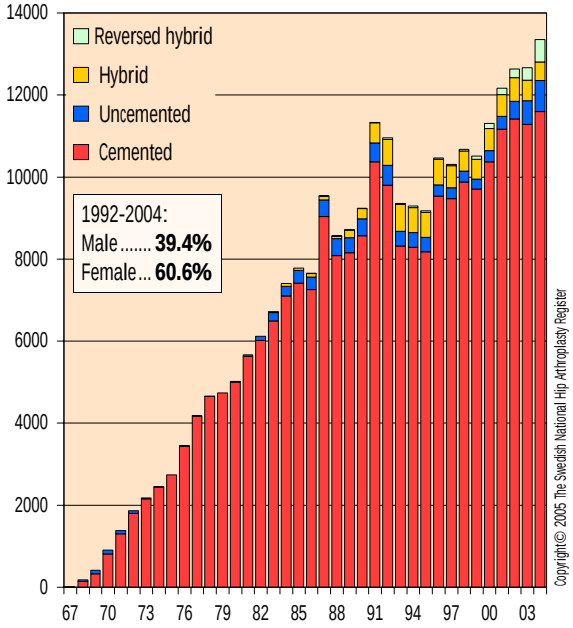
most used during the past 10 years

Stem	1979-1999	2000	2001	2002	2003	2004	Total	Share [1)]
Lubinus SP II	32,730	4,223	4,977	5,814	6,084	6,667	60,495	40.4%
Exeter Polished	18,248	2,242	2,515	2,970	3,361	3,291	32,627	19.2%
Charnley	51,996	1,622	1,606	927	281	81	56,513	13.2%
Spectron EF Primary	2,179	840	938	961	1,077	1,040	7,035	6.2%
Charnley Elite Plus	2,321	444	284	30	2	0	3,081	2.7%
Scan Hip II Collar	1,025	408	429	281	125	10	2,278	2.0%
RX90-S	1,485	207	7	2	0	1	1,702	1.4%
CLS Spotorno	536	86	151	219	310	450	1,752	1.3%
CPT (steel)	425	237	293	280	198	48	1,481	1.3%
Scan Hip Collar	6,676	13	0	0	0	0	6,689	1.1%
Optima	1,398	41	1	0	0	0	1,440	1.0%
Müller Straight	4,264	77	110	103	98	96	4,748	0.9%
Cenator	1,107	134	0	0	0	0	1,241	0.9%
Stanmore mod	107	165	285	300	91	80	1,028	0.9%
Bi-Metric HA uncem.	409	106	92	81	114	126	928	0.8%
Others (total of 160)	55,181	496	530	730	942	1,476	59,355	
Total	180,087	11,341	12,218	12,698	12,683	13,366	242,393	

1) Refers to the proportion of the total number of primary THRs performed during the past 10 years.

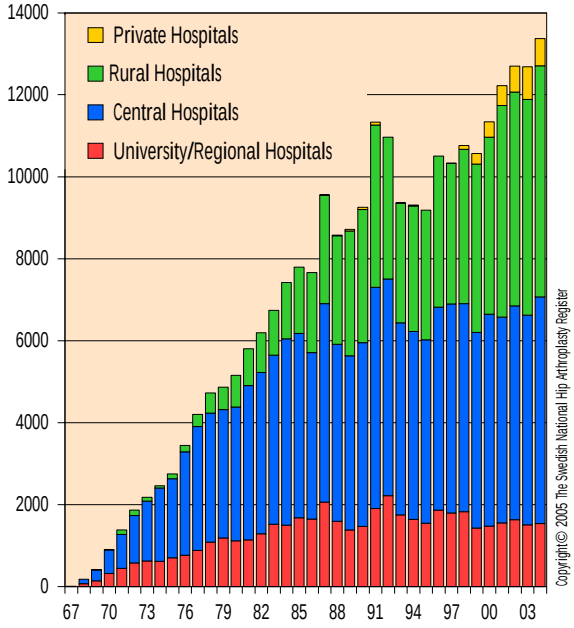
Number of Primary THR

per type of fixation, 1967-2004



Number of Primary THR

per type of hospital, 1967-2004



Number of Primary THR per Hospital and Year

Klinik	1979-1999	2000	2001	2002	2003	2004	Total	Share
Alingsås	892	98	119	114	98	147	1,468	0.7%
Arvika	786	40	20	21	43	117	1,027	0.5%
Bollnäs	813	99	106	110	215	275	1,618	0.7%
Borås	3,858	148	169	127	151	198	4,651	2.1%
Carlanderska	801	65	83	73	42	50	1,114	0.5%
Danderyd	4,389	391	330	328	290	268	5,996	2.7%
Eksjö	2,972	162	162	177	151	190	3,814	1.7%
Elisabethsjukhuset	21	44	35	30	71	121	322	0.1%
Enköping	594	103	105	134	163	149	1,248	0.6%
Eskilstuna	3,297	145	112	75	66	65	3,760	1.7%
Falköping	865	83	252	260	223	213	1,896	0.9%
Falun	3,814	206	207	180	273	301	4,981	2.2%
Frölunda Specialistsjukhus	0	0	0	1	34	61	96	0.0%
Gothenburg Medical Center	5	0	0	0	0	17	22	0.0%
Gällivare	1,518	92	111	86	103	94	2,004	0.9%
Gävle	3,780	233	195	218	194	149	4,769	2.1%
Halmstad	2,380	220	221	203	171	164	3,359	1.5%
Helsingborg	2,854	178	152	176	100	102	3,562	1.6%
Huddinge	3,799	171	147	202	183	222	4,724	2.1%
Hudiksvall	1,687	129	138	165	186	160	2,465	1.1%
Hässleholm-Kristianstad	3,789	306	333	482	580	710	6,200	2.8%
Jönköping	2,685	173	196	163	162	221	3,600	1.6%
Kalix	494	62	61	82	96	84	879	0.4%
Kalmar	2,777	189	161	189	203	225	3,744	1.7%
Karlshamn	910	94	132	122	210	174	1,642	0.7%
Karlskoga	1,466	121	127	136	156	111	2,117	0.9%
Karlskrona	1,983	90	42	50	40	44	2,249	1.0%
Karlstad	3,011	85	92	163	216	235	3,802	1.7%
Karolinska	2,461	177	342	293	281	273	3,827	1.7%
Katrineholm	738	123	132	207	203	226	1,629	0.7%
Kungälv	1,080	139	191	198	175	124	1,907	0.9%
Köping	886	187	228	190	190	210	1,891	0.8%
Landskrona	1,924	323	301	300	224	231	3,303	1.5%
Lidköping	1,087	101	152	111	102	118	1,671	0.7%
Lindesberg	1,119	106	83	132	138	161	1,739	0.8%

(continued on next page)

Number of Primary THR per Hospital and Year (cont.)

Hospital	1979-1999	2000	2001	2002	2003	2004	Total	Share
Linköping	4,220	152	134	250	207	108	5,071	2.3%
Ljungby	1,290	98	138	138	96	103	1,863	0.8%
Lund	3,646	97	106	75	103	99	4,126	1.9%
Lycksele	1,095	107	155	196	200	212	1,965	0.9%
Malmö	4,856	202	176	135	108	125	5,602	2.5%
Mora	1,712	133	169	133	138	144	2,429	1.1%
Motala	1,120	125	123	147	161	229	1,905	0.9%
Movement	0	0	0	0	8	6	14	0.0%
Norrköping	3,511	206	214	219	177	243	4,570	2.0%
Norrtälje	656	88	101	107	92	87	1,131	0.5%
Nyköping	1,696	86	127	125	121	124	2,279	1.0%
Ortopediska Huset	102	115	117	144	181	245	904	0.4%
Oskarshamn	1,002	85	113	112	114	137	1,563	0.7%
Piteå	488	62	72	98	92	137	949	0.4%
S:t Göran	5,762	505	549	463	443	507	8,229	3.7%
Sabbatsberg Närsjukhuset	233	207	238	336	364	135	1,513	0.7%
Simrishamn	661	0	29	153	186	214	1,243	0.6%
Skellefteå	1,403	115	147	160	148	119	2,092	0.9%
Skene	463	64	89	83	87	89	875	0.4%
Skövde	4,215	141	137	143	173	151	4,960	2.2%
Sollefteå	910	57	104	130	123	150	1,474	0.7%
Sophiahemmet	3,213	249	245	175	163	257	4,302	1.9%
Stockholms Specialistvård	0	6	70	99	130	136	441	0.2%
SU/Mölndal	1,848	160	149	123	118	88	2,486	1.1%
SU/Sahlgrenska	3,596	177	192	201	225	202	4,593	2.1%
SU/Östra	3,367	151	129	173	115	100	4,035	1.8%
Sunderby	3,820	95	151	127	117	151	4,461	2.0%
Sundsvall	4,086	151	200	198	181	161	4,977	2.2%
Södersjukhuset	4,823	310	237	257	222	219	6,068	2.7%
Södertälje	243	119	135	125	145	122	889	0.4%
Torsby	778	100	132	74	58	71	1,213	0.5%
Trelleborg	1,749	157	193	165	196	167	2,627	1.2%
Uddevalla	3,054	301	202	289	292	256	4,394	2.0%
Umeå	3,586	97	72	44	58	77	3,934	1.8%
Uppsala	4,006	254	258	259	230	328	5,335	2.4%

(continued on next page)

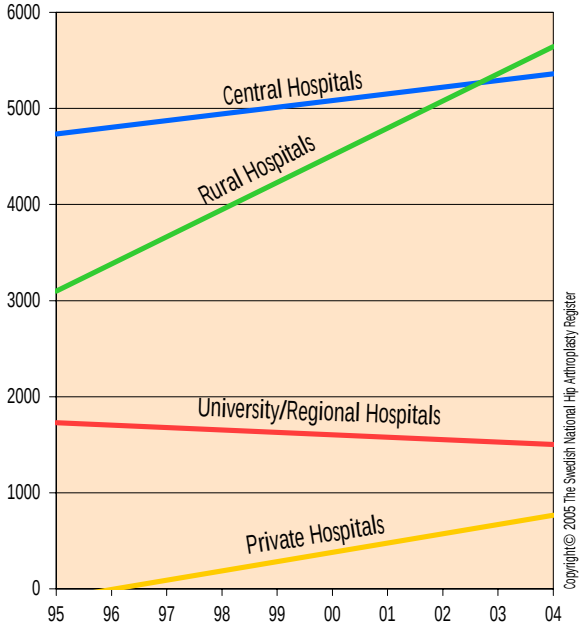
Number of Primary THR per Hospital and Year (cont.)

Hospital	1979-1999	2000	2001	2002	2003	2004	Total	Share
Varberg	2,539	174	219	219	168	191	3,510	1.6%
Visby	1,440	81	85	83	71	61	1,821	0.8%
Värnamo	1,524	115	98	92	101	127	2,057	0.9%
Västervik	1,770	118	92	114	114	121	2,329	1.0%
Västerås	2,493	105	121	122	88	121	3,050	1.4%
Växjö	2,431	93	106	106	67	129	2,932	1.3%
Ystad	1,813	130	121	108	98	110	2,380	1.1%
Ängelholm	2,004	149	184	186	151	105	2,779	1.2%
Örebro	3,687	141	134	190	195	179	4,526	2.0%
Örnsköldsvik	1,545	86	90	127	101	155	2,104	0.9%
Östersund	2,874	130	113	128	181	158	3,584	1.6%
Others [1)]	13,222	164	215	69	43	0	13,713	5.7%
Total	180,087	11,341	12,218	12,698	12,683	13,366	242,393	100%

1) Includes clinics that are no longer active or that does not perform primary THR anymore.

Trends in Primary THR

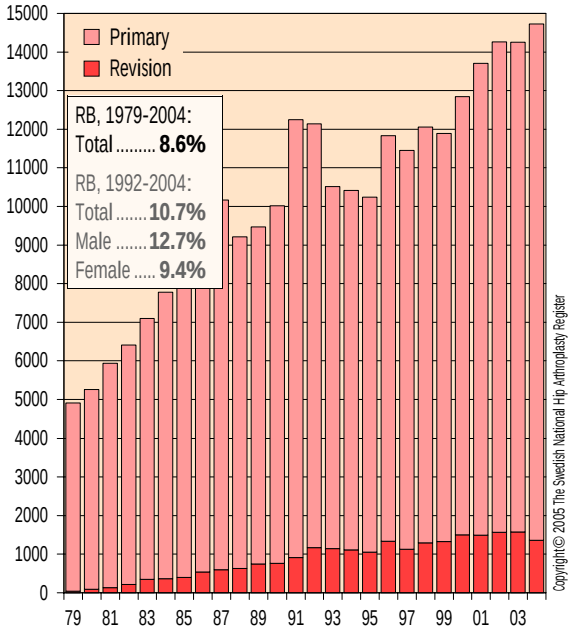
during the last 10 years uppdelat per type of clinic



Year				
1995	1,545	4,476	3,162	0
1996	1,862	4,962	3,679	1
1997	1,795	5,104	3,429	2
1998	1,823	5,083	3,762	96
1999	1,428	4,775	4,108	257
2000	1,478	5,168	4,320	375
2001	1,556	5,025	5,158	479
2002	1,632	5,223	5,208	635
2003	1,510	5,117	5,259	797
2004	1,534	5,536	5,636	660

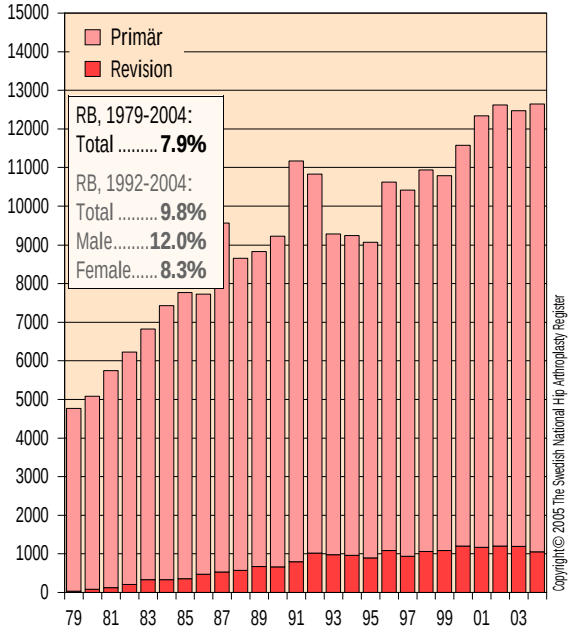
Number of THR per Year

242,393 primary THR, 22,840 revisions, 1979-2004



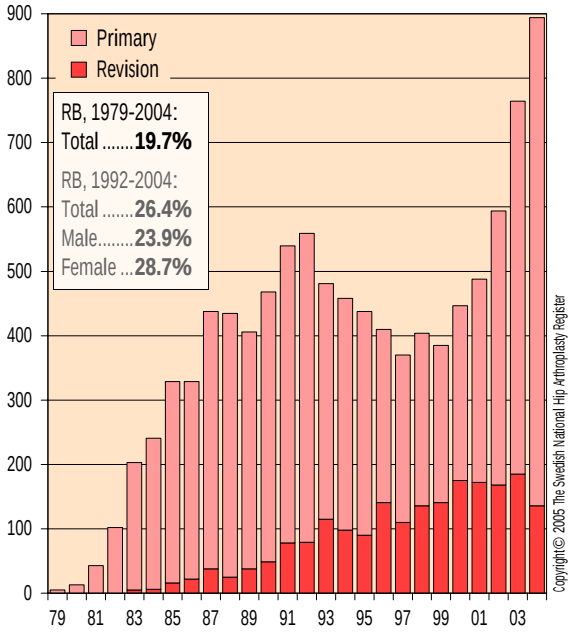
THA with Cemented Implants

222,884 primär THR, 18,996 revisioner, 1979-2004



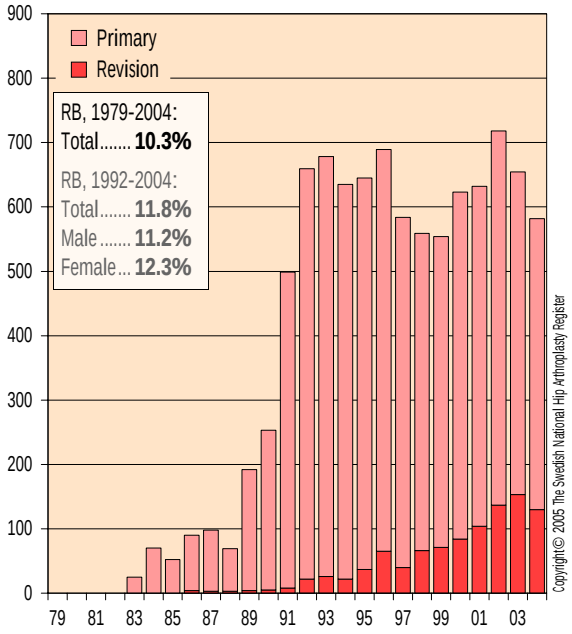
THR with Uncemented Implants

8,221 primary THR, 2,023 revisions, 1979-2004



THR with Hybrid Implants

8,576 primary THR, 984 revisions, 1979-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	57,846	8,787	9,564	10,189	10,116	10,777	107,279	75.7%
Fracture	9,142	1,490	1,522	1,432	1,470	1,468	16,524	11.7%
Inflammatory arthritis	4,483	399	426	374	376	353	6,411	4.5%
Idiopathic femoral head necrosis	2,352	359	362	331	343	343	4,090	2.9%
Childhood disease	1,030	225	255	289	272	319	2,390	1.7%
Secondary osteoarthritis	1,296	1	0	1	3	2	1,303	0.9%
Tumor	289	71	72	69	66	76	643	0.5%
Secondary arthritis after trauma	262	9	17	13	37	28	366	0.3%
(missing)	2,697	0	0	0	0	0	2,697	1.9%
Total	79,397	11,341	12,218	12,698	12,683	13,366	141,703	100%

Number of Primary THR per Diagnosis and Age

1992-2004

Diagnosis	< 50 years		50-59 years		60-75 years		> 75 years		Total	Share
Primary osteoarthritis	3,569	53.5%	14,847	79.5%	58,086	81.6%	30,777	68.1%	107,279	75.7%
Fracture	235	3.5%	794	4.3%	5,835	8.2%	9,660	21.4%	16,524	11.7%
Inflammatory arthritis	1,154	17.3%	1,229	6.6%	3,013	4.2%	1,015	2.2%	6,411	4.5%
Idiopathic femoral head necrosis	422	6.3%	505	2.7%	1,453	2.0%	1,710	3.8%	4,090	2.9%
Childhood disease	916	13.7%	743	4.0%	599	0.8%	132	0.3%	2,390	1.7%
Secondary arthritis	99	1.5%	112	0.6%	472	0.7%	620	1.4%	1,303	0.9%
Tumor	76	1.1%	151	0.8%	277	0.4%	139	0.3%	643	0.5%
Secondary arthritis after trauma	54	0.8%	52	0.3%	128	0.2%	132	0.3%	366	0.3%
(missing)	151	2.3%	242	1.3%	1,319	1.9%	985	2.2%	2,697	1.9%
Total	6,676	100%	18,675	100%	71,182	100%	45,170	100%	141,703	100%

Number of Primary Uncemented Implants per Diagnosis and Age

1992-2004

Diagnosis	< 50 years		50-59 years		60-75 years		> 75 years		Total	Share
Primary osteoarthritis	981	56.1%	1,882	84.2%	772	89.0%	16	61.5%	3,651	74.9%
Childhood disease	314	18.0%	152	6.8%	30	3.5%	3	11.5%	499	10.2%
Inflammatory arthritis	203	11.6%	54	2.4%	17	2.0%	1	3.8%	275	5.6%
Idiopathic femoral head necrosis	107	6.1%	62	2.8%	13	1.5%	1	3.8%	183	3.8%
Fracture	41	2.3%	33	1.5%	14	1.6%	4	15.4%	92	1.9%
Secondary arthritis	32	1.8%	7	0.3%	4	0.5%	1	3.8%	44	0.9%
Secondary arthritis after trauma	18	1.0%	3	0.1%	0	0.0%	0	0.0%	21	0.4%
Tumor	1	0.1%	4	0.2%	0	0.0%	0	0.0%	5	0.1%
(missing)	51	2.9%	39	1.7%	17	2.0%	0	0.0%	107	2.2%
Total	1,748	100%	2,236	100%	867	100%	26	100%	4,877	100%

Number of Primary THR per Type of Fixation and Age

1992-2004

Diagnosis	< 50 years		50-59 years		60-75 years		> 75 years		Total	Share
Cemented	3,021	45.3%	12,641	67.7%	67,326	94.6%	44,594	98.7%	127,582	90.0%
Hybrid	1,464	21.9%	2,987	16.0%	2,420	3.4%	295	0.7%	7,166	5.1%
Uncemented	1,748	26.2%	2,236	12.0%	867	1.2%	26	0.1%	4,877	3.4%
Reversed Hybrid	400	6.0%	750	4.0%	429	0.6%	51	0.1%	1,630	1.2%
(missing)	43	0.6%	61	0.3%	140	0.2%	204	0.5%	448	0.3%
Total	6,676	100%	18,675	100%	71,182	100%	45,170	100%	141,703	100%

Number of Primary THR per Type of Fixation and Year — Younger Than 60 Years

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Cemented	8,311	1,387	1,540	1,526	1,462	1,436	15,662	61.8%
Hybrid	2,815	356	318	386	304	272	4,451	17.6%
Uncemented	2,154	221	264	340	459	546	3,984	15.7%
Reversed hybrid	224	96	119	149	197	365	1,150	4.5%
(missing)	66	4	10	19	3	2	104	0.4%
Total	13,570	2,064	2,251	2,420	2,425	2,621	25,351	100%

Number of Primary THR per Type of Fixation and Year — 60 Years or Older

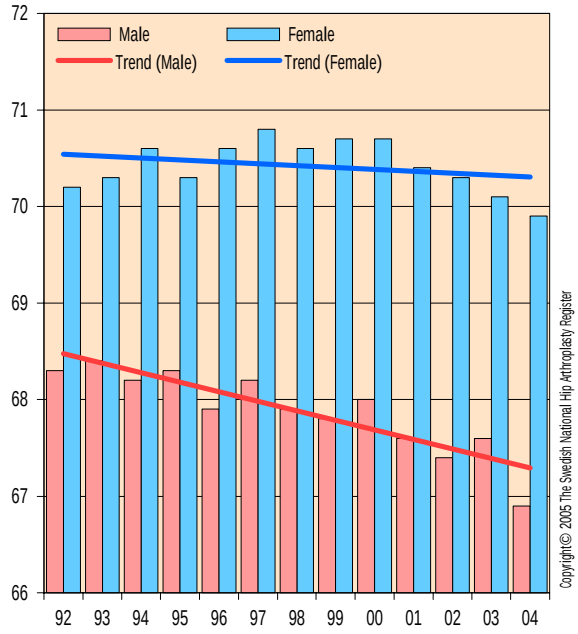
Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Cemented	63,437	8,988	9,624	9,891	9,819	10,161	111,920	96.2%
Hybrid	1,750	183	210	195	197	180	2,715	2.3%
Uncemented	372	51	52	86	120	212	893	0.8%
Reversed hybrid	73	22	39	58	111	177	480	0.4%
(missing)	195	33	42	48	11	15	344	0.3%
Total	65,827	9,277	9,967	10,278	10,258	10,745	116,352	100%

Number of Primary THR per Brand of Cement and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Palacos with Gentamycin	54,604	9,883	10,977	8,773	6,388	6,013	96,638	68.2%
Refobacin-Palacos R	0	0	94	2,562	4,795	5,499	12,950	9.1%
Palacos	7,889	136	7	5	2	8	8,047	5.7%
CMW with Gentamycin	459	256	35	13	6	7	776	0.5%
Copal	0	2	6	5	9	7	29	0.0%
SulCem 1 with Gentamycin	1	5	3	1	9	4	23	0.0%
Others	4,681	41	17	3	0	5	4,747	3.3%
(completely or partly cementless)	8,773	1,001	1,044	1,289	1,467	1,820	15,394	10.9%
(missing)	2,990	17	35	47	7	3	3,099	2.2%
Total	79,397	11,341	12,218	12,698	12,683	13,366	141,703	100%

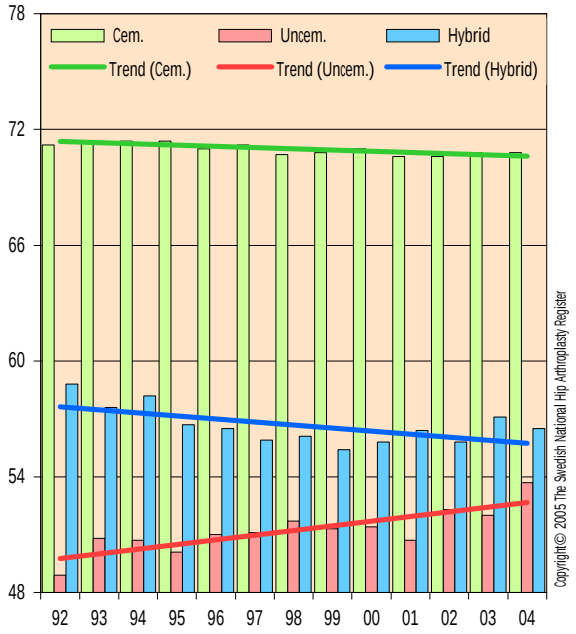
Average Age per Gender

141,702 primary THR, 1992-2004



Average Age per Type of Fixation

141,255 primary THR, 1992-2004



Average Age per Diagnosis and Gender

1992-2004

Diagnosis	Male	Female	Total
Fracture	73.7	76.7	76.0
Secondary osteoarthritis	67.6	73.1	71.5
Idiopathic femoral head necrosis	62.1	72.8	69.5
Primary osteoarthritis	68.0	70.0	69.1
Secondary osteoarthritis after trauma	64.4	69.8	67.2
Tumor	68.1	61.6	64.5
Inflammatory arthritis	60.4	62.6	62.0
Childhood disease	55.1	52.8	53.5
Total	67.8	70.4	69.4

Average Age per Type of Hospital and Gender

1992-2004

Type of Hospital	Male	Female	Total
Rural Hospitals	68.5	70.8	69.9
Central Hospitals	67.9	70.7	69.6
University/Regional Hospitals	65.6	69.0	67.8
Private Hospitals	67.0	68.1	67.7
Total	67.8	70.4	69.4

Follow-up model for patient-related outcome

THR follow-up after 3 years

Standardised follow-up of all patients subjected to primary THR started as a pilot project just over three years ago in the western region. (See Annual Report 2002 an 2003).

Summary of the logistics and method

All patients complete a preoperative questionnaire with 10 questions (Charnley category, pain VAS and EQ-5D). The same questionnaire with an additional question about satisfaction (VAS) is sent to the patient after 1 year. The same procedure is repeated after 6 and 10 years, when x-rays are also taken. A short questionnaire with 6 questions has been created for the radiological examination (see Annual Report 2002 and 2003).

Overall objective

- To include patient-related outcome in the register.
- To increase the sensitivity of the register analysis.
- To identify clinically "silent" radiological changes in order to be able to intervene surgically in the event of threatening loosening and/or development of osteolysis.
- To create a methodologically adequate health-economic instrument for cost-effectiveness analysis and resource allocation.
- To reduce the number of routine controls after THR.

Participating hospitals

Forty hospitals are participating in the standardised follow-up at present. Another ten hospitals will join within the near future. The aim is to have the system used throughout Sweden in 2006.

Results

Prospective ongoing standardised follow-up

As at May 5, 2005, the prospective preoperative database (40 hospitals) contained 8 330 patients. The 1-year follow-up contained 5 140 patients. The prospective function is reported online on the website. Each hospital can log in with a password and obtain its results in real time and compare them with the rest of the country. At present, mean values for all patients are reported. As different categories of hospitals have rather different case mixes, however, we are considering presenting the results in two groups, Charnley category A+B and Charnley category C, corresponding to patients with multiple joint disease or some form of comorbidity.

In the following tables, the mean values for VAS pain (0-100, no pain - unbearable) and VAS satisfaction (0-100, satisfied – dissatisfied) are presented. EQ-5D index is a weighted total value for health with a lowest value of -0.594 and highest value of 1.0.

The results show, as previously, that most patients are satisfied with the results and have good pain relief and that their quality of life and health have improved considerably one year after THR. Above all the health gain is dependent on any comorbidity (category C). If the mean values are reported, this should be related to the hospital's demography, i.e. case mix.

10-year study in the northern region

In 1993 1 186 primary THRs were performed at 11 hospitals in the northern region. 68 of them were revised up until the end of 2003 and 398 had died. 220 patients were randomly selected (20 per unit, 30% of the surviving non-

Preoperatively	All patients n = 8,330	Charnley category A+B n = 4,753	Charnley category C n = 3,577
VAS – pain	62	60	64
EQ-5D index	0.38	0.42	0.33

follow-up 1 year	All patients n = 5,140 (value won)	Charnley category A+B n = 2,701 (value won)	Charnley category C n = 2,439 (value won)
VAS – satisfaction	18	13	24
VAS – pain	15 (47)	10 (50)	20 (44)
EQ-5D index	0.75 (0.37)	0.86 (0.44)	0.62 (0.29)

follow-up 10 years	All patients n = 201	Charnley category A+B n = 83	Charnley category C n = 118
VAS – satisfaction	18	11	27
VAS – pain	20	11	23
EQ-5D index	0.72	0.88	0.58

revised group) for a 10-year radiological follow-up examination and completion of the clinical questionnaire. 201 (91%) responded to the questionnaire. 19 patients did not respond or were too ill or demented to respond. 202 (92%) were x-rayed. In the group followed up, 54% were women. The mean age was 77 years (range 47-91) and 59% classed themselves as category C patients.

10 years after primary hip replacement, the patient-related outcome in the studied group was equal to that found in the 1-year results in the prospective standardised follow-up.

A population study in which 16 000 individuals completed the EQ-5D questionnaire was also performed in the northern region in 2003. Also in this part of Sweden, the THR patients rated their quality of life the same as a local age-matched population (1 315 individuals, EQ-5D 0.72 and 0.74, respectively).

The radiological examination performed by two experienced prosthetic surgeons showed a surprising result. 31% (63/202) of the x-rayed hips showed distinct previously unknown changes. 50 of these had one finding and 13 two findings.

Radiological changes. Outcome after 10 years:

Radiographic results, n = 202	Share (%)
Cup losening	11
Pelvic osteolysis	3
Slitage	15
Stem loosening	2
Femur osteolys	7
Inga förändringar	69

The number of patients listed for revision surgery is not yet known as the clinical follow-up is still in progress.

Patients with radiological findings (63) are being analysed as a subcohort as regards the clinical questionnaire outcome:

All patients	10 years, n = 63
VAS – pain	19
VAS – satisfaction	17
EQ-5D index	0,77

This group of patients thus have practically as good outcome as the whole group, confirming that most of the radiological findings are clinically silent. The observations at 10 years are in agreement with the corresponding analysis performed at 6 years in the western region (see Annual Report 2003).

Collaborative project with the western region

The registrars for the National Total Hip Arthroplasty Register and the Department of Strategic Development of the western region (WR) decided in the autumn of 2003 to collaborate in order to develop a pilot model for regional follow-up. The heads of all 11 Departments of Orthopaedics were consulted and approved the project. The project has been carried out by merging the following databases on an encrypted individual and hospital level:

- The national register's primary database (WR part)
- The national register's reoperation database (WR part)
- The standardised follow-up database – patient-related outcome (WR part)
- VEGA (WR's case database)
- CPP (cost per patient) databases

The analysis is performed per year for the years 2002 – 2004 in order to detect any changes over time. Merging of the two units' databases has for the fist time in practical medical care fulfilled all four dimensions in the so-called "Clinical Value Compass" for a well-defined diagnostic group. It has also created a basis for cost-utility analysis, i. e. QALY analysis. We hope it will lead to more detailed follow-up of hip arthroplasty and clinical improvement both at the regional and hospital level and that the health-economic analysis will contribute to future prioritising.

The Clinical Value Compass (see Figure 1) is a way to describe the value of the treatment for a specific group of patients in four dimensions – clinical status, functional health status, satisfaction in relation to need and cost. The "Värdekompassen" is the modified and tested Swedish version of the one created by Professors Paul Batalden and Eugene Nelson at Dartmouth Medical School, New Hampshire, USA. The compass is a figure (see Figure 1) with four dimensions in the four cardinal points of the compass. All four are equally important. The idea is that there are results in all four directions that need to be investigated, described and improved over time for the patients.

The project, under the working title "Att börja på ny kula" ("Starting afresh"), is a completely new way to use register results for the owner structure in medical care. The results provide an adequate instrument for initial prioritising at both the national and local level. The project is reported separately and will be sent to all heads of department and contact doctors.

The main aim of the report is to encourage people responsible for registers in other fields of medicine to follow what we think is a good example, i.e. to strive to get the model incorporated in the respective quality register's fol-

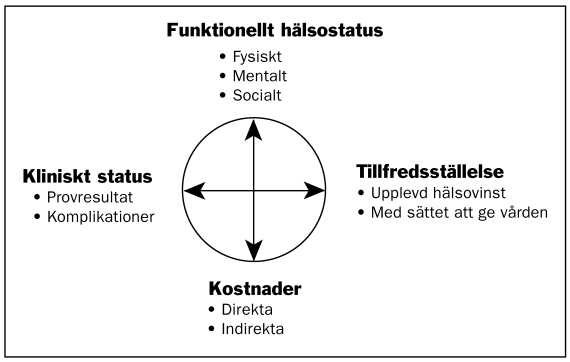


Figure1. "Värdekompassen" Source: Swedish municipalities and county councils. The project yields all the above variables except indirect costs.

low-up routines, after adapting it for the disease concerned. Each register must of course use well-validated disease-specific quality indicators but should add the same generic instrument, EQ-5D, in its follow-up. This should create an instrument for comparison of the utility and cost-effectiveness of different medical interventions. It has been decided to implement the follow-up model for hip arthroplasty in the four counties in northern Sweden as from the autumn of 2005.

Detailed analysis of the patient-related outcome

The rapidly growing patient-rated outcome database has made new types of analyses in the register possible. A multivariant analysis comprising 4 500 patients followed up after one year has been carried out in a collaborative project with the Department of Orthopaedics at Malmö General Hospital and the National Competency Centre for Orthopaedics. The aim of the study is to find the variable or variables in the clinical instrument (10 questions preoperatively) that have the greatest predictive power for the 1-year results of the prospective follow-up. Previous studies have shown that the Charnley classification strongly influences the results, measured both with disease-specific and generic (health-related quality of life) instruments. The analysis shows that the fifth dimension in the EQ-5D, the question on mental anxiety, has an even more pronounced predictive value. Patients who have reported strong anxiety preoperatively have a markedly and statistically significantly poorer outcome one year after surgery.

Since there is a need for more detailed studies, further investigations with a more sensitive psychometric instrument are planned.

Development

Continued implementation

The overall objective is to have the standardised follow-up routine used throughout Sweden. The ongoing structural changes in orthopaedics and the treatment guarantee that is shortly to be introduced will probably mean continued development towards more large elective units for implant surgery. It is important that these units with greatly increased production join and monitor the quality of their activities. Please see the chapter on free choice of care – page 52.

The radiological instrument

Having completed the inter- and intra-observer analysis (see Annual Report 2003) and analysed the results of the 6- and 10-year studies in the western and northern regions, we will proceed with the proposed radiological evaluation: routine x-ray examination should be performed 6 and 10 years after primary surgery.

Revisions

Revision surgery will in future also be included in the follow-up routine. This requires further system development of the web application and review of the follow-up logistics. This work is expected to take approximately one year. Participating hospitals will be notified in good time. Inclusion of the revisions in measurement of the EQ-5D index is necessary for further development of a transparent health-economic model.

Open presentation of patient-related results

When the routine is implemented nationally, we will officially present hospital-specific results for patient-related outcome. It is important that each hospital's case mix also be stated in this context.

Health economics – presentation of QALY calculations

Development of the health-economic model is in progress in collaboration with a health economist and the western region. It will take 1-2 years before a hospital-specific calculation can be obtained via the register's website. The aim is that each hospital will be able to check its cost effectiveness online by health-economic modelling and system development. This instrument will facilitate decision-making and prioritising by heads of departments and clients.

Internet response

A cohort of approximately 9 000 patients who have undergone primary THR before the age of 55 years will be included in a methodological project in which the patients will be urged to complete the follow-up questionnaire via the website. The function will resemble that used by Internet banks, i.e. with a temporary password coupled to the patient's personal identity number. System development of this project will be started within the near future.

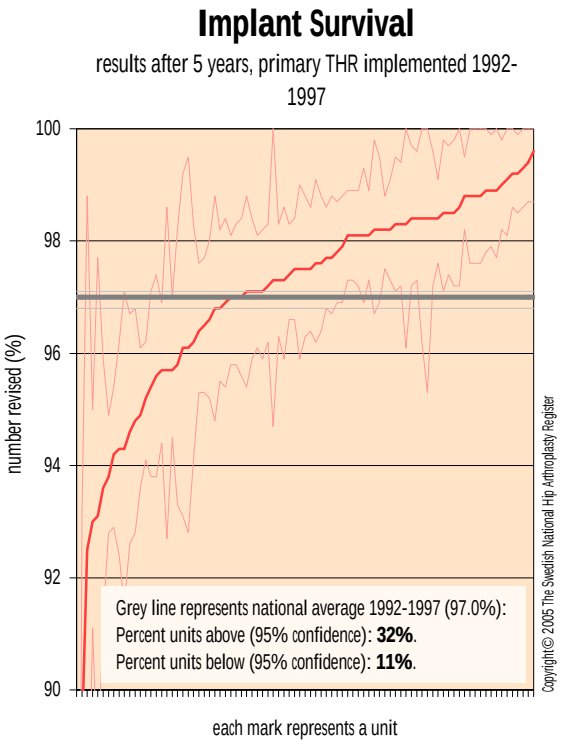
Implant survival as a quality indicator

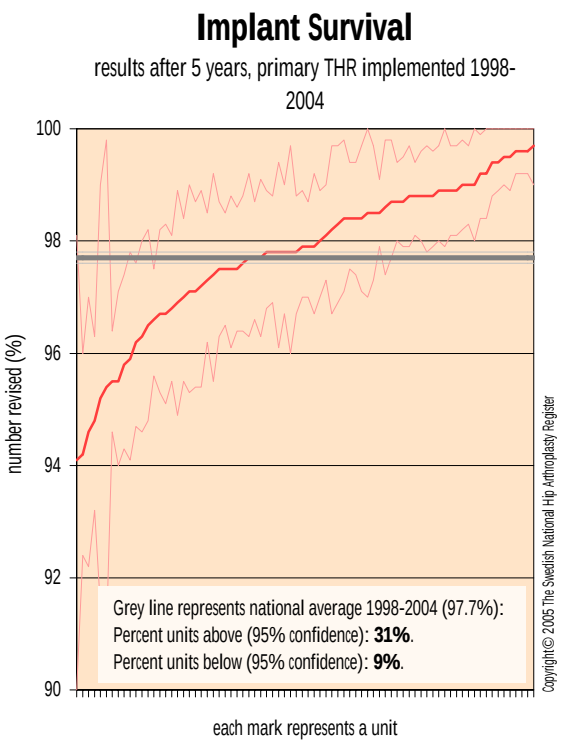
Implant survival for the individual units during the last two 5-year periods is illustrated in this year's report (all implants, diagnoses and reasons for revision). Note that all units in the two periods are included and that the results are now based on 5 years' follow-up. Only units which have reported a statistically evaluable 5-year result (more than 50 patients with risk for revision after 5 years) are included. The y axis shows the units' results and 95% confidence interval. For each period, the national average and 95% confidence interval is indicated (as a broad line).

The aim of this analysis is to illustrate changes over time in the country, based on the individual units' results. The analysis does not take differences in case-mix into consideration. The results are based on Kaplan-Meier survival statistics.

In last year's report (2003), it was reported that the national average for 10-year survival had improved from 89.4% (+/- 0.15) to 92.5% (+/- 0.15) between the observation periods 1979-1991 and 1992-2003. Between 1979 and 1991, 27% of the hospitals did not differ from the national average, 19% were below it and 44% above it. During the period 1992-2003, the percentage of hospitals that produced results corresponding to the national average rose from 27% to 53%.

In the whole country, there has been an improvement of the results during the last two 5-year periods. The national average for 5-year survival improved from 97.0% to 97.7%. The number of hospitals outside the national average is also decreasing. 57% of the units were within the standard deviation during the period 1992-1997. During the following period, 1998-2004, the corresponding figure was 60%. This positive trend probably reflects the use of improved implants in combination with improvements in the cementing and surgical technique. The results should above all be seen at the national level, comparisons between individual units being less relevant until it is possible to compensate for differences in case-mix by means of regression analysis.





Reoperation

The term reoperation includes all types of surgical procedures after the primary operation. These procedures have been registered since the start in 1979. In the middle of 2000 we ceased registration of closed reduction of implant dislocation as the number of missed cases was judged to be too large for meaningful registration. This means that as from last year's annual report, the number of reoperations has decreased by between 12 000 and 13 000 and this must be borne in mind when making comparisons with previous reports.

As previously, we have analysed three categories of reoperations: revision with exchange or extraction of implant components, major surgical intervention and minor surgical intervention without extraction of implant components. Unfortunately, copies of case records from above all 116 reoperations in Lund and Malmö are lacking, which must be borne in mind when interpreting this year's data. The deficient reporting explains why the number of reoperations has decreased this year.

Provided that the distribution of reasons for reoperation is representative, a slight change in the panorama of reasons for reoperation can be discerned. Aseptic loosening is still the dominating reason but its relative frequency has decreased by almost 7% since last year. Instead, the relative frequency of reoperation due to dislocation has increased. It should be emphasised, however, that the number of revisions due to this problem, relative to the total number of primary THR, rather shows the opposite trend (see separate report). The increase in number of reoperations due to technical reasons is only 1% but nevertheless means that the number of procedures has almost doubled. This procedure, together with early revision owing to dislocation, can probably be seen as an important quality indicator. The increase probably reflects the increasing complexity of the implant systems used and/or poorer surgical quality. Continued registration during the coming years is important in order to judge whether this trend is temporary.

Number of Reoperations per Procedure and Year

primary THR 1979-2004

Procedure at reoperation	1979-1999	2000	2001	2002	2003	2004	Total	Share
Exchange of cup and/or stem or extraction	16,109	1,573	1,566	1,647	1,676	1,445	24,016	85.6%
Major surgical intervention	2,100	140	156	164	141	139	2,840	10.1%
Minor surgical intervention	699	56	88	91	100	139	1,173	4.2%
(missing)	6	3	1	2	1	3	16	0.1%
Total	18,914	1,772	1,811	1,904	1,918	1,726	28,045	100%

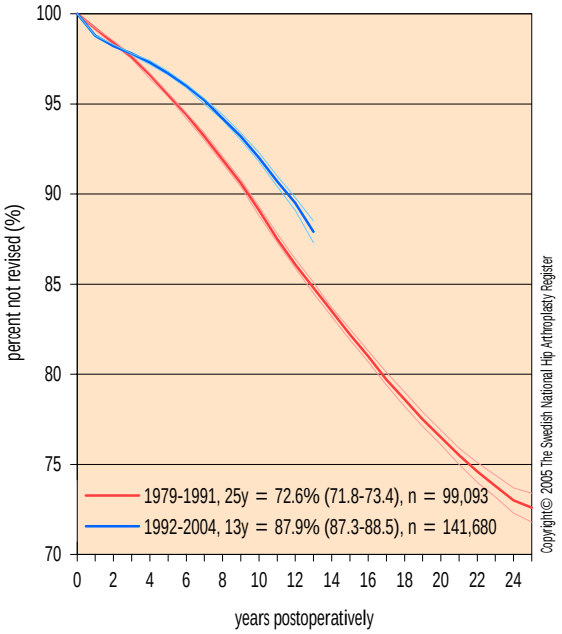
Number of Reoperations per Reason and Year

primary THR 1979-2004

Reason for reoperation	1979-1999	2000	2001	2002	2003	2004	Total	Share
Aseptic loosening	11,499	1,074	1,089	1,135	1,085	848	16,730	59.7%
Dislocation	1,861	234	232	238	253	291	3,109	11.1%
Deep infection	1,587	121	122	173	216	216	2,435	8.7%
Periprosthetic fracture	1,140	179	163	159	156	147	1,944	6.9%
2-stage procedure	751	68	76	83	104	90	1,172	4.2%
Miscellaneous	771	39	77	62	35	43	1,027	3.7%
Technical error	766	22	16	26	26	45	901	3.2%
Implant fracture	259	27	30	19	34	30	399	1.4%
Pain only	247	6	6	8	8	15	290	1.0%
Secondary infection	0	0	0	0	0	1	1	0.0%
(missing)	33	2	0	1	1	0	37	0.1%
Total	18,914	1,772	1,811	1,904	1,918	1,726	28,045	100%

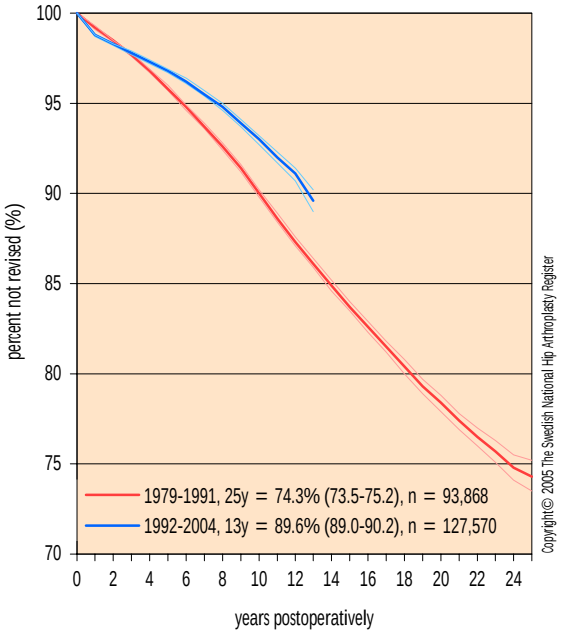
All Implants

all diagnoser and all reasons



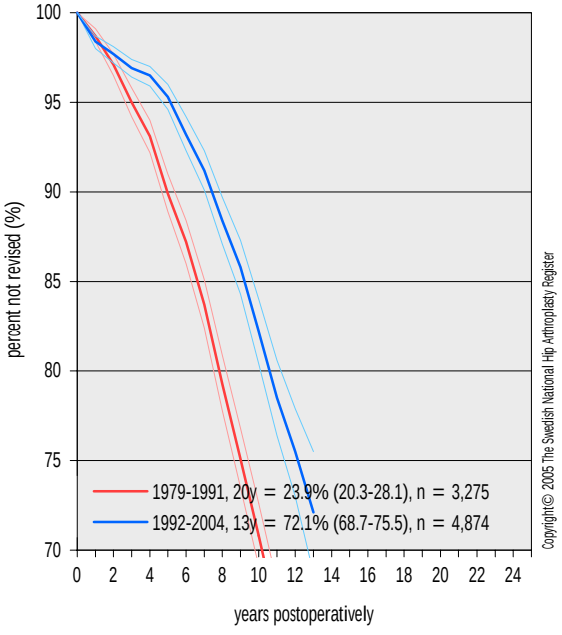
All Cemented Implants

all diagnoses and all reasons



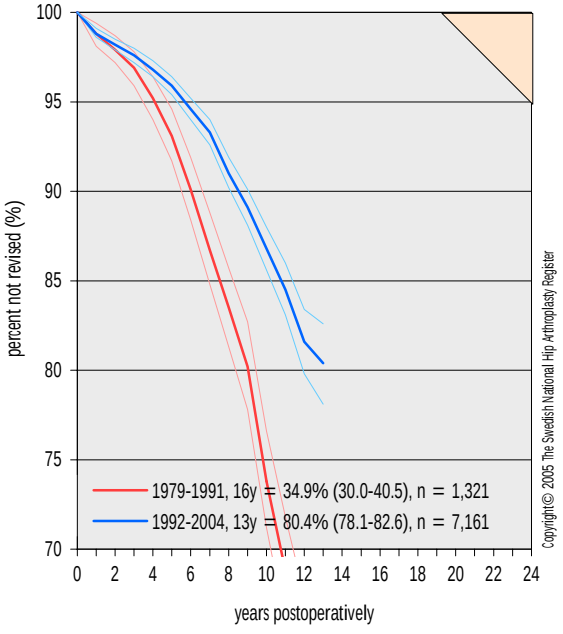
All Uncemented Implants

all diagnoses and all reasons



All Hybrid Implants

all diagnoses and all reasons



Revision

In contrast to reoperation, which is a broader concept, the term revision is used for exchange or extraction of part of the prosthesis (e.g. the polyethylene liner or head), one of the implant components (cup or stem) or the whole implant. During the period 1979-1991, the data for primary hip arthroplasty were registered aggregated for each hospital and not based on the patients' personal identity numbers. Approximations for diagnosis, gender and age distribution and mortality statistics were therefore used for survival calculations. In spite of these approximations, analyses performed have proved to be valid on continuous control (Söderman et al 2000).

In 1992 a more precise system for registration of primary THR, based on the patient's personal identity number, was introduced. With this system, more information about each primary procedure is also registered, making a more complete analysis possible. As from 1999, when reporting via the website started, registration of the number of implant-related variables has been further increased by registration of the article number for each implant component so as to render more detailed reporting and analysis possible in the future.

In this year's report, we have used the same principles in the overall reporting as in last year's report. Revision is presented for all diagnoses and regardless of cause. In addition, revision due to aseptic loosening is reported for the osteoarthritis group with three parameters: revision of the whole implant, the cup and the stem.

The total number of revisions has been relatively constant during the period 2000-2003. The decrease in 2004 is at least partly due to late reporting, as pointed out above. Up until 2003, there was a trend towards increased use of uncemented cups (hybrid implants) for first-time revisions while the proportion of completely uncemented revision implants was low. This observation is interesting and suggests that we avoid using long distally anchored uncemented implants for first-time revision and save this procedure for multiple revisions.

Compared to the diagnostic distribution in the primary group, and without adjusting for any co-existent factors, patients with sequelae to childhood diseases or inflammatory joint diseases are over-represented in the revision group. The revision rate is approximately treble and double, respectively, with these primary diagnoses. The relative proportion of above all the former diagnostic group also tends to increase with an increasing number of revisions, underlining the fact that primary hip arthroplasty in these patients requires more planning and greater knowledge and experience. Both these diagnostic groups have a relatively low average age at primary operation, often with a more complicated anatomy and poorer bone quality than the great majority of patients with primary osteoarthritis. They run an increased risk of having to undergo both revision and rerevision.

As previously, the dominating reasons for early revision (within three years) are technical problems, deep infection and dislocation. 70-84% of the total number of revisions performed for these reasons occur within this period. Revision due to fracture close to the implant increases continuously after 4-6 years. Revision due to loosening seems to have reached a plateau after this time. This plateau may possibly be due to a shift in indications with increasing age. It is more likely, however, that the plateau reflects the fact that certain patients with implant loosening have no or negligible symptoms.

The total number of revisions during the period 1979-2004 is 22 840, 19 021 of which were first-time revisions. The revision burden (RB) is commented upon in the primary THR section. The cumulative revision rate with at least 10 years' follow-up is presented for patients operated upon in five different years. The diagrams show the revision rate for all diagnoses and all reasons for revision and revision for aseptic loosening, deep infection and dislocation. The quality improvement over the years for mechanical strength and the reduced risk of infection is well documented, as previously. Patients operated upon in 1979 had a more than three times higher revision rate after 10 years compared to those operated upon in 1991 and 1995. In last year's report we noted a tendency towards increase of revision due to early dislocation and have therefore carried out a more detailed analysis of this problem (see separate section below).

If implant survival based on all diagnoses and all reasons for revision is compared with the corresponding survival diagram for the osteoarthritis group the differences between the different methods of fixation remain. In the cemented group, survival decreases by 2.2% after 13 years compared to revision regardless of reason and depending on implant exchange. In the uncemented and hybrid fixation groups, the differences are approximately 7%, suggesting that other reasons than loosening are more dominant. This difference is probably at least partly due to demographic and diagnosis-related differences between the groups.

The results for different sex and age-groups are presented in four intervals: younger than 50 years, 50-59 years, 60-75 years and older than 75 years. For each age-interval, all observations, cemented, uncemented and hybrid implants are presented for each sex. Only the total results are presented and we limit them to the period 1992-2003.

In the age-group younger than 50 years, women have poorer results than men, probably owing to dominance of women in the diagnostic groups sequelae to childhood dis-

eases and inflammatory joint disease, two diagnoses with an increased revision rate. In the groups cemented fixation and hybrid fixation, there is no improvement of the results for men between the age-groups < 50 and 50-59 years, in contrast to women.

It is only from 60 years and over that implant survival increases after 13 years, from approximately 80% and 78% respectively to almost 90%. When completely uncemented fixation is used, implant survival increases but with increasing age in a more expected manner. Uncemented fixation gives consistently poorer results regardless of age-group, however.

We are currently studying the younger cohort in more detail in a separate project. Preliminary analyses suggest that the choice of method of fixation of the implant is not decisive for the result. If other factors are adjusted for and the analysis is limited to the most extensively used implants within each group, the choice of method of fixation seems to play a minor role.

For the most extensively used implant types in each fixation group, the results are also presented for survival of the cup and stem separately. Note that in these diagrams both revisions where only one component has been exchanged and those where both components have been exchanged are included, i.e. exchange of the cup + exchange of both and exchange of the stem + exchange of both. We have chosen to limit this part of the report to the group all diagnoses / all reasons for revision and refer to the implant survival tables for more details.

Note that for cemented implants the results for the stem are generally better than those for the cup. The Charnley implant is an exception in this respect, possibly because the flange on the Charnley cup means that cementing can be done under higher pressure, resulting in better cement penetration. The thicker polyethylene layer due to the smaller head diameter is also of importance. The somewhat poorer long-term results for the Reflection cup (all polyethylene) persist and may possibly be related to the increased wear of this polyethylene cup. The reason for this is probably that the polyethylene is sterilised with ethylene oxide gas.

The results have improved during the last 12-13 years. With gradual improvement of the uncemented implants, the notch in the curve, which at present is at approximately four years, should be shifted to the left as a sign that patients provided with the modern and relatively newly implanted designs less frequently undergo reoperation. The appearance of the survival curve is relatively unchanged compared to last year's report, however, which suggests the opposite. For the groups uncemented and hybrid implants, we find that the results for the stems are generally good. In contrast to this, the cups show a poorer result, which is no doubt related to the properties of the liner polyethylene and/or the liner fixation. These factors showed a great variation during the early nineties.

A better result for the uncemented acetabular component may be achievable as the result of development of polyethylene that is more resistant to wear. This polyethylene can be sterilised by radiation with high doses, causing cross-linking of the polyethylene molecules and thereby increasing their resistance to wear. The components are subsequently heat-treated to reduce the amount of free radicals and the risk of secondary oxidation, which has a negative influence on the resistance to wear. It is important to be aware that this treatment process varies between different manufacturers.

Each type of polyethylene should therefore be documented in clinical trials. At present, there is 3-5 years' follow-up of at least three different makes, all of which shows a notable reduction of wear without negative effects. We consider, however, that the existing clinical documentation is still too short for a more general recommendation. Several hospitals use cross-linked polyethylene components for high-risk patients, however. It is important that these are followed up regularly and that we also collect our mutual experience in the register in order to improve the documentation and detect any complications and deficiencies of this new technique as rapidly as possible. If the results reported so far are still valid after long-term follow-up, they may represent a breakthrough for safer hip arthroplasty in active patients with a long remaining life expectancy.

In this open presentation of the results from each clinic, we have introduced two new variables by stating the proportion of patients with primary osteoarthritis and the proportion in the age-group 60-75 years. This is a first attempt to define a so-called case-mix index which corresponds to a simple description of the most common patient category. We believe that these patients represent an average for what one can expect regarding the load on the health service in the form of medical care, surgical difficulty, postoperative course, costs and expected results. These patients (those with primary osteoarthritis in the age-group 60-75) account for 41% of all hip arthroplasties in the database with primary hip prostheses for the period 1992-2004 (n = 141 703). During the same period, 3.2% of these patients underwent revision for any reason. This incidence is 0.5% lower than in the remaining group, which comprises all other patient categories. In a Cox regression, we find that the risk of revision is approximately 27% higher (95% confidence interval: 1.21-1.35) among patients outside the age-interval or with diagnoses other than primary osteoarthritis. Although the analysis must be seen as a first attempt, with no adjustment for coexisting factors,

we believe that it may be of great value to define and identify patients with different requirements as regards resources and at different risk for complications. Definition of relevant risk factors is difficult and requires continuous adjustment after more extensive evaluation. We believe that this concept merits development in order to get a clearer picture of the load on the health service in relation to patient category and to make fairer comparisons.

As expected, we find that the proportion of patients with primary osteoarthritis and the age distribution vary considerably depending on the type of hospital. Certain types of hospitals, above all many rural and private hospitals, operate upon more patients with primary osteoarthritis in the age-group 60-75 years. They also have a generally somewhat higher implant survival. Future analyses should focus upon the question whether a high proportion of patients with primary osteoarthritis in the age-group 60-75 years also means reduced medical costs and analyse more specifically effects on the final result, not just in terms of revision but also satisfaction and function in the individual patient (see the section on standardised follow-up). In the tables, the different hospitals are grouped according to type for these reasons.

Early revision due to dislocation

In last year's report a worrying trend of increasing risk of reoperation due to dislocation was noted. It was highest during the first 1-2 years after the primary operation, thereafter decreasing to a lower level (see figure 1). The analysis of factors which might influence the occurrence of revision due to dislocation is therefore limited to the first two years after the primary operation. The analysis covers the period 1992-2004 (note that a number of revisions are missing for 2004).

The statistical analysis has been limited to variables which occur with higher frequency and that have a reasonably good distribution. Analysis of how a certain type of incision that is almost exclusively used at a certain type of hospital and only for implantation of one and the same type of prosthesis will be difficult to interpret and usually not very meaningful.

The patient-related variables chosen are age, gender, diagnosis, side and whether the patient has been operated upon bilaterally or not. The type of incision is included as a continuous variable in order to investigate any changes during the period 1992-2004. The type of hospital has been registered in four groups: regional (including university), county, rural and private hospitals. Three types of incisions - anterolateral in the lateral and supine position and posterior – have been studied. They account for the dominating number of observations. In order to ensure a reasonable distribution of background variables, we have

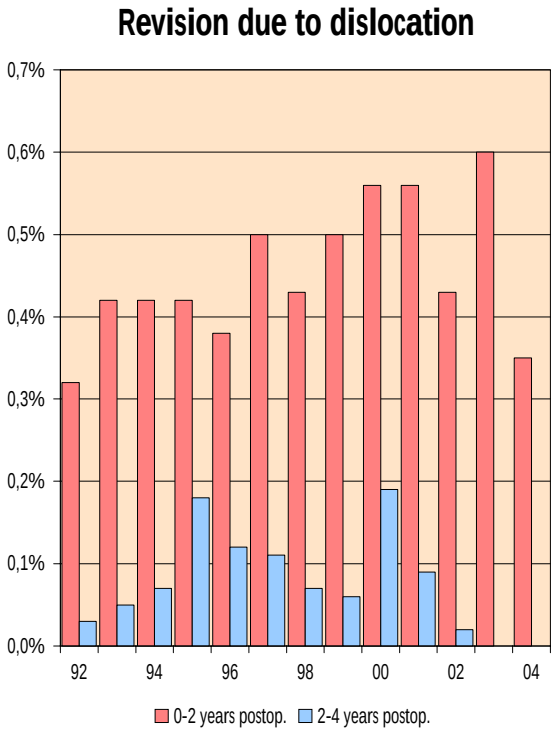


Figure 1. Percentage of primary implants revised due to dislocation within 2 and 4 years in relation to year of operation for the period 1992-2004.

chosen to study implant combinations used for at least 1 000 operations only. Together, these 15 implant combinations make up approximately 80% of the prostheses implanted during the period.

We have used a Cox regression model, which is a way to adjust implant survival for any covariation between different factors. If, for example, a certain implant combination is mainly used in older patients operated upon due to secondary osteoarthritis after fracture, the results are adjusted accordingly. As pointed out above, this adjustment is based to some extent on the fact that the implant combination is also sometimes used in patients with primary osteoarthritis and of younger age.

During the period, the risk of revision due to dislocation in the postoperative phase tends to increase with increasing age. In actual fact, the curve is somewhat biphasic, with the first peak at about 40 years of age, probably representing an increased procedure frequency in this age-group due to osteoarthritis secondary to childhood diseases and idiopathic avascular necrosis (see figure 2).

Throughout the period, revision due to early dislocation has been more common in women than in men. The risk

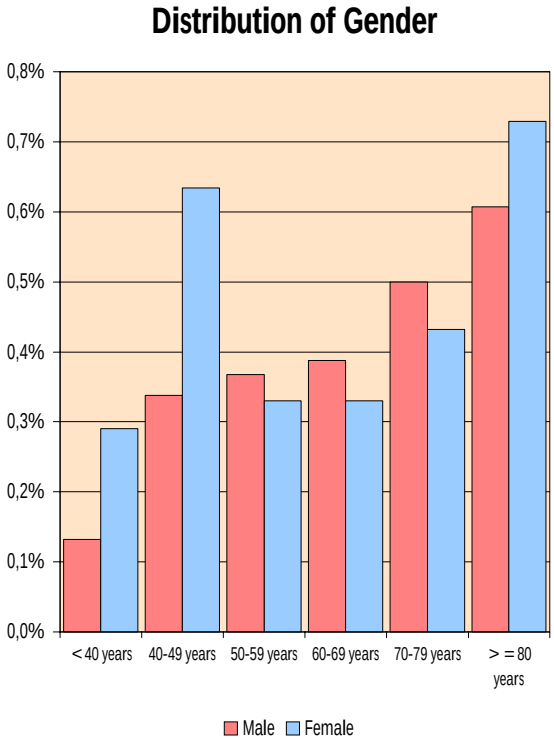


Figure2. Percentage of primary implants revised due to dislocation within 2 years in relation to age and gender.

	Exp(B)	95 % konf.int.		p
		undre	övre	
Increased risk				
Per increased years lived	1,02	1,01	1,02	0,000016
Female	1,21	1,03	1,42	0,023019
Per year after 1992	1,07	1,04	1,09	0,000000
Other cause than OA	3,19	2,71	3,77	0,000000
Operation of other hip	1,28	1,02	1,61	0,030288
CPT stem with Müller cup*	2,78	1,72	4,55	0,000034
Reduced risk				
Operation at rural hospital	0,78	0,66	0,93	0,005130
Anterior incision, patient on side	0,55	0,44	0,68	0,000000
Exeter stem with Charnley cup	0,47	0,28	0,79	0,004407

Factors which influence the risk of early revision due to dislocation (<2 years). Exp(B) is the increase/decrease in risk. Women have a 21% higher risk of being revised due to dislocation within 2 years. The lower limit of the confidence interval is close to 1 (1.03), which means that this observation is considerably less certain than that an anterior incision reduces the risk, where the upper limit of the confidence interval is considerably smaller than 1. Note that Exp(B) is also influenced by how the variable is constructed.

increases with increasing age and is considerably higher in patients not operated upon because of primary osteoarthritis. This applies above all to patients operated upon due to fracture or sequelae to trauma and hip disease in childhood. Younger women are operated upon more often for sequelae to congenital hip dislocation and older women due to fracture.

Another probable patient-related factor is bilateral operation. When the other hip had been operated upon, the risk of dislocation with subsequent early revision surgery increased by almost 30%. The confidence interval is close to 1, as for gender, and these risk factors are the least certain ones in the analysis.

Compared to other incisions, lateral incision in the lateral position reduces the risk of early revision due to dislocation to less than half. This factor, the time factor and diagnosis are the most certain risk factors in the analysis (lowest p value).

We also find that surgery at a rural hospital means that the risk of early revision due to dislocation decreases by approximately 20%. The reason for this is probably a more favourable case-mix. Another possible explanation is that rural hospitals are less engaged in training and have well-developed routines and are manned by surgeons with longer experience. Patients operated upon at rural hospitals have above all a more favourable age distribution and are more often operated upon due to primary osteoarthritis compared to those operated upon at regional and county hospitals. In the latter case, younger and older patients are over-represented (see figures 3 and 4).

Of the individual implant combinations used in more than 1 000 operations, only two differ from the others. We have here compared each individual implant combination with all other implants instead of selecting a reference implant. It emerges that the combination Exeter stem and Charnley cup means a reduced risk of early revision surgery due to dislocation while combination of a CPT stem with an all-polyethylene Müller cup is associated with an increased risk.

The representativeness of the finding concerning the combination CPT stem and all-polyethylene Müller cup can be questioned as several of the background variables show a small variation. This cup/stem combination has almost

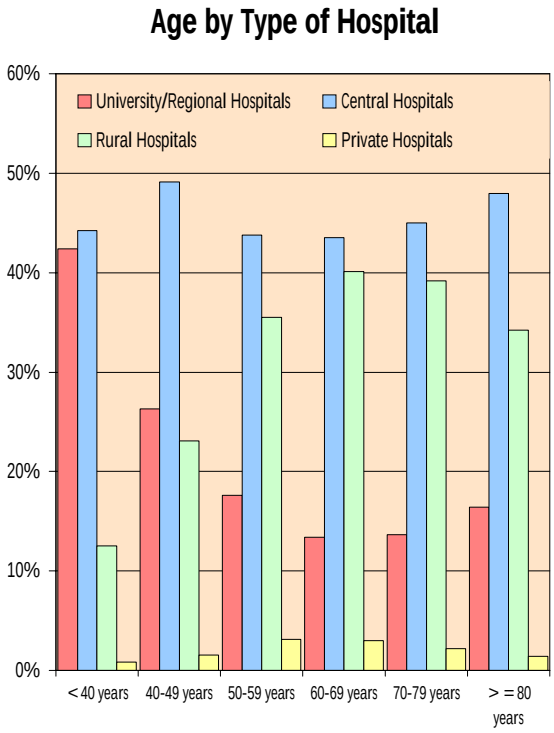
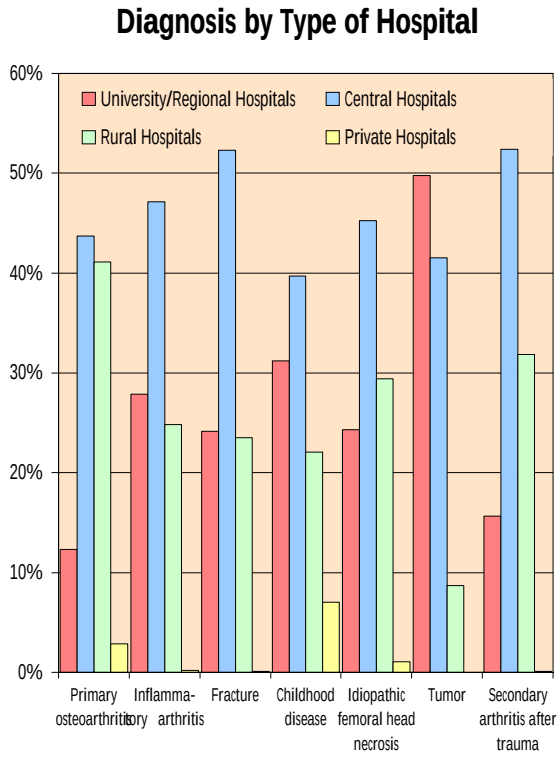


Figure 3. Illustration of the case-mix at different categories of hospitals. Each age-group constitutes 100%. At regional hospitals, above all younger patients are operated upon, at central hospitals mainly patients in the age-group 50-79 years, while at rural hospitals the age distribution is more even.



Figur 4. Illustration of the case-mix at different categories of hospitals. Each group of diagnosis constitutes 100%. At regional hospitals, childhood diseases and tumor are over-represented, at central hospitals the diagnoses are more evenly distributed, while at rural hospitals are primarily patients with osteoarthritis operated (approximately 41% of all operations with this diagnosis).

exclusively been used at county hospitals, mainly with posterior incisions and only in 1 200 operations. The combination Exeter stem and Charnley cup has been more widely used and is used in all types of hospitals and with all three most widely used incisions.

In summary, we find that several factors combine to influence the risk of early revision due to dislocation. The most certain correlations exist for diagnosis, type of incision and age. Since many factors, e.g. the occurrence of training posts, the individual surgeon's experience and any effects of the free flow, are not recorded in the register, we can only speculate about the reduced risk for operation at rural hospitals. The high-risk groups for the complication, viz. younger patients with sequelae to childhood hip diseases and older patients with fracture, are probably not sufficiently well represented at this type of hospital for the observation to be really relevant.

We also note that revision due to early dislocation is generally not influenced by the choice of implant design. The importance of the size of the caput has not been studied. On the other hand, two sizes, 22 and 28 mm, are mainly used in Sweden and the smallest size is mainly used with the Charnley stem. Also, the stability increases most with a diameter of 32 mm or more according to many studies.

If the new polyethylene gives less wear, both linear and volumetric, even in the long run, the caput diameter can be increased. This would increase the range of movement of the hip and probably also the stability. The international trend is towards routine use of the 32 mm caput and, in the case of revision due to early dislocation, consider even larger diameters in combination with the new polyethylene.

Number of Revisions per Reason and Years of Revision

only the first revision, primary THR 1979-2004

Reason for Revision	1979-1999	2000	2001	2002	2003	2004	Total	Share
Aseptic loosening	10,008	894	879	948	894	689	14,312	75.2%
Deep infection	1,038	52	53	74	87	64	1,368	7.2%
Dislocation	720	113	107	122	124	158	1,344	7.1%
Protesnära fraktur	631	97	80	74	93	78	1,053	5.5%
Technical error	414	12	7	10	13	39	495	2.6%
Implant fracture	200	19	24	12	21	14	290	1.5%
Miscellaneous	51	8	10	11	6	11	97	0.5%
Pain only	43	3	2	5	4	5	62	0.3%
Total	13,105	1,198	1,162	1,256	1,242	1,058	19,021	100%

Number of Revisions per Reason and Number of Previous THRs

primary THR 1979-2004

Reason for Revision	0		1		2		> 2		Total	Share
Aseptic loosening	14,312	75.2%	1,968	63.4%	339	59.2%	64	44.4%	16,683	73.0%
Dislocation	1,344	7.1%	380	12.3%	83	14.5%	35	24.3%	1,842	8.1%
Deep infection	1,368	7.2%	341	11.0%	73	12.7%	28	19.4%	1,810	7.9%
Periprosthetic fracture	1,053	5.5%	243	7.8%	44	7.7%	4	2.8%	1,344	5.9%
Technical error	495	2.6%	76	2.5%	17	3.0%	2	1.4%	590	2.6%
Implant fracture	290	1.5%	57	1.8%	10	1.7%	3	2.1%	360	1.6%
Miscellaneous	97	0.5%	25	0.8%	5	0.9%	6	4.2%	133	0.6%
Pain only	62	0.3%	11	0.4%	2	0.3%	2	1.4%	77	0.3%
Secondary infection	0	0.0%	1	0.0%	0	0.0%	0	0.0%	1	0.0%
Total	19,021	100%	3,102	100%	573	100%	144	100%	22,840	100%

Number of Revisions per Diagnosis and Number of Previous THRs

primary THR 1979-2004

Diagnosis at Primary THR	0		1		2		> 2		Total	Share
Primary osteoarthritis	14,071	74.0%	2,210	71.2%	395	68.9%	91	63.2%	16,767	73.4%
Periprosthetic fracture	1,794	9.4%	256	8.3%	38	6.6%	6	4.2%	2,094	9.2%
Inflammatory arthritis	1,529	8.0%	299	9.6%	68	11.9%	17	11.8%	1,913	8.4%
Childhood disease	911	4.8%	207	6.7%	41	7.2%	19	13.2%	1 178	5.2%
Idiopathic femoral head necrosis	313	1.6%	51	1.6%	12	2.1%	3	2.1%	379	1.7%
Secondary arthritis after trauma	157	0.8%	46	1.5%	11	1.9%	8	5.6%	222	1.0%
Secondary osteoarthritis	57	0.3%	7	0.2%	1	0.2%	0	0.0%	65	0.3%
Tumor	26	0.1%	6	0.2%	3	0.5%	0	0.0%	35	0.2%
(missing)	163	0.9%	20	0.6%	4	0.7%	0	0.0%	187	0.8%
Total	19 021	100%	3 102	100%	573	100%	144	100%	22 840	100%

Number of Revisions per Year of Revision and Number of Previous THRs

primary THR 1979-2004

Year of revision	0		1		2		> 2		Total	Share
1979-1999	13,105	68.9%	1,881	60.6%	307	53.6%	56	38.9%	15,349	67.2%
2000	1,198	6.3%	245	7.9%	48	8.4%	13	9.0%	1,504	6.6%
2001	1,162	6.1%	251	8.1%	56	9.8%	23	16.0%	1,492	6.5%
2002	1,256	6.6%	231	7.4%	60	10.5%	17	11.8%	1,564	6.8%
2003	1,242	6.5%	255	8.2%	57	9.9%	20	13.9%	1,574	6.9%
2004	1,058	5.6%	239	7.7%	45	7.9%	15	10.4%	1,357	5.9%
Total	19,021	100%	3,102	100%	573	100%	144	100%	22,840	100%

Number of Revisions per Type of Fixation at Primary THR and Year of Revision

only the first revision, primary THR 1979-2004

Type of fixation at primary THR	1979-1999	2000	2001	2002	2003	2004	Total	Share
Cemented	11,296	967	932	984	953	828	15,960	83.9%
Uncemented	996	135	126	136	141	99	1,633	8.6%
Hybrid	325	73	79	103	123	101	804	4.2%
Reversed hybrid	63	8	5	8	10	18	112	0.6%
(missing)	425	15	20	25	15	12	512	2.7%
Total	13,105	1,198	1,162	1,256	1,242	1,058	19,021	100%

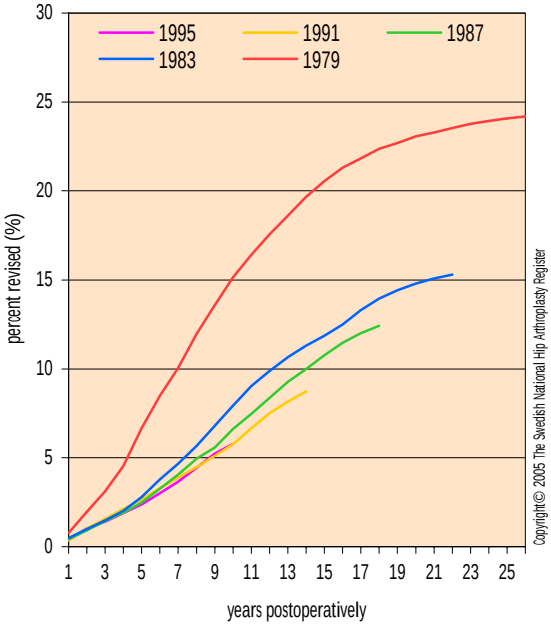
Number of Revisions per Reason and Time to revision

only the first revision, primary THR 1979-2004

Reason for revision	0 – 3 years		4 – 6 years		7 – 10 years		> 10 years		Total	Share
Aseptic loosening	2,578	48.1%	3,280	84.2%	4,315	86.8%	4,139	86.4%	14,312	75.2%
Deep infection	1,018	19.0%	173	4.4%	118	2.4%	59	1.2%	1,368	7.2%
Dislocation	937	17.5%	139	3.6%	130	2.6%	138	2.9%	1,344	7.1%
Periprosthetic fracture	264	4.9%	195	5.0%	272	5.5%	322	6.7%	1,053	5.5%
Technical error	415	7.7%	31	0.8%	27	0.5%	22	0.5%	495	2.6%
Implant fracture	45	0.8%	57	1.5%	96	1.9%	92	1.9%	290	1.5%
Miscellaneous	57	1.1%	15	0.4%	11	0.2%	14	0.3%	97	0.5%
Pain only	48	0.9%	7	0.2%	3	0.1%	4	0.1%	62	0.3%
Total	5,362	100%	3,897	100%	4,972	100%	4,790	100%	19,021	100%

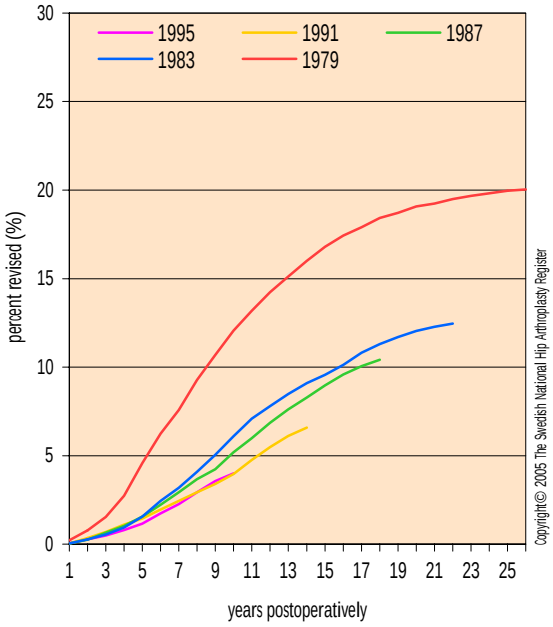
All Diagnoses and All Reasons

cumulative frequency of revision



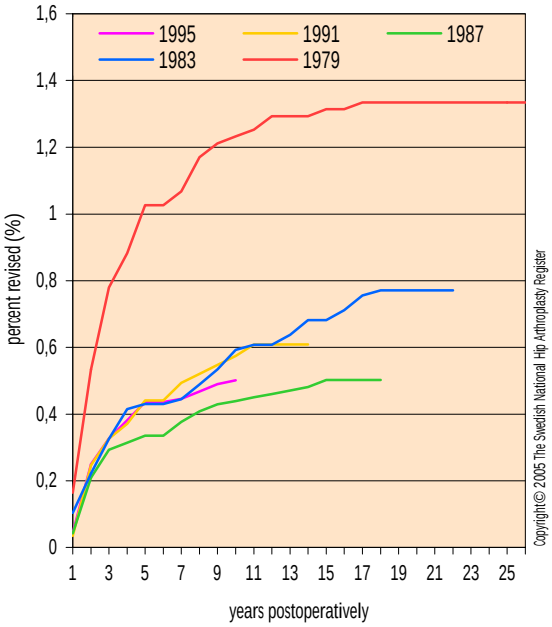
Aseptic Loosening

cumulative frequency of revision



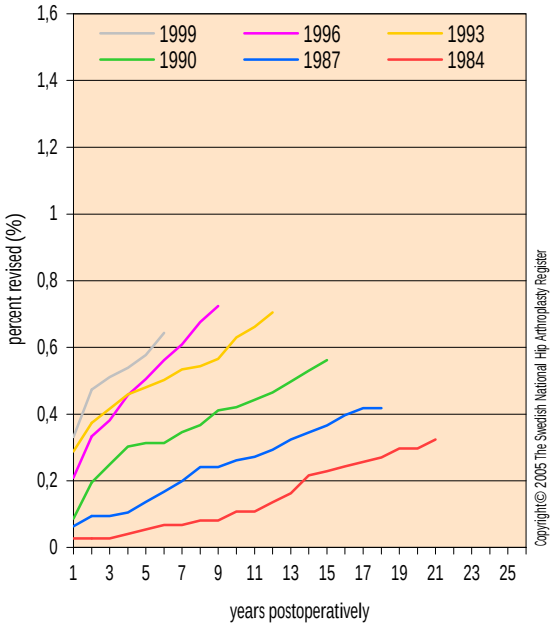
Deep Infection

cumulative frequency of revision



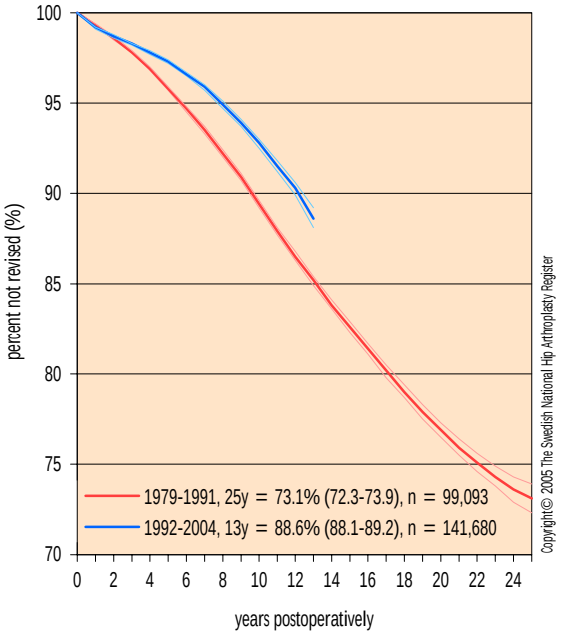
Dislocation

cumulative frequency of revision



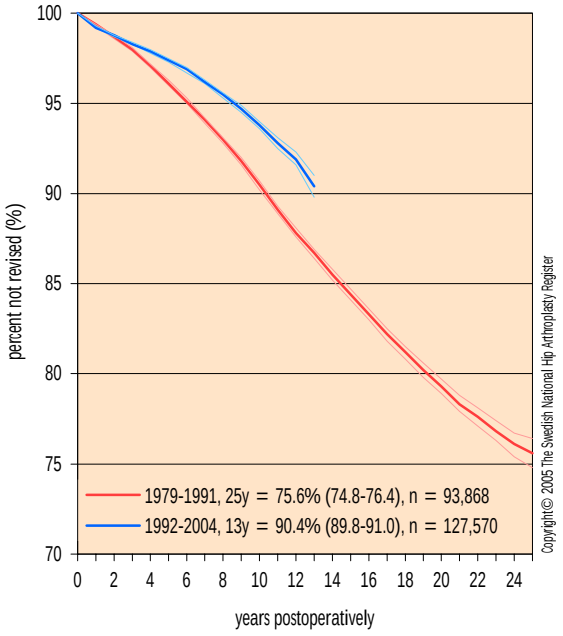
All Implants

all diagnoses and all reasons for revision



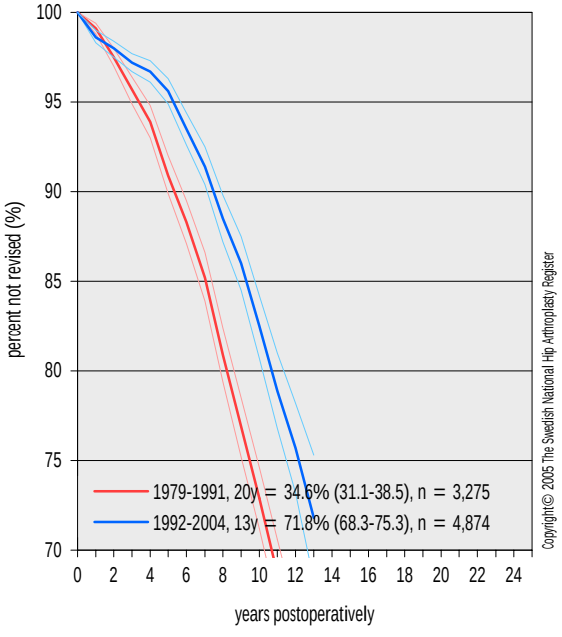
All Cemented Implants

all diagnoses and all reasons for revision



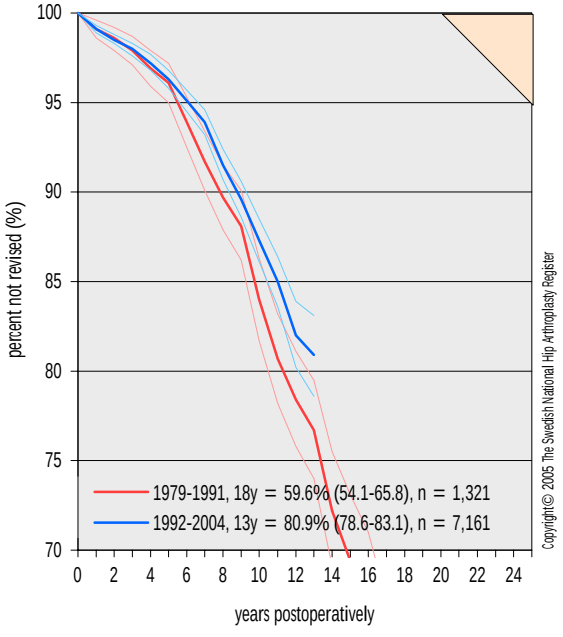
All Uncemented Implants

all diagnoses and all reasons for revision



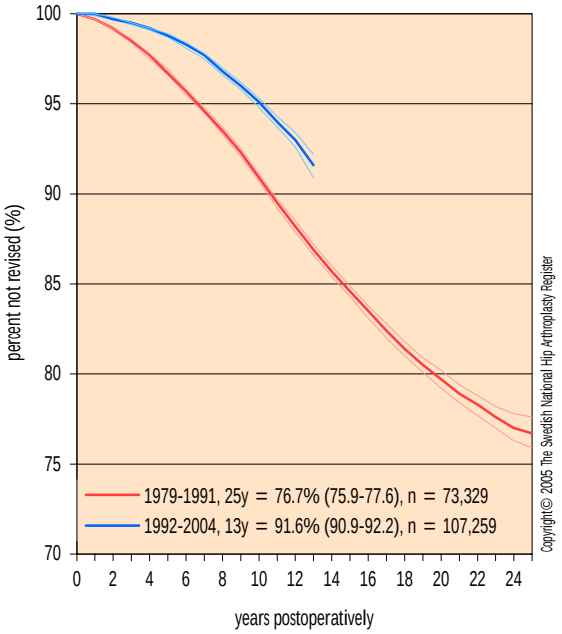
All Hybrid Implants

all diagnoses and all reasons for revision



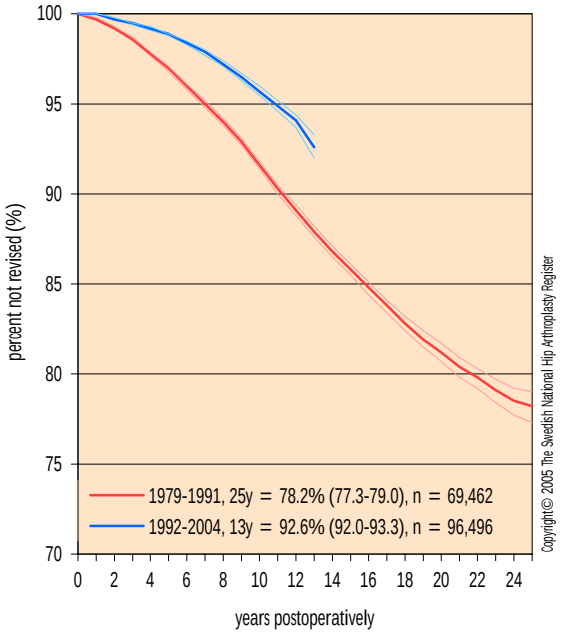
All Implants

osteoarthritis and aseptic loosening



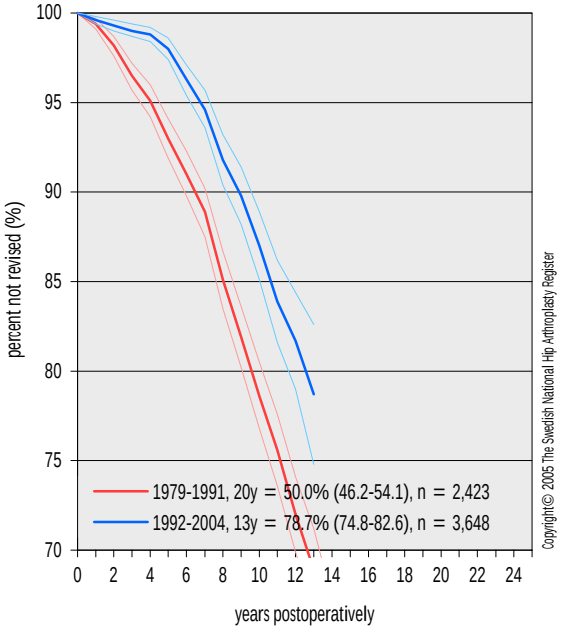
All Cemented Implants

osteoarthritis and aseptic loosening



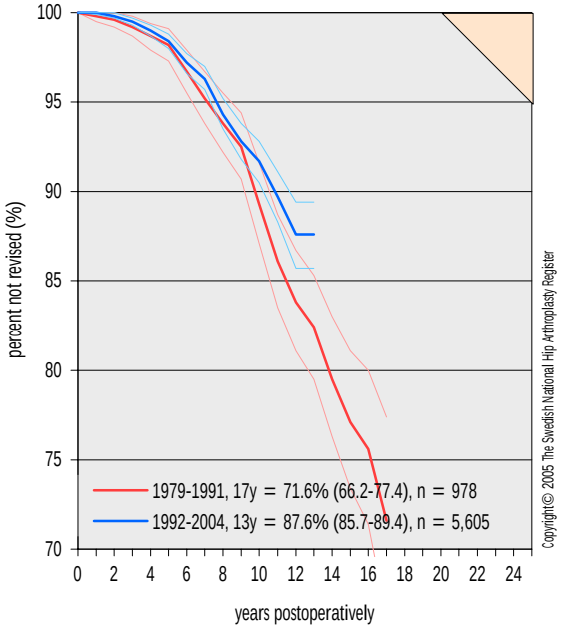
All Uncemented Implants

osteoarthritis and aseptic loosening



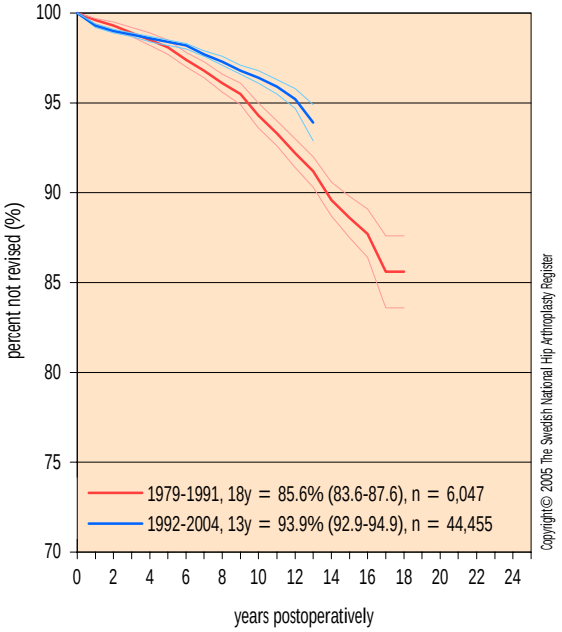
All Hybrid Implants

osteoarthritis and aseptic loosening



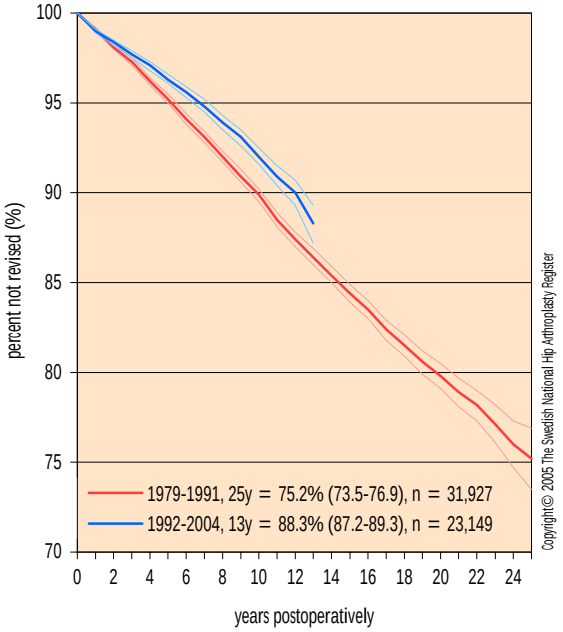
Lubinus SP II

all diagnoses and all reasons for revision



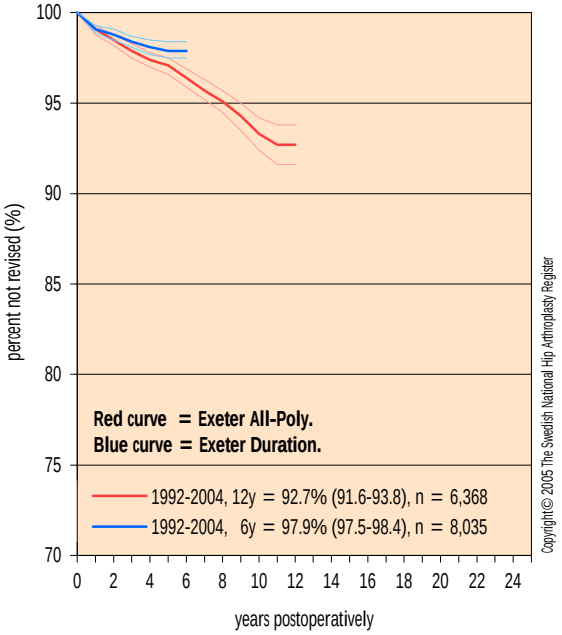
Charnley

all diagnoses and all reasons for revision



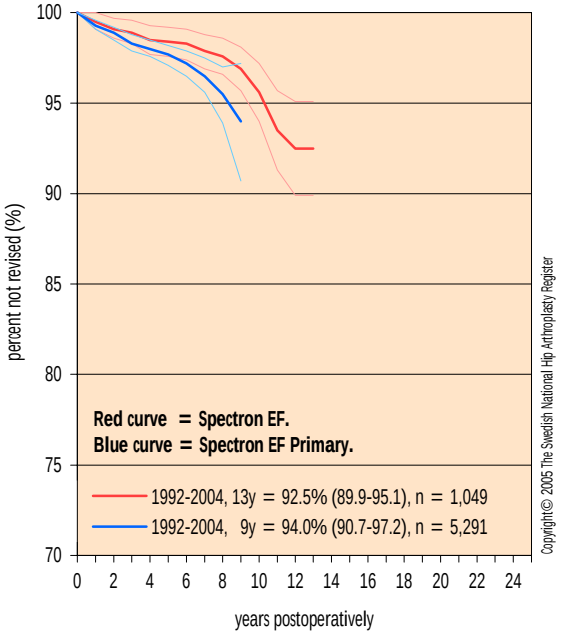
Exeter (Exeter Polished)

all diagnoses and all reasons for revision



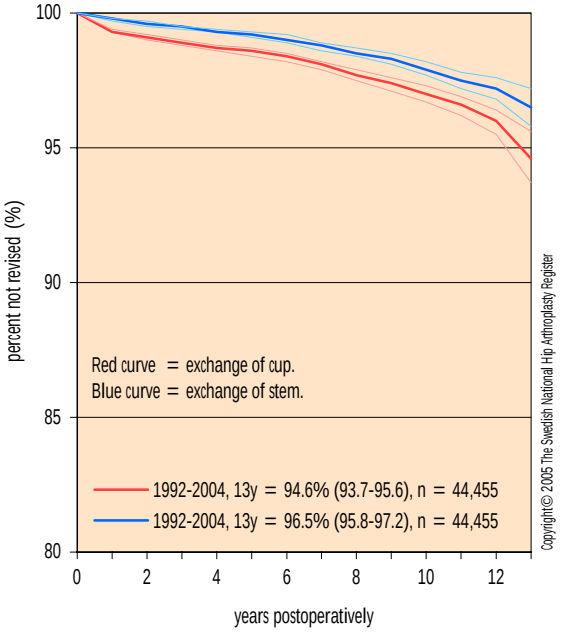
Reflection All-Poly (Spectron)

all diagnoses and all reasons for revision



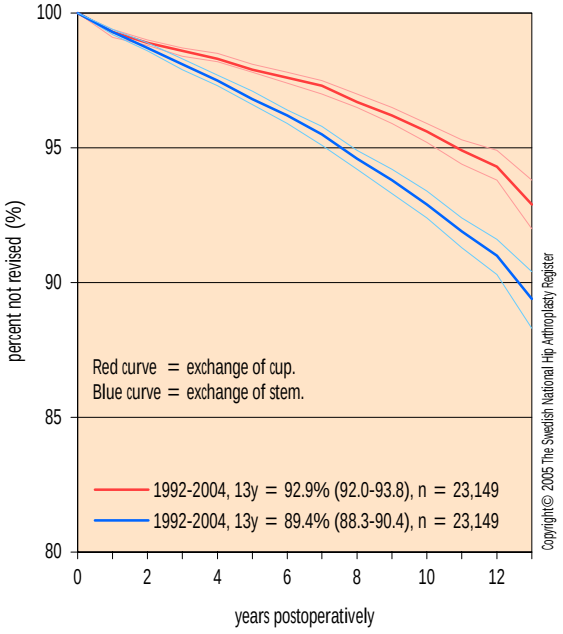
Lubinus SP II

all diagnoses and all reasons for revision



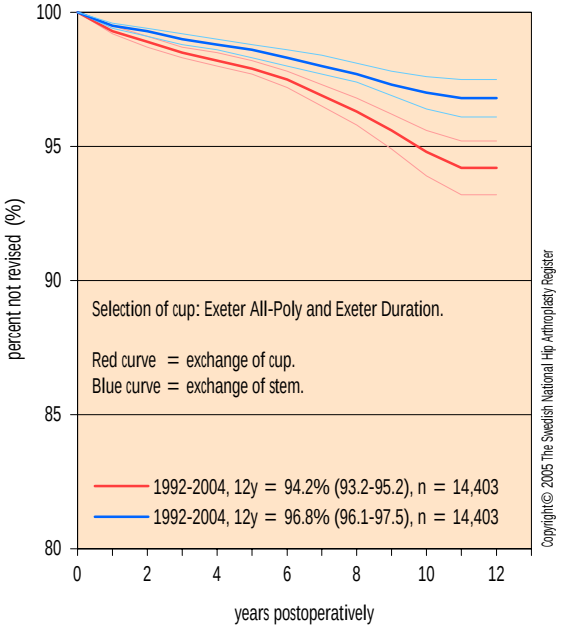
Charnley

all diagnoses and all reasons for revision



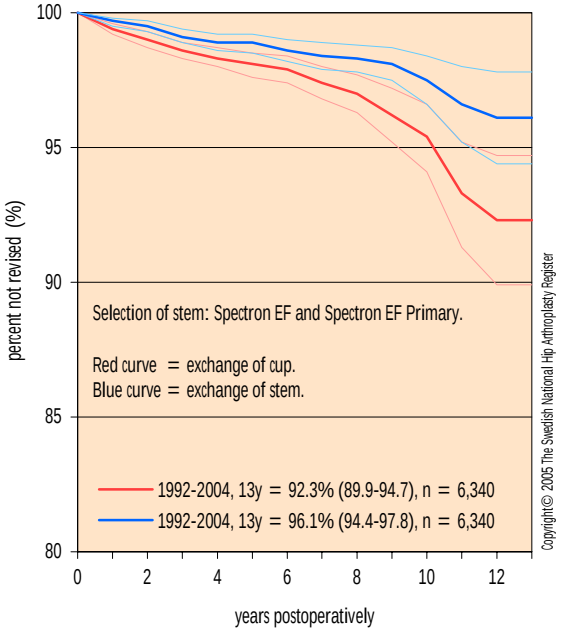
Exeter (Exeter Polished)

all diagnoses and all reasons for revision



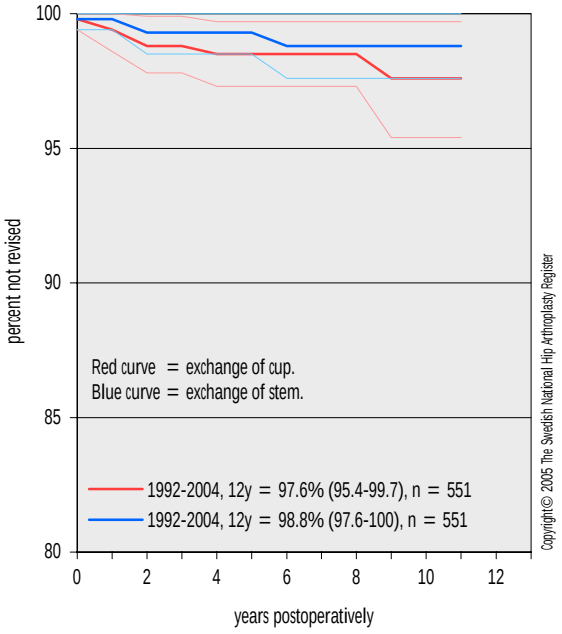
Reflection All-Poly (Spectron)

all diagnoses and all reasons for revision



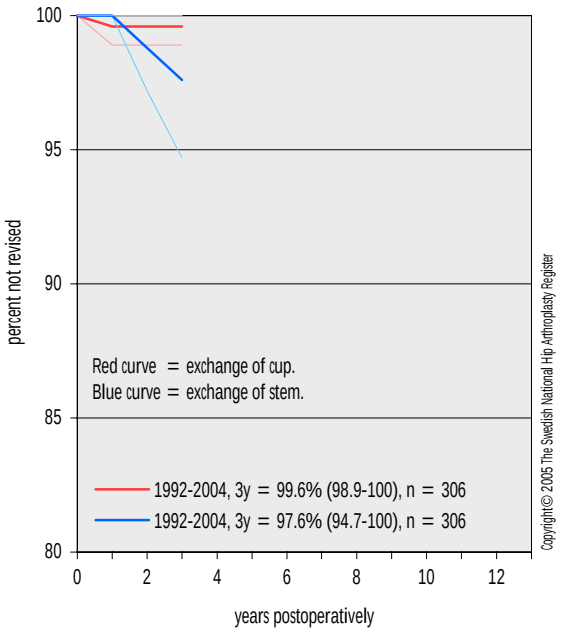
CLS Spotorno

all diagnoses and all reasons



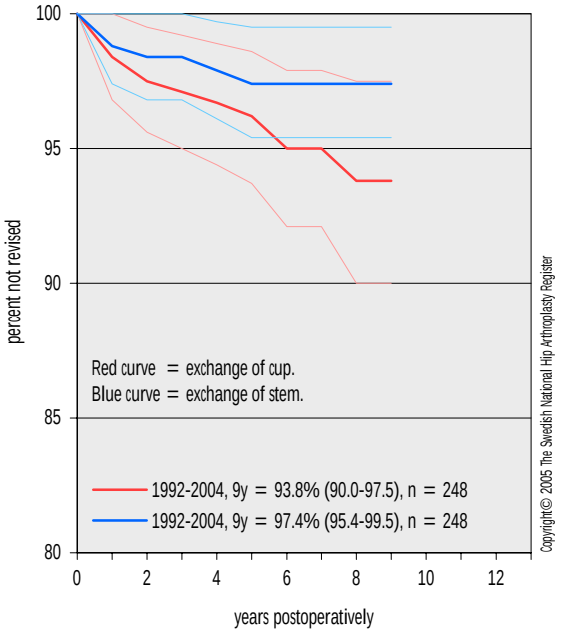
Allofit (CLS Spotorno)

all diagnoses and all reasons



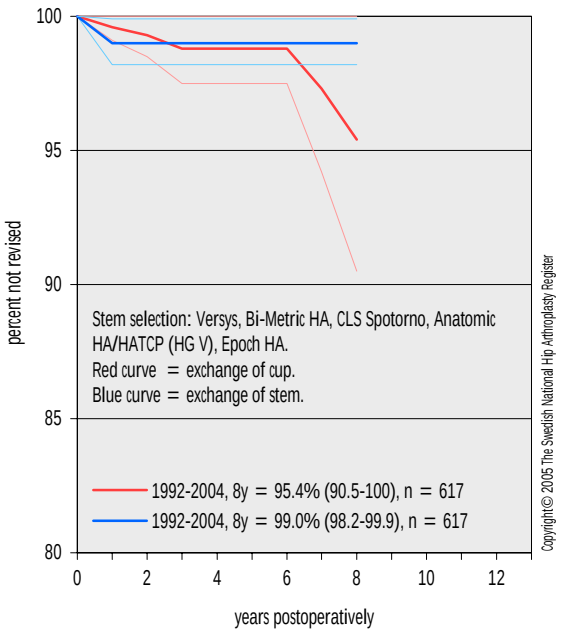
Romanus HA (Bi-Metric HA uncem.)

all diagnoses and all reasons



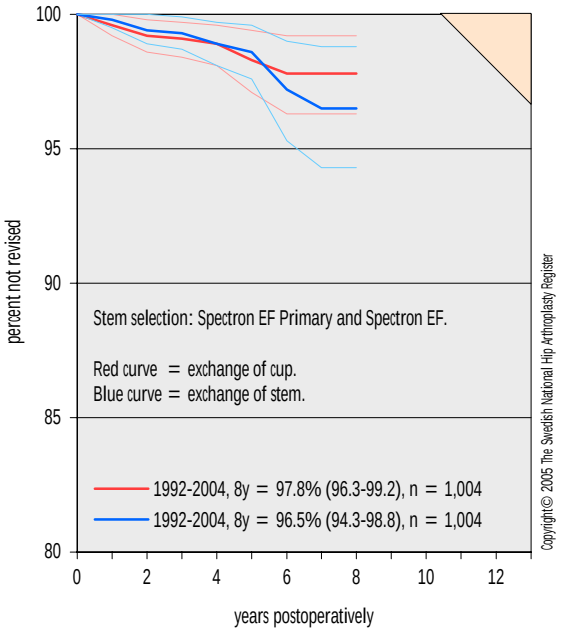
Trilogy HA

alla diagnoses and all reasons



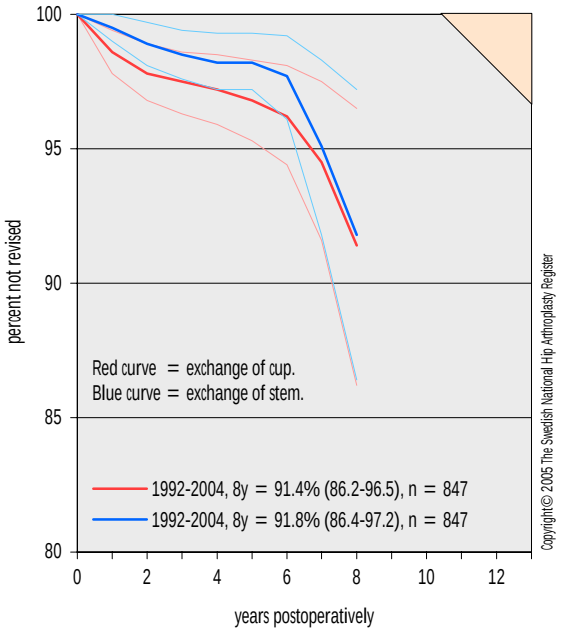
Trilogy HA (Spectron)

all diagnoses and all reasons



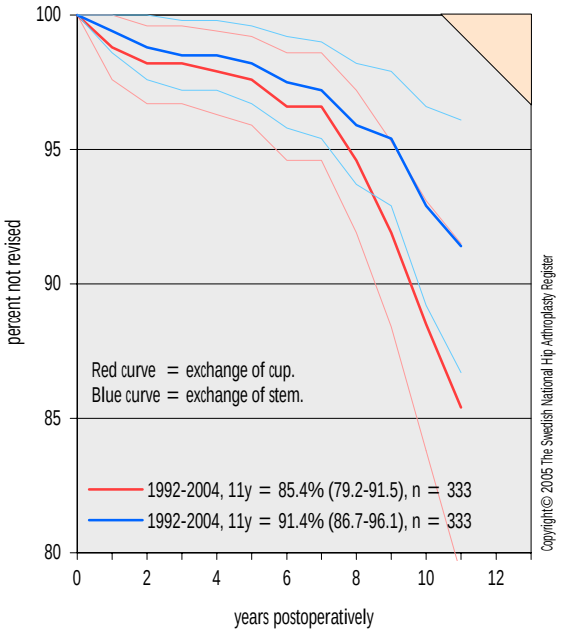
Trilogy HA (Lubinus SP II)

all diagnoses and all reasons



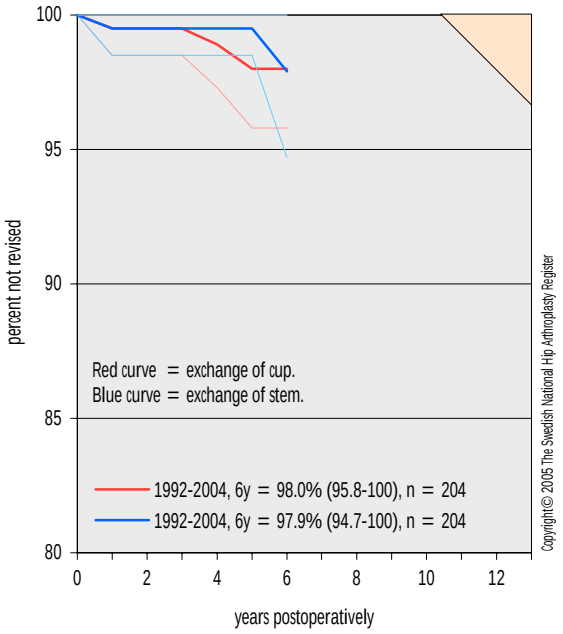
ABG HA (Lubinus SP II)

all diagnoses and all reasons



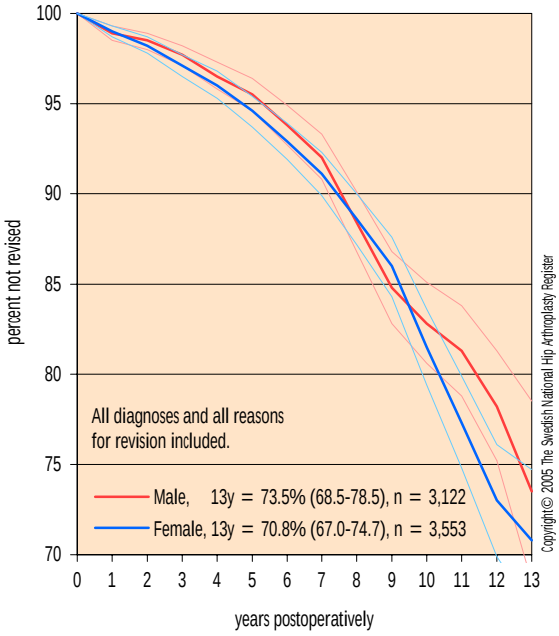
ABG II HA (Lubinus SP II)

all diagnoses and all reasons



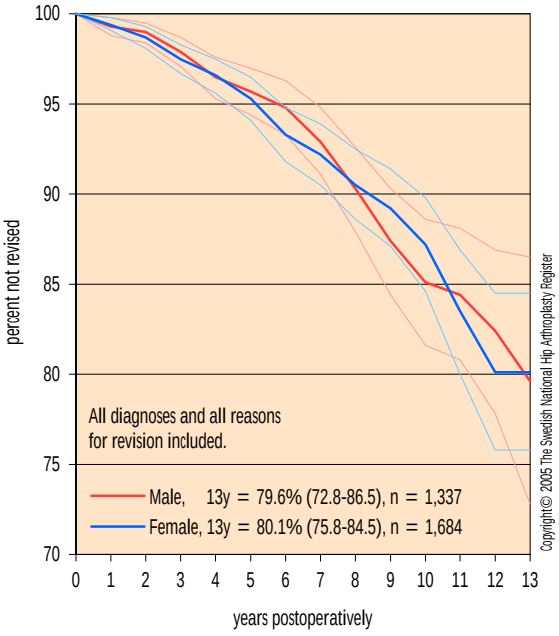
Younger than 50 years

all observations, 1992-2004



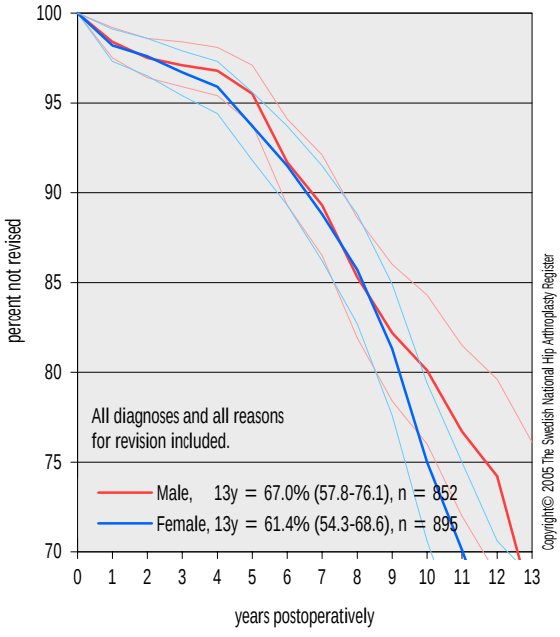
Younger than 50 years

cemented implants, 1992-2004



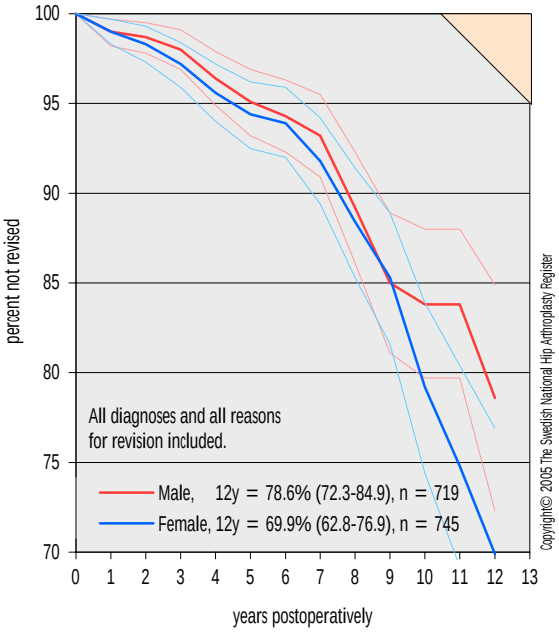
Younger than 50 years

uncemented implants, 1992-2004



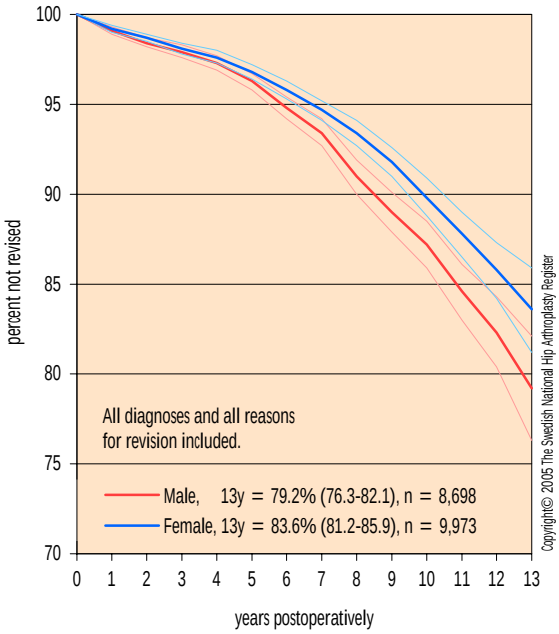
Younger than 50 years

hybrid implants, 1992-2004



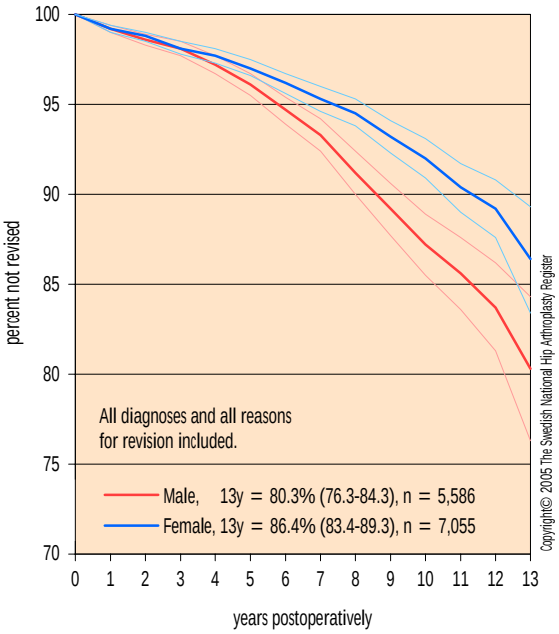
Between 50 and 59 years

all observations, 1992-2004



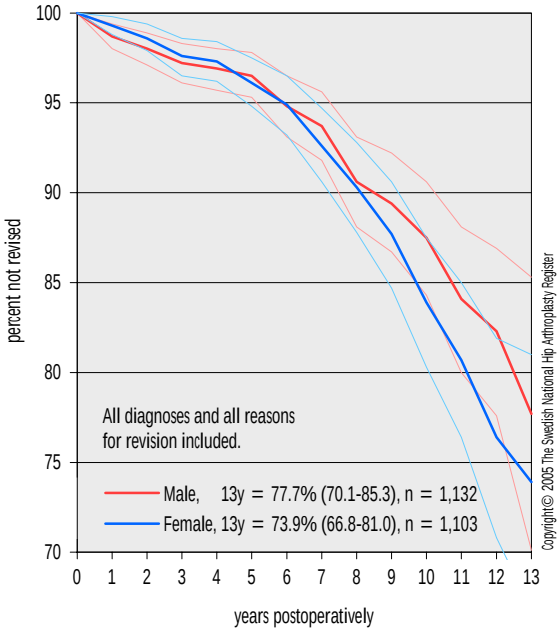
Between 50 and 59 years

cemented implants, 1992-2004



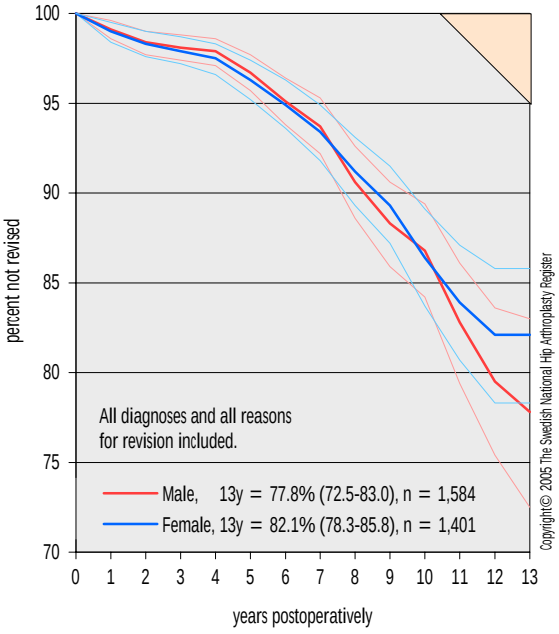
Between 50 and 59 years

uncemented implants, 1992-2004



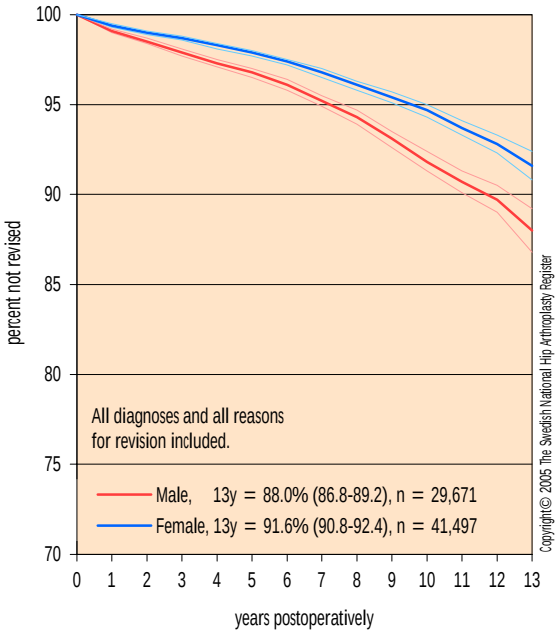
Between 50 and 59 years

hybrid implants, 1992-2004



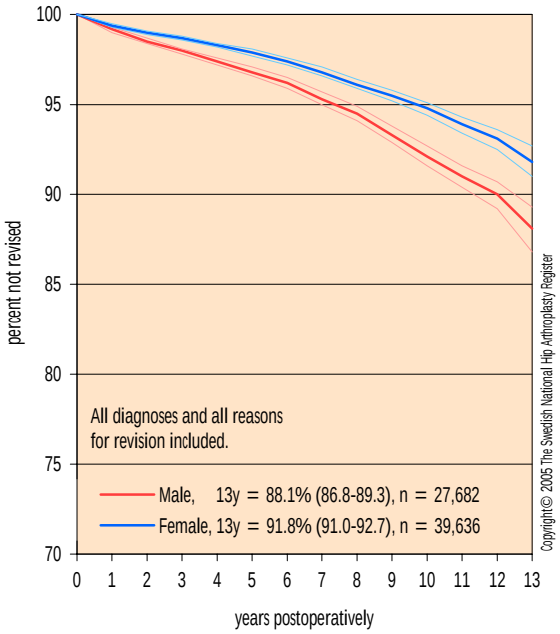
Between 60 and 75 years

all observations, 1992-2004



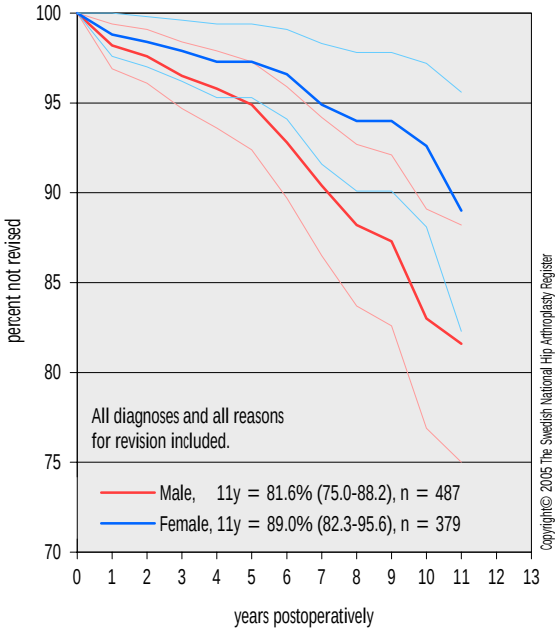
Between 60 and 75 years

cemented implants, 1992-2004



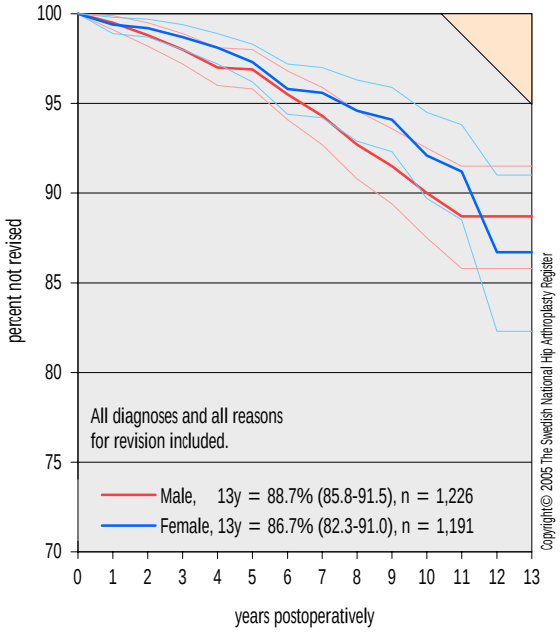
Between 60 and 75 years

uncemented implants, 1992-2004



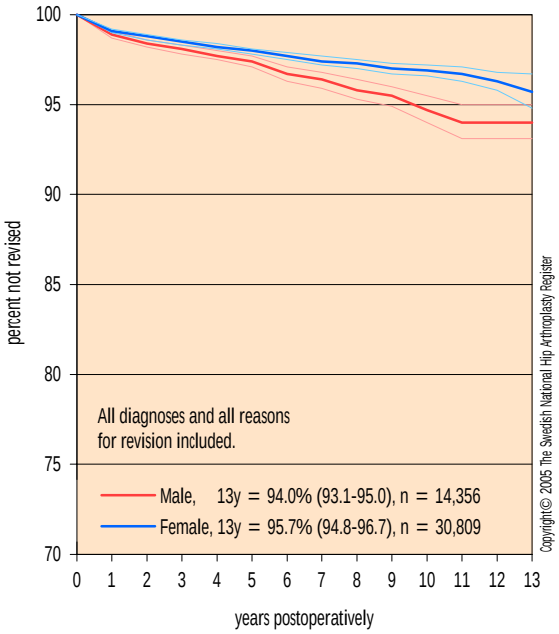
Between 60 and 75 years

hybrid implants, 1992-2004



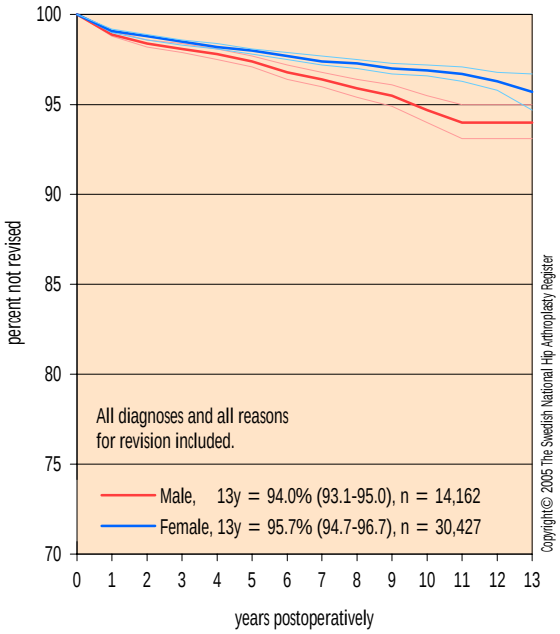
Older than 75 years

all observations, 1992-2004



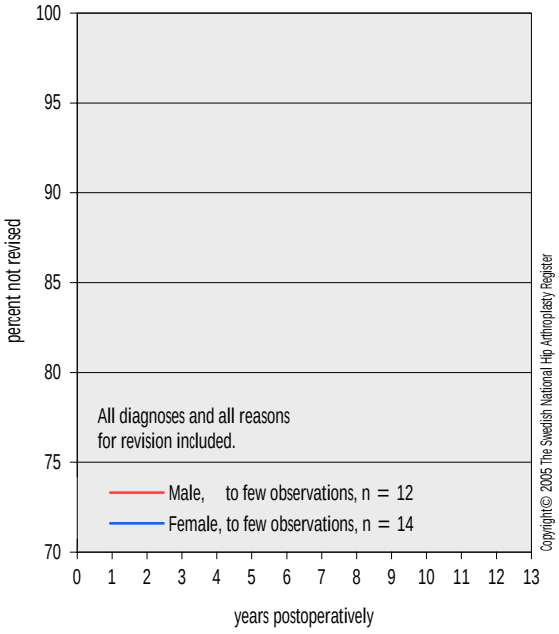
Older than 75 years

cemented implants, 1992-2004



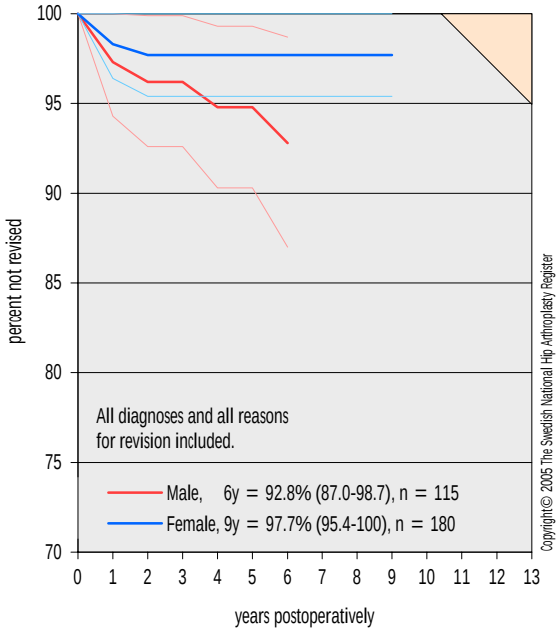
Older than 75 years

uncemented implants, 1992-2004



Older than 75 years

hybrid implants, 1992-2004



Implant Survival per Type

all diagnoses and all reasons for revision, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
ABG HA (ABG cem.)	1992–1998	241	58.9%	27.0%	98.2%	±1.8%	92.7%	±4.1%
ABG HA (ABG uncem.)	1992–1998	280	78.9%	5.4%	97.1%	±1.9%	83.2%	±4.9%
ABG HA (Lubinus SP II)	1992–1998	333	80.5%	39.6%	96.9%	±1.9%	87.5%	±4.8%
ABG II HA (ABG uncem.)	1993–2004	177	79.7%	7.9%	97.4%	±2.6%		
ABG II HA (Lubinus SP II)	1997–2004	204	81.9%	30.4%	98.0%	±2.1%		
Biomet Müller (Bi-Metric cem.)	1992–1996	1,068	66.2%	56.8%	96.4%	±1.1%	90.7%	±1.9%
Biomet Müller (CPT steel)	1997–2004	950	94.8%	46.9%	95.9%	±1.5%		
Biomet Müller (RX90-S)	1994–2001	1 452	76.8%	51.2%	97.8%	±0.8%	93.1%	±2.4%
Biomet Müller (Stanmore mod)	1997–2002	94	95.7%	44.7%	98.9%	±1.6%		
Cenator (Bi-Metric cem.)	1993–1999	293	70.6%	39.6%	97.1%	±1.9%	92.6%	±3.8%
Cenator (Cenator)	1993–2000	1,218	60.1%	44.7%	92.8%	±1.5%	83.7%	±3.9%
Cenator (Charnley Elite Plus)	1996–2000	320	84.1%	48.8%	96.7%	±2.0%		
Cenator (Cone uncem.)	1994–2000	56	60.7%	10.7%	96.4%	±4.3%		
Cenator (Exeter Polished)	1998–2003	661	84.6%	54.2%	99.5%	±0.5%		
Cenator (Lubinus SP II)	1997–2000	63	50.8%	63.5%	93.6%	±6.7%		
Charnley (Bi-Metric cem.)	1992–1998	58	48.3%	32.8%	96.1%	±4.6%		
Charnley (CAD)	1992–1996	224	62.9%	51.8%	97.2%	±2.2%	95.4%	±3.0%
Charnley (Charnley Elite Plus)	1994–2003	1,407	69.5%	49.3%	96.4%	±1.0%		
Charnley (Charnley)	1992–2004	23,149	75.5%	53.6%	96.3%	±0.3%	92.0%	±0.5%
Charnley (Exeter Polished)	1992–2004	1,402	77.7%	57.8%	98.4%	±0.9%	97.0%	±1.8%
Charnley (Lubinus SP II)	1992–2004	334	83.2%	59.0%	97.4%	±1.8%	95.3%	±2.8%
Charnley (Müller Straight)	1992–1998	104	87.5%	71.2%	96.9%	±3.3%	95.7%	±4.1%
Charnley (PCA E-series Textured)	1992–1996	129	82.2%	53.5%	96.8%	±3.1%	83.2%	±7.2%
Charnley Elite (ABG uncem.)	1994–2004	368	90.8%	22.3%	97.4%	±1.9%		
Charnley Elite (Charnley Elite Plus)	1992–2002	944	67.6%	48.6%	94.5%	±1.7%		
Charnley Elite (Charnley)	1992–2001	337	60.5%	52.2%	95.6%	±2.3%	88.4%	±4.1%
Charnley Elite (Exeter Polished)	1996–2004	4,392	70.5%	50.3%	98.9%	±0.4%		
Charnley Elite (Lubinus SP II)	1992–2004	818	79.7%	53.8%	98.0%	±1.4%		
Charnley Elite (PCA E-series Textured)	1992–1997	213	79.8%	56.3%	96.9%	±2.4%	88.1%	±5.0%
Charnley Elite (Spectron EF Primary)	1998–2004	251	90.8%	54.6%	97.7%	±2.3%		
CLS Spotorno (CLS Spotorno)	1992–2004	551	85.5%	24.7%	98.5%	±1.2%	97.1%	±2.3%
Contemporary (Exeter Polished)	1996–2004	322	88.2%	53.4%	96.7%	±2.0%		
Contemporary (Lubinus SP II)	1994–2001	102	66.7%	57.8%	97.0%	±3.2%		
Duralock (uncem.) (Spectron EF Primary)	1996–2000	112	87.5%	52.7%	97.3%	±2.9%		
Duralock (uncem.) (Spectron EF)	1993–1999	53	79.2%	81.1%	96.2%	±4.5%		
Exeter Duration (Exeter Polished)	1999–2004	8,035	82.8%	51.7%	97.9%	±0.5%		
Exeter Duration (Lubinus SP II)	1999–2004	442	77.6%	49.8%	100.0%	±0.0%		
Exeter Metal-backed (Exeter Polished)	1992–1994	589	68.4%	64.2%	98.7%	±1.0%	95.3%	±1.9%
Exeter All-Poly (Exeter Polished)	1992–2004	6,368	73.1%	51.1%	97.1%	±0.5%	93.3%	±0.9%
Exeter All-Ploy (Lubinus SP II)	1992–2002	202	79.2%	47.0%	97.3%	±2.3%		
Exeter Polished (Exeter Polished)	1992–1995	669	68.8%	51.3%	95.9%	±1.5%	92.5%	±2.2%
FAL (Lubinus SP II)	1999–2004	2,927	78.2%	52.8%	98.9%	±0.6%		
Harris-Galante I (Lubinus SP II)	1992–1997	72	79.2%	19.4%	97.2%	±3.4%	92.2%	±6.6%
Harris-Galante II (Charnley)	1992–1996	144	85.4%	27.8%	93.0%	±4.2%	86.0%	±5.9%
Harris-Galante II (Lubinus SP II)	1992–1997	235	62.1%	27.7%	94.8%	±2.9%	84.0%	±4.9%
Harris-Galante II (Spectron EF)	1992–1996	161	73.3%	56.5%	96.2%	±3.0%	87.6%	±5.4%

(continued on next page.)

Implant Survival per Type (cont.)

all diagnoses and all reasons for revision, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
HGPII/HATCP (HG III) (Spectron EF)	1992–1995	93	53.8%	47.3%	100.0%	±0.0%	96.6%	±3.6%
ITH (ITH)	1992–1997	315	58.1%	38.4%	98.5%	±1.5%	96.4%	±2.5%
LINK Pressfit (Lubinus SP II)	1996–2000	61	62.3%	8.2%	100.0%	±0.0%		
Lubinus All-Poly (Lubinus IP)	1992–1998	825	55.6%	41.5%	99.3%	±0.6%	98.4%	±1.1%
Lubinus All-Poly (Lubinus SP II)	1992–2004	44,455	77.0%	54.5%	98.4%	±0.1%	96.4%	±0.4%
Mallory-Head uncem. (Lubinus SP II)	1995–2004	95	82.1%	8.4%	96.6%	±3.6%		
Müller All-Poly (Bi-Metric cem.)	1992–1995	94	81.9%	63.8%	96.6%	±3.6%	94.9%	±5.0%
Müller All-Poly (MS30 Unpolished)	1992–2001	113	58.4%	57.5%	94.1%	±4.6%		
Müller All-Poly (Müller Straight)	1992–2004	1,551	73.2%	58.5%	97.7%	±0.8%	96.6%	±1.1%
Müller All-Poly (Straight-stem standard)	1996–2004	134	91.8%	50.7%	94.8%	±4.5%		
Omnifit (Lubinus SP II)	1992–1995	172	80.8%	29.1%	95.9%	±3.0%	77.6%	±6.5%
Omnifit (Omnifit)	1992–1995	317	57.7%	12.0%	92.1%	±3.0%	66.5%	±5.3%
OPTICUP (Lubinus SP II)	1995–2004	597	61.0%	49.2%	98.8%	±1.0%		
OPTICUP (NOVA Scan Hip)	1993–2000	156	66.0%	41.7%	91.6%	±4.6%		
OPTICUP (Optima)	1993–2000	755	73.8%	50.2%	96.6%	±1.4%	89.9%	±2.8%
OPTICUP (Scan Hip II Collar)	1996–2004	1,978	76.0%	48.4%	97.0%	±1.0%		
OPTICUP (Scan Hip Collar)	1995–1996	83	79.5%	51.8%	97.2%	±3.4%		
PCA (PCA)	1992–1994	70	71.4%	22.9%	95.7%	±4.5%	85.0%	±8.6%
Reflection (Spectron EF Primary)	1996–2004	5,291	73.9%	51.3%	97.7%	±0.6%		
Reflection (Spectron EF)	1992–1998	1,049	68.8%	55.5%	98.4%	±0.8%	95.6%	±1.6%
Reflection HA (Lubinus SP II)	1995–2004	175	86.9%	12.0%	93.8%	±4.6%		
Reflection HA (Spectron EF)	1995–1998	70	82.9%	28.6%	98.5%	±2.2%		
Romanus (Bi-Metric cem.)	1992–1998	376	76.3%	30.9%	95.6%	±2.1%	84.4%	±4.1%
Romanus (Bi-Metric HA uncem.)	1992–1999	145	82.8%	15.9%	99.3%	±1.0%	92.0%	±4.5%
Romanus (Bi-Metric uncem.)	1992–1997	260	71.9%	10.0%	96.9%	±2.1%	87.3%	±4.2%
Romanus (Lubinus SP II)	1992–1996	98	73.5%	18.4%	97.9%	±2.5%	89.2%	±6.4%
Romanus (RX90-S)	1994–2000	182	91.2%	38.5%	96.1%	±2.8%	88.1%	±5.1%
Romanus HA (Bi-Metric HA uncem.)	1992–2004	248	75.4%	10.5%	96.2%	±2.4%		
Scan Hip Cup (Lubinus SP II)	1992–2002	91	56.0%	46.2%	95.3%	±4.4%		
Scan Hip Cup (Optima)	1993–2001	506	70.4%	56.3%	98.5%	±1.1%	91.6%	±4.0%
Scan Hip Cup (Scan Hip II Collar)	1996–2001	207	76.8%	39.6%	96.8%	±2.5%		
Scan Hip Cup (Scan Hip Collar)	1992–2000	2,873	71.0%	49.8%	97.8%	±0.5%	92.1%	±1.3%
Scan Hip Cup (Scan Hip Collarless)	1992–1999	133	67.7%	48.1%	98.4%	±1.9%	90.5%	±6.0%
Secur-Fit (Omnifit)	1996–1999	104	72.1%	2.9%	89.1%	±6.1%		
SHP (Lubinus SP II)	1994–2004	609	80.8%	52.4%	99.4%	±0.6%	97.9%	±1.6%
SLS (CLS Spotorno)	1992–1998	66	81.8%	33.3%	96.9%	±3.6%		
Spectron Metal-backed (Spectron EF)	1992–1993	113	77.0%	62.8%	99.1%	±1.3%	99.1%	±1.3%
Spectron (Spectron EF)	1992–1998	75	81.3%	52.0%	100.0%	±0.0%		
Stanmore (Stanmore mod)	1994–2004	592	46.6%	45.9%	98.7%	±1.0%		
Stanmore (Stanmore)	1992–1998	103	87.4%	54.4%	96.8%	±3.4%	89.7%	±6.9%
Trilogy (Cone uncem.)	1998–2004	136	41.2%	16.9%	94.4%	±5.4%		
Trilogy HA (Anatomic HA/HATCP (HG V))	1994–1999	58	82.8%	24.1%	94.8%	±5.5%		
Trilogy HA (Lubinus SP II)	1995–2004	847	84.2%	41.1%	96.6%	±1.5%		
Trilogy HA (Optima)	1995–1999	97	94.8%	44.3%	96.9%	±3.3%		
Trilogy HA (Spectron EF Primary)	1996–2004	971	74.2%	46.0%	98.2%	±1.2%		
Weber All-Poly (Straight-stem standard)	1999–2004	669	99.3%	65.3%	98.6%	±1.1%		
ZCA (CPT steel)	1993–2004	113	77.9%	43.4%	95.1%	±4.1%		

Implant Survival per Type

osteoarthritis and aseptic loosening, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
ABG HA (ABG cem.)	1992–1998	142	100.0%	24.6%	100.0%	±0.0%	93.8%	±4.8%
ABG HA (ABG uncem.)	1992–1998	221	100.0%	5.9%	98.6%	±1.5%	84.7%	±5.4%
ABG HA (Lubinus SP II)	1992–1998	268	100.0%	47.0%	99.6%	±0.6%	95.9%	±2.9%
ABG II HA (Lubinus SP II)	1997–2004	167	100.0%	32.3%	99.0%	±1.5%		
Biomet Müller (Bi-Metric cem.)	1992–1995	707	100.0%	59.1%	97.4%	±1.2%	92.0%	±2.3%
Biomet Müller (CPT steel)	1997–2003	901	100.0%	47.6%	99.5%	±0.5%		
Biomet Müller (RX90-S)	1994–2001	1,115	100.0%	54.9%	99.1%	±0.6%	94.8%	±2.5%
Biomet Müller (Stanmore mod)	1997–2002	90	100.0%	44.4%	98.9%	±1.6%		
Cenator (Bi-Metric cem.)	1993–1999	207	100.0%	45.9%	98.5%	±1.6%	94.3%	±3.9%
Cenator (Cenator)	1993–2000	732	100.0%	53.6%	94.2%	±1.8%	86.4%	±4.1%
Cenator (Charnley Elite Plus)	1997–2000	269	100.0%	52.4%	98.4%	±1.5%		
Cenator (Exeter Polished)	1998–2003	559	100.0%	56.4%	99.8%	±0.3%		
Charnley (CAD)	1992–1996	141	100.0%	61.7%	98.5%	±1.8%	95.9%	±3.6%
Charnley (Charnley Elite Plus)	1994–2002	978	100.0%	52.7%	98.5%	±0.8%		
Charnley (Charnley)	1992–2004	17,487	100.0%	57.0%	97.9%	±0.3%	94.2%	±0.5%
Charnley (Exeter Polished)	1992–2004	1,090	100.0%	62.9%	100.0%	±0.0%	98.9%	±1.3%
Charnley (Lubinus SP II)	1992–2004	278	100.0%	62.2%	99.2%	±1.0%	98.2%	±1.9%
Charnley (Müller Straight)	1992–1998	91	100.0%	73.6%	98.8%	±1.8%	97.3%	±3.1%
Charnley (PCA E-series Textured)	1992–1996	106	100.0%	57.5%	97.1%	±3.0%	83.0%	±8.0%
Charnley Elite (Charnley Elite Plus)	1992–2002	638	100.0%	51.1%	95.7%	±1.8%		
Charnley Elite (Charnley)	1992–2001	204	100.0%	59.3%	94.7%	±3.2%	90.6%	±4.5%
Charnley Elite (Exeter Polished)	1996–2004	3,095	100.0%	54.8%	99.9%	±0.1%		
Charnley Elite (Lubinus SP II)	1992–2004	652	100.0%	57.2%	99.2%	±0.9%		
Charnley Elite (PCA E-series Textured)	1992–1997	170	100.0%	57.6%	98.2%	±2.0%	88.9%	±5.4%
Charnley Elite (Spectron EF Primary)	1998–2004	228	100.0%	57.9%	98.6%	±1.6%		
CLS Spotorno (CLS Spotorno)	1992–2004	471	100.0%	27.2%	100.0%	±0.0%	99.4%	±0.9%
Contemporary (Exeter Polished)	1996–2004	284	100.0%	54.6%	98.5%	±1.5%		
Contemporary (Lubinus SP II)	1994–2001	68	100.0%	64.7%	100.0%	±0.0%		
Duralock (uncem.) (Spectron EF Primary)	1996–2000	98	100.0%	55.1%	98.0%	±2.5%		
Exeter Duration (Exeter Polished)	1999–2004	6,656	100.0%	54.2%	99.5%	±0.3%		
Exeter Duration (Lubinus SP II)	1999–2004	343	100.0%	53.4%	100.0%	±0.0%		
Exeter Metal-backed (Exeter Polished)	1992–1994	403	100.0%	67.7%	99.2%	±0.9%	95.7%	±2.2%
Exeter All-Poly (Exeter Polished)	1992–2004	4,653	100.0%	55.9%	98.8%	±0.3%	95.8%	±0.9%
Exeter All-Poly (Lubinus SP II)	1992–2002	160	100.0%	48.1%	97.9%	±2.2%		
Exeter Polished (Exeter Polished)	1992–1995	460	100.0%	55.7%	97.7%	±1.4%	94.9%	±2.2%
FAL (Lubinus SP II)	1999–2004	2,289	100.0%	56.6%	99.9%	±0.2%		
Harris-Galante I (Lubinus SP II)	1992–1997	57	100.0%	24.6%	100.0%	±0.0%		
Harris-Galante II (Charnley)	1992–1996	123	100.0%	30.1%	98.4%	±2.0%	95.8%	±3.6%
Harris-Galante II (Lubinus SP II)	1992–1997	146	100.0%	21.9%	98.6%	±1.6%	88.8%	±5.4%
Harris-Galante II (Spectron EF)	1992–1996	118	100.0%	61.0%	100.0%	±0.0%	95.2%	±4.0%
ITH (ITH)	1992–1996	183	100.0%	45.4%	98.8%	±1.5%	97.4%	±2.6%
Lubinus All-Poly (Lubinus IP)	1992–1998	459	100.0%	49.5%	99.3%	±0.8%	98.3%	±1.4%
Lubinus All-Poly (Lubinus SP II)	1992–2004	34,230	100.0%	58.5%	99.6%	±0.1%	98.1%	±0.3%
Mallory-Head uncem. (Lubinus SP II)	1995–2004	78	100.0%	7.7%	100.0%	±0.0%		
Müller All-Poly (Bi-Metric cem.)	1992–1995	77	100.0%	62.3%	97.2%	±3.3%	97.2%	±3.3%
Müller All-Poly (MS30 Unpolished)	1992–2001	66	100.0%	71.2%	98.3%	±2.5%		

(continued on next page.)

Implant Survival per Type (cont.)

osteoarthritis and aseptic loosening, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
Müller All-Poly (Müller Straight)	1992–2004	1,136	100.0%	65.2%	99.6%	±0.4%	98.3%	±1.1%
Müller All-Poly (Straight-stem standard)	1996–2004	123	100.0%	50.4%	97.4%	±3.1%		
Omnifit (Lubinus SP II)	1992–1995	139	100.0%	28.8%	97.8%	±2.3%	78.6%	±7.1%
Omnifit (Omnifit)	1992–1995	183	100.0%	17.5%	93.4%	±3.6%	67.7%	±7.0%
OPTICUP (Lubinus SP II)	1995–2004	364	100.0%	54.1%	99.3%	±0.8%		
OPTICUP (NOVA Scan Hip)	1993–2000	103	100.0%	49.5%	91.8%	±5.4%		
OPTICUP (Optima)	1994–2000	557	100.0%	56.4%	97.6%	±1.3%	91.7%	±2.8%
OPTICUP (Scan Hip II Collar)	1996–2004	1,503	100.0%	52.2%	98.4%	±0.9%		
OPTICUP (Scan Hip Collar)	1995–1996	66	100.0%	59.1%	98.3%	±2.5%		
Reflection (Spectron EF Primary)	1996–2004	3,909	100.0%	54.5%	99.2%	±0.4%		
Reflection (Spectron EF)	1992–1998	722	100.0%	58.3%	99.4%	±0.6%	97.4%	±1.5%
Reflection HA (Lubinus SP II)	1995–2004	152	100.0%	11.2%	95.4%	±4.4%		
Reflection HA (Spectron EF)	1995–1998	58	100.0%	34.5%	100.0%	±0.0%		
Romanus (Bi-Metric cem.)	1992–1998	287	100.0%	33.8%	96.8%	±2.1%	88.3%	±4.1%
Romanus (Bi-Metric HA uncem.)	1992–1999	120	100.0%	19.2%	100.0%	±0.0%	92.9%	±4.8%
Romanus (Bi-Metric uncem.)	1992–1997	187	100.0%	11.8%	99.5%	±0.8%	93.1%	±3.8%
Romanus (Lubinus SP II)	1992–1996	72	100.0%	22.2%	98.6%	±2.1%	91.1%	±6.8%
Romanus (RX90-S)	1994–2000	166	100.0%	40.4%	97.0%	±2.6%	90.4%	±4.9%
Romanus HA (Bi-Metric HA uncem.)	1994–2004	187	100.0%	12.3%	100.0%	±0.0%		
Scan Hip Cup (Optima)	1993–2001	356	100.0%	62.4%	99.7%	±0.5%	97.2%	±2.6%
Scan Hip Cup (Scan Hip II Collar)	1996–2001	159	100.0%	44.7%	99.3%	±1.0%		
Scan Hip Cup (Scan Hip Collar)	1992–2000	2,041	100.0%	55.1%	98.8%	±0.5%	93.4%	±1.3%
Scan Hip Cup (Scan Hip Collarless)	1992–1995	90	100.0%	57.8%	100.0%	±0.0%	91.2%	±6.8%
Secur-Fit (Omnifit)	1996–1999	75	100.0%	2.7%	95.9%	±4.3%		
SHP (Lubinus SP II)	1994–2004	492	100.0%	56.1%	100.0%	±0.0%	99.2%	±1.0%
SLS (CLS Spotorno)	1992–1998	54	100.0%	40.7%	98.1%	±2.8%		
Spectron Metal-backed (Spectron EF)	1992–1993	87	100.0%	66.7%	100.0%	±0.0%	100.0%	±0.0%
Spectron (Spectron EF)	1993–1998	61	100.0%	52.5%	100.0%	±0.0%		
Stanmore (Stanmore mod)	1994–2004	276	100.0%	59.4%	100.0%	±0.0%		
Stanmore (Stanmore)	1992–1998	90	100.0%	57.8%	97.6%	±2.9%	91.3%	±6.8%
Trilogy HA (Lubinus SP II)	1995–2004	713	100.0%	43.6%	99.7%	±0.5%		
Trilogy HA (Optima)	1995–1999	92	100.0%	44.6%	97.8%	±2.6%		
Trilogy HA (Spectron EF Primary)	1996–2004	720	100.0%	53.5%	99.7%	±0.5%		
Weber All-Poly (Straight-stem standard)	1999–2004	664	100.0%	65.8%	100.0%	±0.0%		
ZCA (CPT steel)	1993–2004	88	100.0%	50.0%	97.4%	±3.1%		

[1] First and last observed year of primary THR.
[2] Number of primary THRs during the period with the conditions specified in the table heading.
[3] Percentage of primary THRs performed due to primary osteoarthritis.
[4] Percentage of primary THRs in the age-group 60-75 years (age at primary operation).

Certain hospitals do not have a sufficient number of primary operations during the period to give a 10-year implant survival value. For it to be possible to calculate the 10-year survival, the longest observed time between the primary operation and revision must be at least 10 years. We have therefore chosen to present the 5-year survival as well. A condition which has consistently been applied in the survival statistics from the register is that only values where at least 50 patients at risk remain are shown. Hospitals with smaller production may therefore lack values for this reason. All hospitals that have reported to the register during 2004 are included in the table, even if values are lacking.

Implant Survival per Hospital

all diagnoses, all reasons for revision and all types of implants, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
University/Regional Hospitals								
Huddinge	1992–2004	2,619	64.5%	45.2%	95.3%	±1.0%	87.6%	±2.0%
Karolinska	1992–2004	2,287	56.8%	44.9%	94.9%	±1.1%	87.4%	±2.9%
Linköping	1992–2004	2,464	68.0%	44.4%	99.0%	±0.5%	96.6%	±1.4%
Lund	1992–2004	1,949	50.1%	40.5%	97.1%	±0.9%	89.7%	±2.2%
Malmö	1992–2004	2,831	51.9%	45.8%	96.0%	±0.8%	88.1%	±1.9%
SU/Sahlgrenska	1992–2004	2,595	60.9%	41.0%	97.7%	±0.7%	91.5%	±2.0%
SU/Östra	1992–2004	2,112	75.4%	49.7%	97.5%	±0.8%	93.2%	±1.7%
Umeå	1992–2004	1,546	70.0%	48.7%	97.5%	±0.9%	94.8%	±1.5%
Uppsala	1992–2004	3,362	55.1%	39.0%	94.4%	±1.0%	86.9%	±2.0%
Central Hospitals								
Borås	1992–2004	2,307	68.4%	48.8%	97.5%	±0.7%	94.6%	±1.5%
Danderyd	1992–2004	3,599	85.8%	43.8%	96.8%	±0.7%	93.4%	±1.4%
Eksjö	1992–2004	2,232	83.5%	53.5%	96.6%	±0.9%	93.4%	±1.6%
Eskilstuna	1992–2004	1,814	59.8%	47.5%	97.9%	±0.7%	95.8%	±1.5%
Falun	1992–2004	1,833	82.9%	51.6%	96.0%	±1.3%		
Gävle	1992–2004	1,915	71.4%	47.6%	96.9%	±0.9%	84.2%	±6.5%
Halmstad	1992–2004	2,122	64.1%	48.0%	97.3%	±0.8%	93.3%	±2.0%
Helsingborg	1992–2004	1,905	72.9%	49.7%	96.4%	±1.0%	86.6%	±2.8%
Hässleholm-Kristianstad	1992–2004	4,209	83.3%	53.6%	97.9%	±0.5%	93.9%	±1.5%
Jönköping	1992–2004	2,100	79.8%	51.0%	97.5%	±0.8%	95.2%	±1.3%
Kalmar	1992–2004	2,287	65.0%	48.8%	98.3%	±0.6%	95.3%	±1.5%
Karlskrona	1992–2004	1,069	71.8%	47.5%	95.5%	±1.4%	90.0%	±2.5%
Karlstad	1992–2004	1,811	68.4%	48.2%	97.2%	±0.9%	92.7%	±2.2%
Norrköping	1992–2004	2,676	67.5%	47.9%	98.2%	±0.6%	92.0%	±1.9%
S:t Göran	1992–2004	5,492	72.8%	45.6%	94.6%	±0.7%	88.2%	±1.5%
Skövde	1992–2004	2,124	71.1%	45.6%	96.4%	±0.9%	89.2%	±2.2%
SU/Mölndal	1992–2004	1,567	75.9%	51.9%	97.0%	±1.0%	91.5%	±2.5%
Sunderby (inklusive Boden)	1992–2004	1,970	63.5%	48.5%	97.1%	±0.9%	91.8%	±1.9%
Sundsvall	1992–2004	2,406	82.6%	52.2%	96.0%	±0.9%	93.1%	±1.6%
Södersjukhuset	1992–2004	3,548	57.5%	40.9%	98.3%	±0.5%	93.9%	±1.4%
Uddevalla	1992–2004	2,604	68.9%	49.5%	97.9%	±0.6%	93.7%	±1.8%
Varberg	1992–2004	2,157	83.9%	52.3%	97.2%	±0.9%	91.7%	±2.2%
Västerås	1992–2004	1,546	67.1%	51.9%	97.8%	±0.8%	93.1%	±2.3%
Växjö	1992–2004	1,331	82.8%	53.6%	97.8%	±0.9%	94.1%	±2.1%
Ystad	1992–2004	1,394	77.8%	48.9%	97.1%	±1.0%	94.3%	±2.1%
Örebro	1992–2004	2,328	71.6%	49.7%	98.5%	±0.6%	95.7%	±1.4%
Östersund	1992–2004	1,884	80.3%	52.5%	97.6%	±0.8%	94.8%	±1.5%
Rural Hospitals								
Alingsås	1992–2004	1,180	82.0%	57.3%	98.8%	±0.8%	97.2%	±1.6%
Arvika	1992–2004	569	82.1%	55.4%	91.8%	±2.9%	84.7%	±5.0%
Bollnäs	1992–2004	1,402	83.0%	54.9%	98.1%	±0.9%	94.1%	±3.0%
Carlanderska	1992–2004	525	93.0%	48.8%	98.8%	±1.1%	96.1%	±3.6%
Enköping	1992–2004	924	93.5%	60.9%	96.6%	±1.6%	89.9%	±4.9%
Falköping	1992–2004	1,601	85.8%	57.1%	97.8%	±0.9%	91.4%	±3.0%
Frölunda Specialistsjukhus	2002–2004	96	99.0%	58.3%				

(continued on next page.)

Implant Survival per Hospital (cont.)

all diagnoses, all reasons for revision and all types of implants, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
Gällivare	1992–2004	1,125	79.9%	55.8%	99.0%	±0.7%	97.6%	±1.4%
Hudiksvall	1992–2004	1,539	76.0%	53.9%	97.6%	±0.9%	96.5%	±1.3%
Kalix	1992–2004	796	83.4%	58.7%	99.0%	±0.8%	97.8%	±1.6%
Karlshamn	1992–2004	1,229	89.5%	50.0%	97.9%	±1.1%	95.2%	±2.4%
Karlskoga	1992–2004	1,277	86.7%	52.5%	98.6%	±0.7%	94.8%	±2.5%
Katrineholm	1992–2004	1,465	87.7%	53.2%	99.0%	±0.6%	99.0%	±0.6%
Kungälv	1992–2004	1,696	86.1%	55.8%	99.2%	±0.5%	94.5%	±3.5%
Köping	1992–2004	1,684	92.0%	58.1%	98.9%	±0.7%	95.2%	±3.1%
Landskrona	1992–2004	2,422	90.2%	49.0%	98.3%	±0.6%	94.1%	±2.3%
Lidköping	1992–2004	1,032	88.9%	50.7%	98.3%	±0.8%		
Lindesberg	1992–2004	1,238	81.0%	52.5%	98.3%	±0.9%	95.8%	±2.2%
Ljungby	1992–2004	1,327	87.8%	54.0%	98.3%	±0.8%	95.4%	±1.9%
Lycksele	1992–2004	1,562	79.1%	57.7%	98.8%	±0.7%	97.3%	±1.7%
Mora	1992–2004	1,661	85.5%	53.7%	96.9%	±1.0%	93.8%	±1.9%
Motala	1992–2004	1,602	76.2%	49.6%	99.1%	±0.6%	96.0%	±2.1%
Norrtälje	1992–2004	1,011	74.1%	50.0%	96.4%	±1.4%	96.2%	±1.4%
Nyköping	1992–2004	1,395	80.7%	55.8%	98.5%	±0.7%	97.7%	±1.2%
Oskarshamn	1992–2004	1,071	80.6%	53.1%	99.3%	±0.6%	96.1%	±2.8%
Piteå	1992–2004	949	82.8%	55.7%	98.3%	±1.0%	96.2%	±2.1%
Simrishamn	1992–2004	875	91.3%	57.1%	97.9%	±1.4%	90.3%	±3.8%
Skellefteå	1992–2004	1,514	74.8%	52.4%	97.8%	±0.8%	96.8%	±1.1%
Skene	1992–2004	875	91.5%	56.6%	98.4%	±1.0%	94.8%	±2.7%
Sollefteå	1992–2004	1,112	85.9%	54.9%	97.9%	±1.1%	93.7%	±2.8%
Sophiahemmet	1992–2004	1,925	96.7%	53.6%	94.6%	±1.3%	83.6%	±3.8%
Södertälje	1995–2004	889	84.3%	53.7%	99.0%	±0.9%		
Torsby	1992–2004	808	81.4%	56.1%	96.9%	±1.5%	90.7%	±3.8%
Trelleborg	1992–2004	1,889	76.3%	47.6%	96.5%	±1.0%	93.5%	±1.9%
Visby	1992–2004	1,014	82.0%	52.9%	93.8%	±1.7%	87.1%	±3.3%
Värnamo	1992–2004	1,206	82.9%	53.7%	98.8%	±0.8%	96.2%	±2.0%
Västervik	1992–2004	1,284	79.0%	52.8%	97.8%	±1.0%	94.6%	±2.1%
Ängelholm	1992–2004	1,760	75.6%	49.3%	97.5%	±0.9%	92.4%	±2.5%
Örnsköldsvik	1992–2004	1,385	80.5%	55.2%	99.4%	±0.4%	98.2%	±1.1%
Private Hospitals								
Elisabethsjukhuset	1999–2004	322	87.0%	56.2%	95.4%	±4.4%		
Gothenburg Medical Center	2004–2004	17	100.0%	47.1%				
Movement	2003–2004	14	92.9%	57.1%				
Ortopediska Huset	1996–2004	901	98.1%	57.5%	97.0%	±2.0%		
Sabbatsberg Närsjukhuset	1998–2004	1,513	89.5%	56.9%	99.6%	±0.4%		
Stockholms Specialistvård	2000–2004	441	96.6%	55.8%				

Implant Survival per Hospital

osteoarthritis and aseptic loosening, all types of implants, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
University/Regional Hospitals								
Huddinge	1992–2004	1,688	100.0%	49.1%	95.8%	±1.1%	88.4%	±2.3%
Karolinska	1992–2004	1,300	100.0%	50.6%	98.0%	±1.0%	89.7%	±4.3%
Linköping	1992–2004	1,676	100.0%	52.4%	99.5%	±0.5%	97.1%	±1.5%
Lund	1992–2004	976	100.0%	46.4%	98.7%	±0.8%	92.8%	±2.3%
Malmö	1992–2004	1,470	100.0%	51.6%	98.1%	±0.8%	90.1%	±2.1%
SU/Sahlgrenska	1992–2004	1,581	100.0%	45.2%	98.8%	±0.6%	93.4%	±2.2%
SU/Östra	1992–2004	1,592	100.0%	52.6%	98.5%	±0.6%	94.5%	±1.7%
Umeå	1992–2004	1,082	100.0%	53.4%	99.2%	±0.6%	98.3%	±1.0%
Uppsala	1992–2004	1,854	100.0%	47.2%	95.8%	±1.1%	89.8%	±2.1%
Central Hospitals								
Borås	1992–2004	1,578	100.0%	54.1%	99.1%	±0.6%	96.9%	±1.4%
Danderyd	1992–2004	3,088	100.0%	45.7%	99.2%	±0.4%	96.9%	±1.1%
Eksjö	1992–2004	1,864	100.0%	56.7%	98.6%	±0.6%	95.7%	±1.6%
Eskilstuna	1992–2004	1,084	100.0%	55.7%	99.0%	±0.6%	96.3%	±1.7%
Falun	1992–2004	1,519	100.0%	54.7%	97.2%	±1.2%		
Gävle	1992–2004	1,368	100.0%	52.2%	99.4%	±0.6%	91.9%	±6.0%
Halmstad	1992–2004	1,361	100.0%	51.7%	99.7%	±0.4%	94.3%	±3.4%
Helsingborg	1992–2004	1,389	100.0%	53.6%	98.1%	±0.9%	89.8%	±2.9%
Hässleholm-Kristianstad	1992–2004	3,508	100.0%	56.1%	99.1%	±0.5%	95.0%	±1.8%
Jönköping	1992–2004	1,676	100.0%	54.7%	99.7%	±0.3%	98.3%	±1.1%
Kalmar	1992–2004	1,487	100.0%	55.5%	99.6%	±0.4%	97.4%	±1.6%
Karlskrona	1992–2004	768	100.0%	49.0%	97.5%	±1.1%	93.3%	±2.5%
Karlstad	1992–2004	1,238	100.0%	53.2%	99.2%	±0.6%	96.6%	±1.8%
Norrköping	1992–2004	1,806	100.0%	54.3%	99.1%	±0.5%	92.5%	±2.3%
S:t Göran	1992–2004	3,999	100.0%	48.3%	97.3%	±0.6%	90.3%	±2.2%
Skövde	1992–2004	1,510	100.0%	47.9%	97.8%	±0.9%	91.7%	±2.2%
SU/Mölndal	1992–2004	1,189	100.0%	54.6%	99.0%	±0.7%	96.3%	±1.8%
Sunderby (inklusive Boden)	1992–2004	1,251	100.0%	55.6%	99.3%	±0.6%	95.8%	±1.9%
Sundsvall	1992–2004	1,988	100.0%	55.4%	98.7%	±0.6%	96.4%	±1.5%
Södersjukhuset	1992–2004	2,041	100.0%	46.3%	99.6%	±0.3%	96.5%	±1.5%
Uddevalla	1992–2004	1,793	100.0%	54.8%	99.4%	±0.5%	96.7%	±1.4%
Varberg	1992–2004	1,809	100.0%	56.0%	98.3%	±0.8%	93.3%	±2.3%
Västerås	1992–2004	1,037	100.0%	56.1%	99.4%	±0.6%	95.7%	±2.2%
Växjö	1992–2004	1,102	100.0%	55.9%	99.1%	±0.7%	95.9%	±2.0%
Ystad	1992–2004	1,085	100.0%	53.9%	99.3%	±0.6%	97.0%	±2.0%
Örebro	1992–2004	1,666	100.0%	55.0%	99.3%	±0.5%	97.9%	±1.1%
Östersund	1992–2004	1,513	100.0%	54.5%	99.7%	±0.3%	97.1%	±1.4%
Rural Hospitals								
Alingsås	1993–2004	968	100.0%	58.8%	99.5%	±0.5%	98.0%	±1.8%
Arvika	1992–2004	467	100.0%	56.5%	95.9%	±2.3%	89.6%	±5.0%
Bollnäs	1992–2004	1,164	100.0%	56.8%	99.4%	±0.6%	97.8%	±1.9%
Carlanderska	1992–2004	488	100.0%	48.6%	99.4%	±0.7%	96.9%	±3.5%
Enköping	1992–2004	864	100.0%	61.8%	97.9%	±1.4%	92.9%	±4.5%
Falköping	1992–2004	1,374	100.0%	57.3%	98.9%	±0.8%	91.9%	±3.8%
Frölunda Specialistsjukhus	2002–2004	95	100.0%	57.9%				

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Implant Survival per Hospital (cont.)

osteoarthritis and aseptic loosening, all types of implants, 1992-2004

Cup (Stem)	Period [1]	Number [2]	OA [3]	60-75 yrs [4]	5 yrs	95% CL	10 yrs	95% CL
Gällivare	1992–2004	899	100.0%	59.6%	100.0%	±0.0%	99.3%	±0.9%
Hudiksvall	1992–2004	1,170	100.0%	59.6%	99.6%	±0.4%	99.3%	±0.7%
Kalix	1992–2004	664	100.0%	62.7%	99.7%	±0.5%	98.7%	±1.5%
Karlshamn	1992–2004	1,100	100.0%	51.7%	99.3%	±0.6%	97.1%	±2.3%
Karlskoga	1992–2004	1,107	100.0%	54.1%	99.9%	±0.1%	97.2%	±2.2%
Katrineholm	1992–2004	1,285	100.0%	55.7%	99.6%	±0.5%	99.6%	±0.5%
Kungälv	1992–2004	1,460	100.0%	56.5%	99.6%	±0.5%	95.4%	±3.6%
Köping	1993–2004	1,549	100.0%	58.9%	99.1%	±0.8%	94.9%	±4.0%
Landskrona	1992–2004	2,184	100.0%	51.1%	99.2%	±0.5%	94.9%	±2.4%
Lidköping	1992–2004	917	100.0%	51.4%	99.3%	±0.6%		
Lindesberg	1992–2004	1,003	100.0%	55.2%	99.9%	±0.1%	97.5%	±2.3%
Ljungby	1992–2004	1,165	100.0%	55.7%	99.7%	±0.4%	97.7%	±1.5%
Lycksele	1992–2004	1,235	100.0%	58.5%	99.5%	±0.5%	96.9%	±3.1%
Mora	1992–2004	1,420	100.0%	56.3%	98.0%	±0.9%	95.0%	±1.8%
Motala	1993–2004	1,220	100.0%	53.2%	99.7%	±0.4%	97.5%	±2.2%
Norrtälje	1992–2004	749	100.0%	55.7%	98.8%	±0.9%	98.5%	±1.2%
Nyköping	1992–2004	1,126	100.0%	59.7%	99.8%	±0.3%	99.3%	±0.7%
Oskarshamn	1992–2004	863	100.0%	56.2%	99.9%	±0.2%	97.4%	±2.6%
Piteå	1992–2004	786	100.0%	58.4%	99.8%	±0.4%	99.2%	±1.0%
Simrishamn	1992–2004	799	100.0%	59.1%	99.1%	±0.9%	92.0%	±4.0%
Skellefteå	1992–2004	1,133	100.0%	57.1%	99.8%	±0.3%	99.0%	±1.0%
Skene	1992–2004	801	100.0%	58.4%	98.8%	±1.0%	96.9%	±1.9%
Sollefteå	1992–2004	955	100.0%	56.6%	98.9%	±0.9%	94.6%	±2.9%
Sophiahemmet	1992–2004	1,862	100.0%	53.7%	96.5%	±1.1%	87.0%	±3.9%
Södertälje	1995–2004	749	100.0%	54.7%	100.0%	±0.0%		
Torsby	1992–2004	658	100.0%	58.7%	98.5%	±1.4%	90.3%	±5.2%
Trelleborg	1992–2004	1,441	100.0%	48.5%	98.5%	±0.8%	94.9%	±2.1%
Visby	1992–2004	831	100.0%	54.9%	95.1%	±1.7%	90.7%	±3.1%
Värnamo	1992–2004	1,000	100.0%	56.3%	99.5%	±0.5%	96.8%	±2.1%
Västervik	1992–2004	1,014	100.0%	55.1%	99.7%	±0.4%	97.7%	±1.6%
Ängelholm	1992–2004	1,330	100.0%	54.7%	98.9%	±0.7%	96.0%	±2.1%
Örnsköldsvik	1992–2004	1,115	100.0%	60.2%	100.0%	±0.0%	99.8%	±0.3%
Private Hospitals								
Elisabethsjukhuset	1999–2004	280	100.0%	54.3%	97.7%	±2.8%		
Gothenburg Medical Center	2004–2004	17	100.0%	47.1%				
Movement	2003–2004	13	100.0%	53.8%				
Ortopediska Huset	1996–2004	884	100.0%	57.9%	99.0%	±1.3%		
Sabbatsberg Närsjukhuset	1998–2004	1,354	100.0%	57.4%	100.0%	±0.0%		
Stockholms Specialistvård	2000–2004	426	100.0%	56.3%				

[1] First and last observed year of primary THR.
[2] Number of primary THRs during the period with the conditions specified in the table heading.
[3] Percentage of primary THRs performed due to primary osteoarthritis.
[4] Percentage of primary THRs in the age-group 60-75 years (age at primary operation).

Certain types of implants have not been used sufficiently often during the period to give a 10-year implant survival value. For it to be possible to calculate the 10-year survival, the longest observed time between the primary operation and revision must be at least 10 years. A condition which has consistently been applied in the survival statistics from the register is that only values where at least 50 patients at risk remain are shown. Implants used less often may therefore be lacking for this reason. Only implants for which the 5-year value has been calculated are included in the table.

Environmental and technical profile

In the environmental/technique profile, the units report their surgical technique and surgical environment annually. It is important to be aware that each hospital must update its environmental profile via the website. If it does not, it is assumed that the environmental profile / surgical technique is unchanged from the previous year.

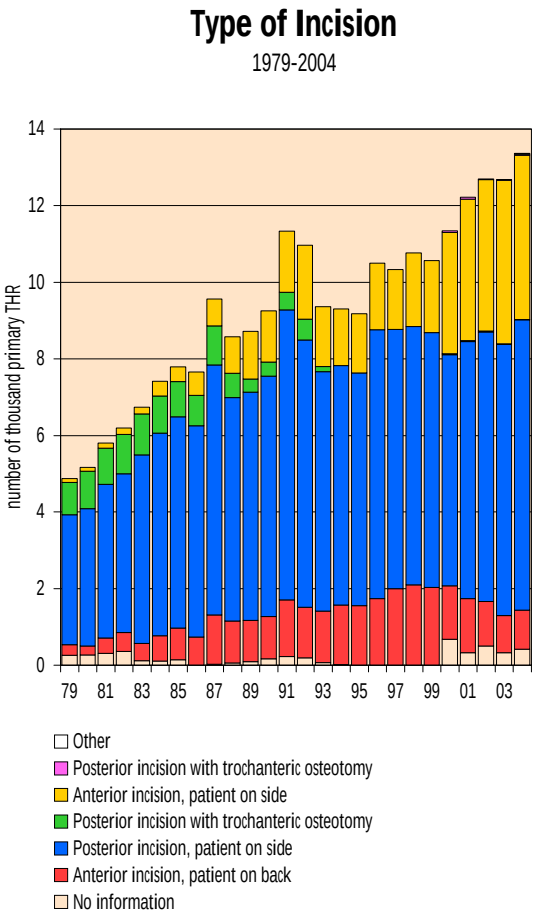
Since the environmental profile is based on aggregated data per hospital per year, it leads to uncertainty in statistical analyses of the database. The primary and revision databases are based on the individual operation, the patient's personal identity number and the side as unique variables.

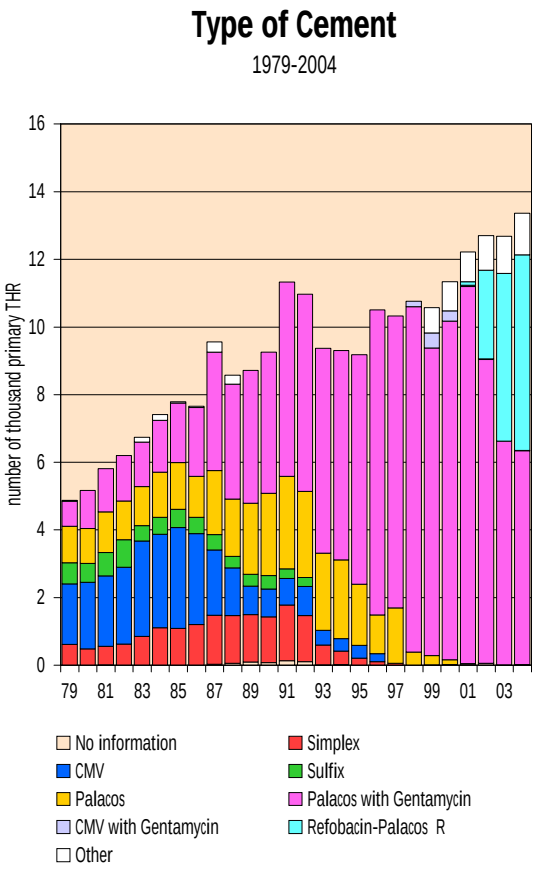
Most hospitals use a very similar technique. This applies above all to technical factors that have previously been shown to influence the results in a statistical regression analysis (See Annual report 1997-1999). In this study, we found several factors relating to femoral cementing which reduced the risk significantly, viz.:

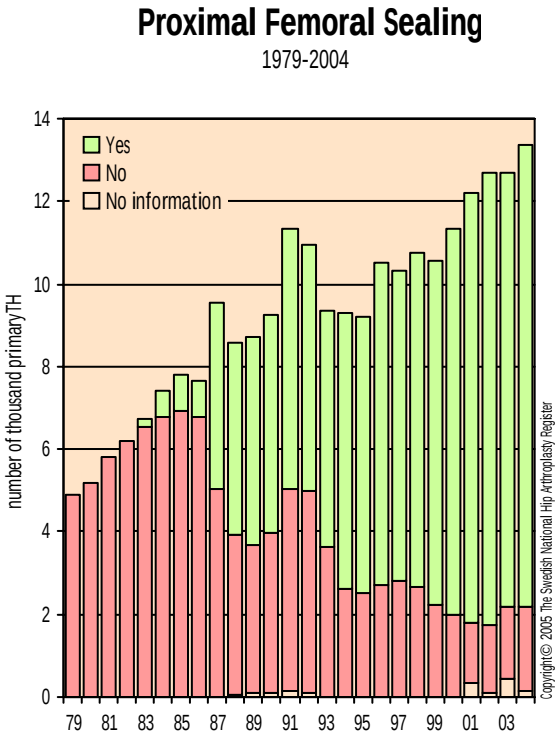
- Cementing with Palacos Gentamycin
- High pulsatile lavage
- Distal femoral plugging.
- Retrograde cement-filling (cement pistol).
- Proximal femoral seal (high-pressure cementing).

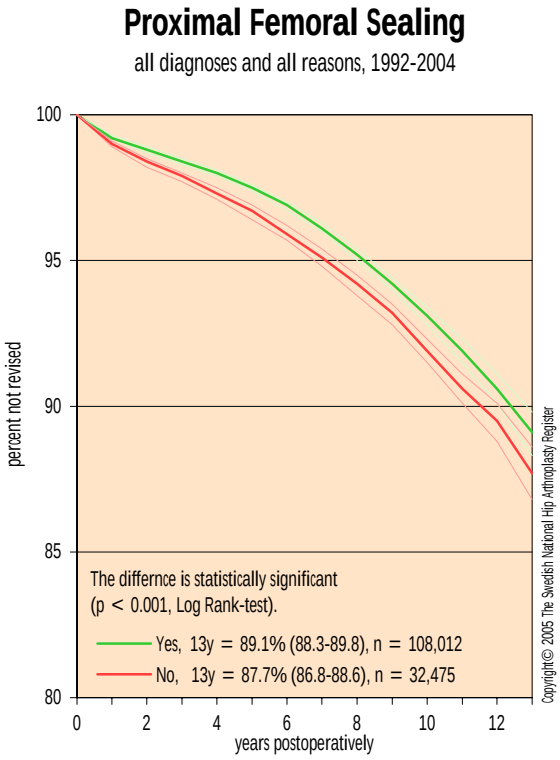
The first four of these technical variables are now used in almost 100% of cases at all hospitals. The percentage that do not use proximal femoral seal, i.e. do not use high-pressure cementing, has increased somewhat during recent years. In 2004 15.4% of the units reported that they did not use proximal femoral seal although previous regression analyses had clearly shown that this factor reduces the risk of mechanical failure and future revision.

A Kaplan-Meier analysis of approximately 140 000 patients operated upon during the period 1992-2004 gave a 13-year survival for the patients operated upon using high-pressure technique of 89.1 + /-0.8% while the corresponding implant survival for those operated upon without this technique was 87.7 + /-0.9%. The difference is statistically significant ($p < 0.001$, Log Rank Test). The reason why some units hesitate to use the technique is no doubt related to the increased risk of









thromboembolic complications. This risk can be reduced, however, by careful cleaning of the bone bed (high pulsatile lavage) prior to cementing. This has been scientifically tested in several studies. The recommendation is quite clear: proximal sealing with high-pressure irrigation both before and after application of the distal femoral plug is essential for enhanced cement penetration and to reduce the risk of embolism.

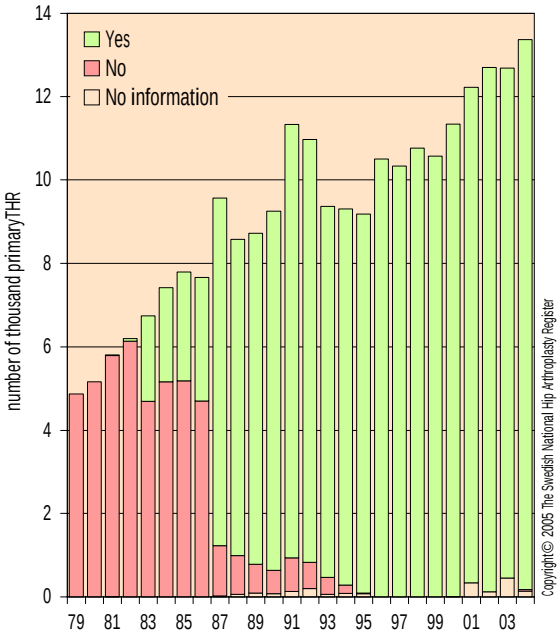
The majority of patients are operated upon with Palacos Gentamycin or its generic equivalent, i.e. Refobacin-Palacos R. The products are identical but we nevertheless register both separately. During the past year, several units have changed to Refobacin-Palacos. We urge the hospitals and individual surgeons to specify exactly which cement is used when reporting online.

We note continued increase of the use of compression instruments for cementing the cup. The proportion of units that do not use a brush for cleansing now exceeds 34%. This is consistent with previous information from the register as we were not able to demonstrate any significant effect of this method of cleansing and illustrates the impact the information from the register has.

Almost 60% of the patients have been operated upon via posterior incisions. At the same time, we note a reduction in anterolateral incisions in the supine position while the number of anterolateral incisions in the lateral position is almost unchanged compared to previous years. Since 2003 the number of possible types of incisions has been increased. Three types of mini-incisions have been included. During 2003 and 2004, five and 27 patients respectively have been operated upon in Sweden with a so-called MIS 1 (anterior or posterior) or MIS 2. The number is still too small for an adequate analysis. Of the 32 patients operated upon with some form of mini-incision so far, three (9.4%) have undergone reoperation for some reason and with a short follow-up time. This indicates introduction problems with this new surgical approach.

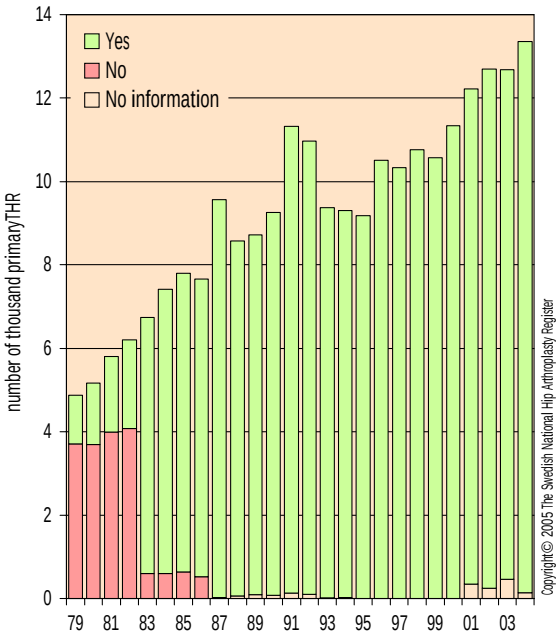
Cleansing by Lavage

1979-2004



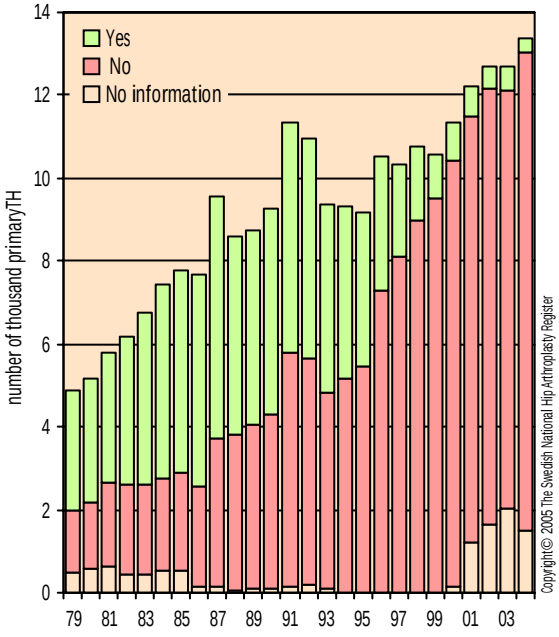
Distal Femoral Plug

1979-2004



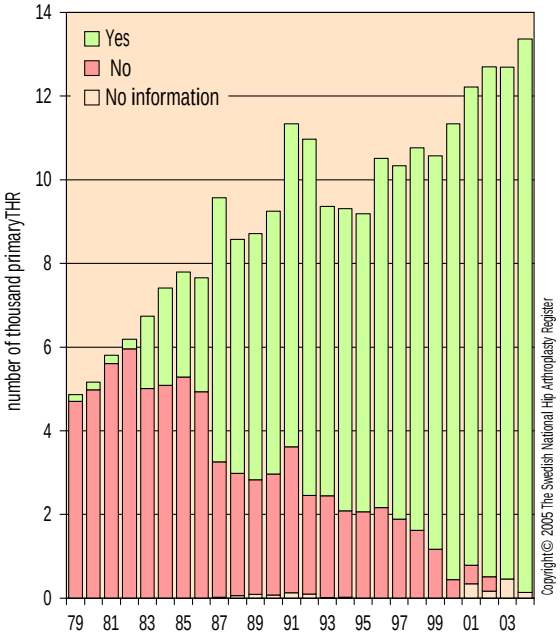
Per Oral Antibiotics

1979-2004



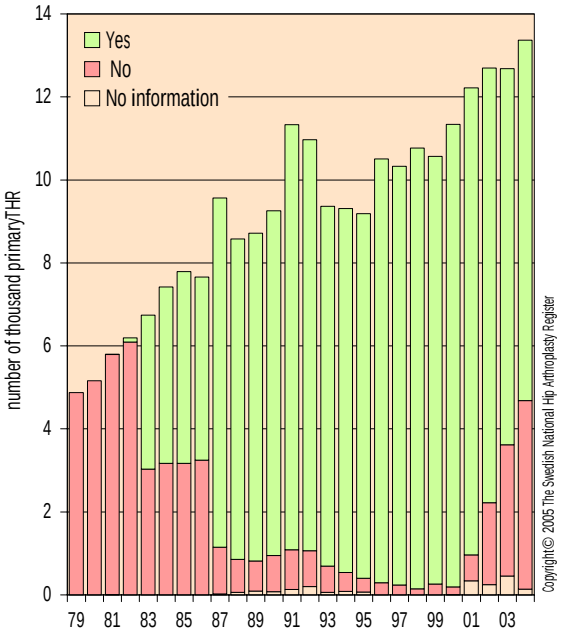
Acetabular Compression

1979-2004



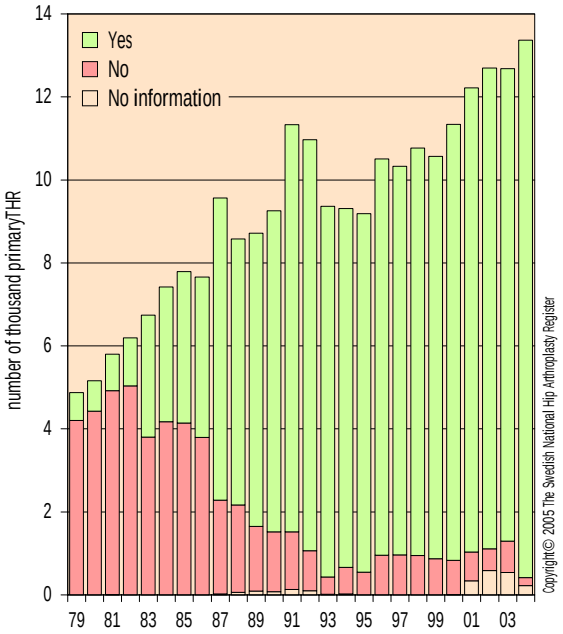
Cleansing by Brush

1979-2004



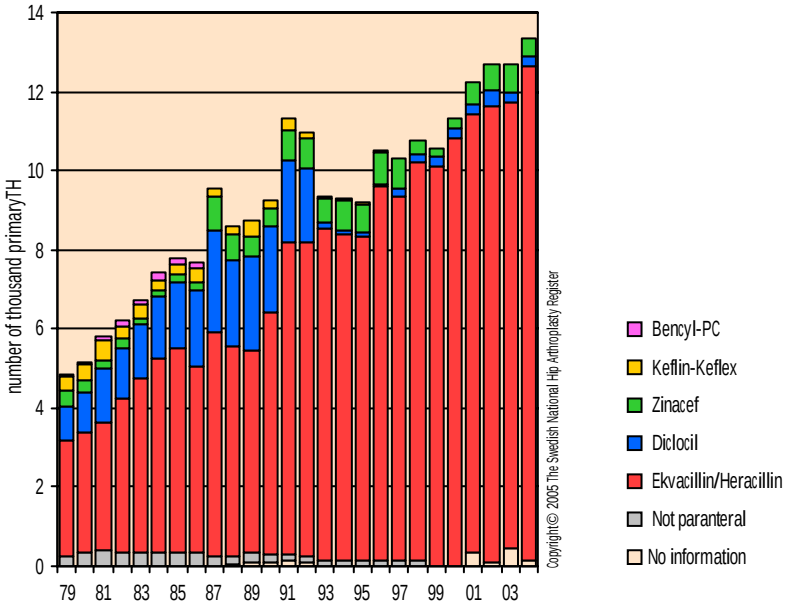
Retrograde Cement-filling of Femur

1979-2004



Parental Brand of Antibiotics

1979-2004



Periprosthetic femoral fractures

During the last few years, periprosthetic femoral fractures have been the second most common reason for revision during mid- to long-term follow-up (from 4 to 6 years after primary THR – see the table on page 26). The increasing number of cases of this serious complication is not due to an increased incidence (see Results). The most likely explanation is instead that the population of THR patients is increasing continuously and that both younger and older patients are operated upon more often than before. This in turn means that the risk-group is steadily increasing. Furthermore, after four decades of hip implant surgery, the number of patients with a revised or re-revised hip has increased. Periprosthetic fractures are more common after revision compared to after primary THR. Studies of late periprosthetic fractures performed so far report relatively small materials and usually concern a single method of treatment without comparisons. Femoral periprosthetic fractures are reported to the register as a complication, which has provided a unique opportunity to collect a large prospective material for analysis.

Material and methods

Between 1979 and 2000, 1 049 late periprosthetic fractures were reported to the register. During the period 1999-2000, the last 321 cases were followed prospectively in a nationwide multicentre study with clinical (Harris Hip Score and Standardised Follow-up Protocol – see page 14) and radiological follow-up 1-2 years postoperatively. The material was analysed mainly with respect to patient demographics, implant-related factors, fracture treatment and outcome. Via the register's database, it was possible to make comparisons between the fracture group and other patients operated upon during the same period.

The patients were divided into two groups, those that sustained a fracture after the primary arthroplasty and those that were revised one or more times before the fracture occurred. The fractures were classified according to the Vancouver classification into three levels: fracture around the greater or lesser trochanter (type A), those around the implant (type B) and those distal to the implant (type C). Type B fractures were divided into three subgroups: those around a fixed stem (B1), those around a loose stem (B2) and those around a loose stem with extensive bone loss (B3).

In the statistical risk analyses presented, only the group with fractures after primary THR are included. The revision group is more heterogeneous, with a number of confounding factors which make statistical analysis difficult.

Results

In this Annual Report, only the most important clinical results are presented. For further details, readers are referred to the forthcoming thesis on the subject (2006).

All patients

688 patients had undergone primary THR and 361 one or more revisions at the time of the fracture. The mean age was 74 years in both groups, with an almost identical sex distribution. The average time interval from primary THR to fracture was 7.4 years. The cumulative incidence was 0.4% for the primary group and 2.1% for the revision group. Patients with a primary diagnosis of RA and sequelae to hip fractures were significantly more common in the fracture group compared to the total number of patients who underwent hip arthroplasty during the same period ($p < 0.001$, Fischer's Exact Test).The highest percentage of fractures (approximately 80%) were classified as Vancouver B1 or B2. 70% of the femoral components in the primary THR group and 44% in the revision group were loose at the time of fracture. The cause of fracture was in most cases minor trauma. An implant-related factor could also be demonstrated, Charnley and Exeter implants being significantly over-represented in the fracture group ($p < 0.001$, Fischer's Exact Test).The Lubinus implant was clearly under-represented ($p < 0.001$, Fischer's Exact Test). The postoperative complication rate was high (18%) and 23% of the patients underwent reoperation owing to some complication before December 31, 2002. The Kaplan-Meier survival analysis showed a 10-year survival of 73.2 + /-4.4% in the primary group and 64.9 + /-6.6% in the revision group.

Prospective multicentre study

This part of the study, which comprised more modern treatment methods, included 321 patients, 230 of whom had a primary implant at the time of fracture. As in the retrospective study, a high percentage of loose implants at the time of fracture was found, 66% in the primary and 49% in the revised group. The Charnley and Exeter implants were also over-represented in this cohort and the Lubinus implant under-represented ($p < 0.001$, Fischer's Exact Test).

The Kaplan-Meier survival after 54 months was 73.5 + /-7.0% in the primary group and 77.3 + /-8.8% in the revision group. As at December 31, 2002, 22% had undergone reoperation. Examination of preoperative and postoperative x-rays by an independent radiologist showed poor agreement between the radiologist's findings and the preoperative judgement. This applied above all to fractures categorised as Vancouver B1 and B2. Analysis revealed a high rate of reoperation (23%) among cases classified as B1. In a modern treatment algorithm, fractures of type B1 and C (with stable fixed stems) are the only cases in which osteosynthesis without stem revision can be recommended. The results of this study indicate that the surgeon probably often makes an incorrect preoperative judgement regarding fixation of the femoral component. There is international consensus that in cases of periprosthetic fracture, a loose stem should always be revised.

217 out of 321 (68%) could answer the follow-up questionnaire (66 patients were dead, 38 too ill or demented).

Clinical outcome in the prospective group 1 to 2 years after operation:

Outcome variable	Mean	SD
Harris Hip Score	64	19.7
VAS-pain	23	21.3
VAS-satisfaction	27	26.8
EQ-5D-index [1)]	0.59	0.32

VAS pain: 0-100 (none-unbearable), VAS satisfaction: 0-100 (satisfied-dissatisfied). The EQ-5D health index is an weighted total value for health with a minimum value of -0.594 and a maximum of 1.0.
1) EQ-5D for an age-matched population of patients six years after THR = 0.75.

Risk of fracture close to the implant after primary THR (Poisson regression analysis):

Variable	Risk [1)]	p-value
Female	■	p = 0.0012
Charnley	■	p = 0.035
Exeter	■	p < 0.001
Lubinus SP II	■	p < 0.001
Type of hospital	■	n.s
Region West	■	p = 0.022
Other regions	■	n.s
Primary OA	■	p < 0.001
RA	■	p = 0.046
Hip fracture	■	p < 0.001

Risk of reoperation (Poisson regression analysis):

Variable	Risk [1)]	p-värde
Stable fixated stem	■	p = 0.0002
No revision	■	p < 0.001
Lubinus SP II long	■	p = 0.0018
Distally fixated long uncemented stem	■	p = 0.0283
Vancouver class B_1 [2)]	■	p < 0.001
Vancouver class B_2 [3)]	■	p = 0.0053
Revision of stem	■	p = 0.0033
Revision of stem + osteosynthesis	■	p = 0.0039
Plate osteosynthesis only [4)]	■	p < 0.001

1) ■ = higher risk , ■ = lower risk, ■ = no influence.
2) That type B1 has an increased risk is surprising as this type of fracture should have the best prognosis – if the fracture occurs around a stable femoral component without bone loss, it is in principal equivalent to an isolated femoral fracture. The reason for the poor results is probably that the surgeon did not notice that the stem component was loose, i.e. that the fracture should have been classified as a B2 type and treated differently.
3) The situation here is the opposite, i.e. the loosening was so obvious that a stem revison was performed.
4) This variable has a clear connection with the wrongly classed B1 cases, i.e. plate fixation was performed around a loose implant, rapidly leading to repeated surgery.

Summary of the results

The study has resulted in three main findings:

- A majority of the late periprosthetic fractures occur around a loose femoral stem.
- There are significant design-related risk factors for fracture after primary THR.
- The results after treatment of this serious complication have both historically and contemporarily been poor, with a high rate of complications and reoperation.

Discussion

This study exemplifies one of the great advantages of a national register, viz. the possibility of analysing an uncommon complication in a statistically adequate manner. The results consistently show a need for a uniform classification and treatment algorithm. During the last few years, two new treatment methods have been introduced: osteosynthesis with angularly stable plates and the use of structural bone grafts – so-called strut grafts. Long-term results of these methods of treatment cannot be analysed in this study but international studies have shown promising results.

In view of the poor results, it might be argued that the management of these difficult cases should be centralised to special units but the fact that these acute patients are not always transportable speaks against this suggestion. These patients should be operated upon by surgeons with a high level of competency and experience of both fracture and prosthetic surgery.

Short, straight femoral components increased the risk of late periprosthetic fracture, which is important to note when selecting standard implants in the future.

Finally, the following recommendations may be made:

- Always determine whether the stem is loose – if in doubt, explore the joint!
- Always revise a lose stem!
- Follow THR patients with some form of regular radiological follow-up!
- Intervene in time if the stem is loose, above all if there is bone loss!
- Consider revision with distally fixed uncemented stems!

Free choice of care and hip replacement surgery

Swedish medical care is currently undergoing radical structural changes. Hip and knee arthroplasty is increasingly concentrated to elective production units. These units have been able to offer patients from other counties shorter waiting times under the free choice of care scheme. There is no standard follow-up routine for these patients and any secondary measures needed due to complications are usually performed at the patient's own home hospital. In connection with the new national treatment guarantee scheme, there is a risk that this flow of patients over county and regional borders will increase, possibly affecting the quality of the care and perhaps also having consequences for the possibilities of adequate follow-up. Against this background, it is considered of interest to document the effects of this flow as early and objectively as possible. We have considered it important to carry out such an analysis and have obtained the support of the National Competency Centre for Orthopaedics for this.

Selection and methods

The total production of primary THRs during 2002 and 2003 (25 390 operations) was defined with the aid of the register's primary database. Each patient's postal address and municipality and county code was obtained form the National Address Register. Patients operated upon outside their home county were registered in a separate database. This database also contained patients referred to another hospital owing to the diagnosis and/or technical difficulty. To exclude these referred patients as far as possible, only cemented primary arthroplasties performed due to primary osteoarthritis outside university hospitals were included.

Patient populations operated upon within and outside their own county were compared with respect to frequency of, and reason for, reoperation. The patient-related outcome was also compared between the two groups by sending a follow-up questionnaire in accordance with the standardised follow-up model (see page 14) to the "free-flow" patients. We have used the standardised follow-up outcome for patients operated upon in their home county as reference. Before sending the questionnaire to the patients concerned, we informed all hospitals in the country about the study by letter to the heads of the orthopaedic departments and contact doctors.

Results

The total number of hip arthroplasties that fulfilled the admission criteria was 16 749, 14 785 of which were performed within and 1 964 (11.7%) outside the patient's home county. The number of patients in the free choice of care group was 1 845, i.e. 119 were operated upon bilaterally during the study period. The patients operated upon bilaterally filled in two questionnaires (one for each hip) and the reoperation rate was based on the number of hips treated. The Western Region sent the most patients to another region (32%). The most common recipient was the Southern Region, which operated upon 34.6% of the hips.

Group	Distribution of gender	Age	Diseased at follow-up
Operated in home county (n = 14,785)	female 59%	70.4 years (22 – 99)	502 (3.4%)
Free choice (n = 1,964)	female 56%	69.6 years (30 – 92)	51 (2.6%)

Table 1. Patient demographics (all patients with primary osteoarthritis). None of the differences is statistically significant. Tendency to a significant difference in mortality.

Hospital	Number of operations	Share (%)	Cumulativ share (%)
Hässleholm-Kristianstad	372	18.9	18.9
Simrishamn	171	8.7	27.6
Sabbatsberg Närsjukhuset	157	8.0	35.6
S:t Göran	138	7.0	42.7
Sophiahemmet	137	7.0	49.6
Ortopediska Huset	105	5.3	55.0
37 övriga kliniker	884	45.0	100
Total	1,964	100	100

Table 2. The hospitals which most frequently operated upon patients from other counties in 2002 and 2003.

Region to region	Number of operations	Share (%)	Kumulativ andel (%)
Västra Götaland to Skåne	365	18.6	18.6
Dalarna to Stockholm	134	6.8	25.4
Halland to Skåne	127	6.5	31.9
Västra Götaland to Stockholm	99	5.0	36.9
Västra Götaland to Halland	97	4.9	41.9
Värmland to Örebro	93	4.7	46.6
Uppsala to Stockholm	86	4.4	51.0
Södermanland to Stockholm	80	4.1	55.0
Jämtland to Stockholm	63	3.2	58.2
Others	820	41.8	100
Total	1,964	100	100

Table 3. The most frequent "flows".

Reoperation

This part of the analysis includes all open reoperations (not only revisions but all kind of repeated surgery). The follow-up extends until December 31, 2004. The mean follow-up time was then 24 months (range 12-36). The follow-up time is therefore very short and mainly reflects early postoperative complications such as early deep infection and revision due to recurrent dislocation. The hip register stop-

Reason	Operated in home county (n = 14 ,785)		Free choice (n = 1,964)	
	Count	Share (%)	Antal	Andel (%)
Aseptic loosening	15	0.1	4	0.2
Deep infection	55	0.4	11	0.6
Fracture	16	0.1	2	0.1
Dislocation	64	0.4	9	0.5
Technical error	11	0.1	1	0.1
Pain only	3	0.0	0	0.0
Miscellaneous	17	0.1	2	0.1
Total	181	1.2	29	1.5

Table 4. Reasons for reoperation. Statistical analysis of the percentage of C-patients revealed no significant difference between the two groups.

ped registering closed reduction of dislocations on July 1, 2000 and this measure could therefore not be studied. 181 out of 14 785 (1.2%) patients undergoing primary THR in their home county underwent reoperation, compared to 29 out of 1 964 (1.5%) operated upon at hospitals outside their home county (p = 0.33 Fischer's Exact Test). Implant survival based on revision or extraction as the definition of failure after three years was 99.1 + /-0.2% for the home county group and 98.5 + /-0.8% for the free-flow group (Kaplan-Meier analysis, p = 0.073, Log Rank Test).

The mean time interval between primary THR and operation was 0.7 years (range 0.0-2.2) for patients operated upon at their home hospital and 0.9 years (range 0.0-2.4) for the free choice of care (p = 0.03, Mann-Whitney U-test). The difference means that the patients not primary operated upon at their home hospitals or within the region are treated later if they need early revision. 80% of those operated upon within their own county who underwent reoperation were treated at the primary hospital while in the free choice of care group the figure was only 24%, i.e. few of the players involved in the free flow scheme take care of their complications.

Patient-rated outcome

1 964 hip arthroplasties in 1 845 patients were included in the free choice of care group. 51 had died when the form was posted (all of whom had undergone unilateral operation), which means that 1 913 hips could be included in the analysis. After one reminder letter, the response rate was 1 825 (95%). The mean follow-up time was 27 months. As a reference group for this part of the analysis, we used the 1-year results from the standardised follow-up (May 5, 2005, see page 14). To achieve comparable patient demographics, only patients with primary osteoarthritis provided with cemented implants outside university hospitals were included. The reference cohort then comprised 2 455 hip arthroplasties with a mean follow-up time of 12 months. The patient-rated outcome for the free flow, measured as pain and satisfaction VAS and health-related quality of life, was completely comparable to that in the patients operated upon in their own county.

Group	Distribution of gender	Age	Share Charnley category C
Hip dispensary (n = 2,455)	female 58.7%	70.4 years (40 – 93)	47.0%
Free choice (n = 1,913)	female 56%	69.4 years (30 – 89)	40.6%

Table 5. Patient demographics and patient-related outcome. The difference in the percentage of C-patients between the two groups is statistically significant (p=0.001, Fischer's Exact Test). Patients in the free choice of care group thus had a lower comorbidity and lower mortality.

Group	VAS-pain	VAS-satisfaction	EQ-5D index
Hip dispensary (n = 2,455)	14	17	0.77
Free choice (n = 1,825)	13	16	0.78

Table 6. Patient-related outcome – mean values.

Discussion

After a short follow-up, we found that the patients in the free-flow group were equally free from pain and satisfied and had the same health gain as the traditionally treated patients, with the reservation that the free-flow patients had a significant different demographic profile. They should therefore have had a somewhat higher EQ-5D index and been somewhat more satisfied as the percentage of C-patients was significantly lower than in the reference group.

As regards reoperation and revision, there is a trend towards an increased frequency in the free choice of care group. It is quite clear that the majority of the players in the free choice of care scheme do not reoperate on their own complications and that patients who undergo primary THR outside their own county have to wait longer for intervention in the event of early complications.

Two of the largest producers of the free choice of care have ceased performing implant surgery or will do so. None of the six largest hospitals that produce under the free choice scheme participates in the standardised follow-up. This type of quality assurance, with comparison with the national results, would have been much easier and cheaper to achieve if the hospitals concerned had joined.

The cohort now analysed will in future be followed annually as regards reoperation rate. Not until we have 5-7 years' follow-up will it be possible to perform a reliable analysis of any quality differences regarding aseptic loosening and revision.

Regions

The procedure frequency per 100 000 inhabitants is presented this year for patients in all age categories. Since the previous calculation (2003) was related to the whole age interval although only patients over 50 years of age were presented, the relative numbers per region are shifted upwards. The national average, just over 120 operations per 100 000 inhabitants, is indicated with the grey line in the diagram. The variation in procedure frequency can be explained by a real difference in incidence of osteoarthritis requiring treatment but access to medical care probably plays an important role. We note that the number of primary THRs per 100 000 inhabitants has decreased further during 2004 in the two regions which lie below the national average, viz. Stockholm and Gotland and the Western region. In the other regions, there has been an increase of varying magnitude during 2004 compared to 2003.

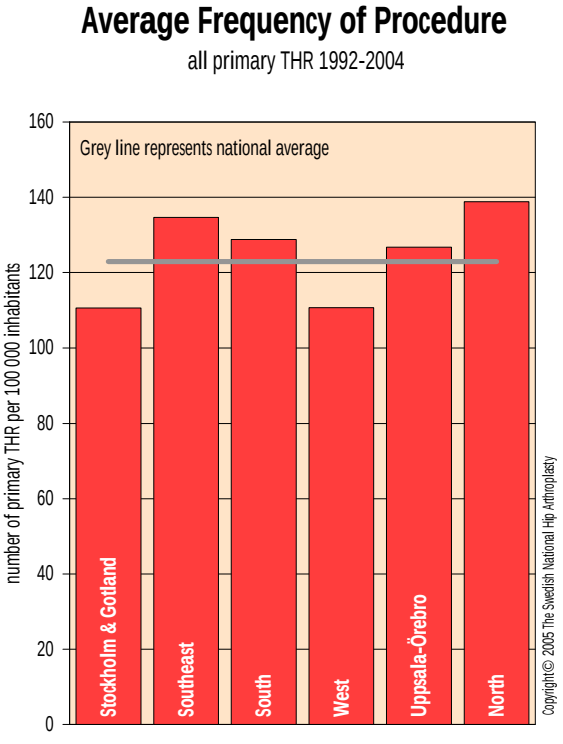
For all six regions, the 15 most common implants during the period 1979-1999 and then each year up until 2004 are indicated. In addition, the number of primary operations and the procedure frequency are shown, in relation to the national average, for primary osteoarthritis per year since 1992. The number of primary operations in the region and the revisions to which these gave rise are shown in the form of histograms. The total revision burdens (RB, number of revisions / number of primary THRs + revisions) for 1979-2003 and 1992-2004 are shown, as well as the RB separately for women and men in the period 1992-2004. Two regions (Northern and Southern) have lower relative revision rates (7.4 and 8.2%) while the other regions are approximately equal (8.7-8.9%). These data reflect to some extent the quality of the surgery performed in the region but the percentage is also influenced by the number of primary THRs performed.

Regions which need and are also able to perform a large number of primary arthroplasties will automatically have a lower **relative** revision rate. Other factors, like any variations in case-mix (the percentage of high-risk patients) between the regions, will also influence the RB. If one compare the percentage of revised primary arthroplasties in the different regions, another picture also emerges. During the period 2001-2004, 1.3 and 1.4%, respectively, of the primary THRs performed in the Northern and Southern regions, which had the lowest RBs, were revised. In the other regions (Southeastern, Uppsala-Örebro, Western and Stockholm and Gotland), the figure was in most cases somewhat lower (0.9, 1.1, 1.1 and 1.8%). RB, which reflects a certain time period, must therefore be interpreted but it nevertheless provides important information about the difficulty, consumption of resources and quality of the operations performed.

The survival curves give a general idea of the results and present implant survival for all diagnoses and reasons and also for the group with primary osteoarthritis that have been revised due to aseptic loosening.

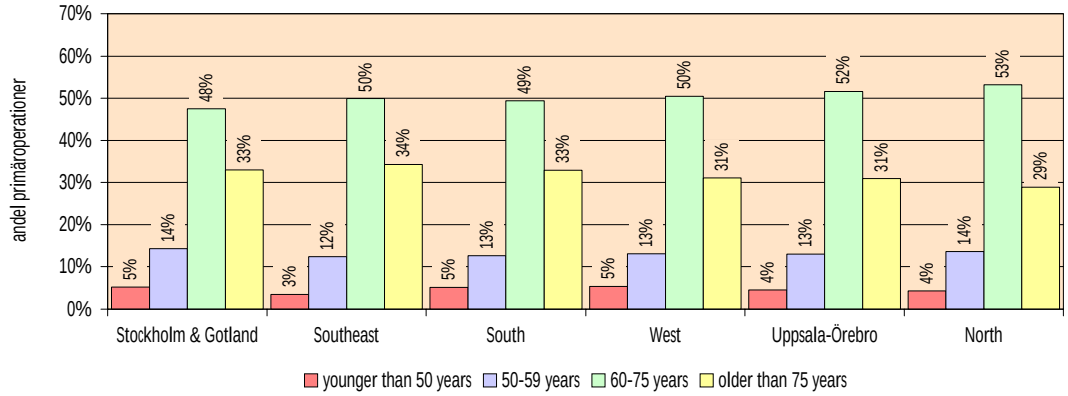
With regard to the fixation method, the difference due to the fact that certain regions are responsible for developments in the implant field and are therefore using uncemented, hybrid and reversed hybrid techniques more often still persists. The future of hybrid replacements will probably depend on whether studies of new joint materials like modified high-molecular weight (cross-linked) polyethylene and ceramic/ceramic or metal/metal show that these materials can prevent development of peri-implant osteolysis without causing new problems. Evaluation of uncemented monoblock cups in prospective controlled studies is, for the same reason, also of interest.

During 2004, the percentage of fully cemented implants varied between 79.5% (Stockholm and Gotland region) and 92.7% (Northern region). The Western region performed the most hybrid arthroplasties (8.7%), followed by the Southeastern region (6.3%). The percentage was lowest in the Uppsala-Örebro region (1%). The Stockholm and Gotland region accounted for by far the most reversed hybrids (13.0%), followed by the Northern and Western regions (both 2.3%). Completely uncemented arthroplasties were performed above all in the Western, Uppsala-Örebro and Stockholm and Gotland regions (9.1, 8.4 and 6.1%). The observed differences are probably partly due to ongoing clinical studies in certain regions. Also, there is now good documentation for a number of uncemented stems. Other aspects, such as price and surgical habit, then become more important factors in the choice of implant than the type of fixation.



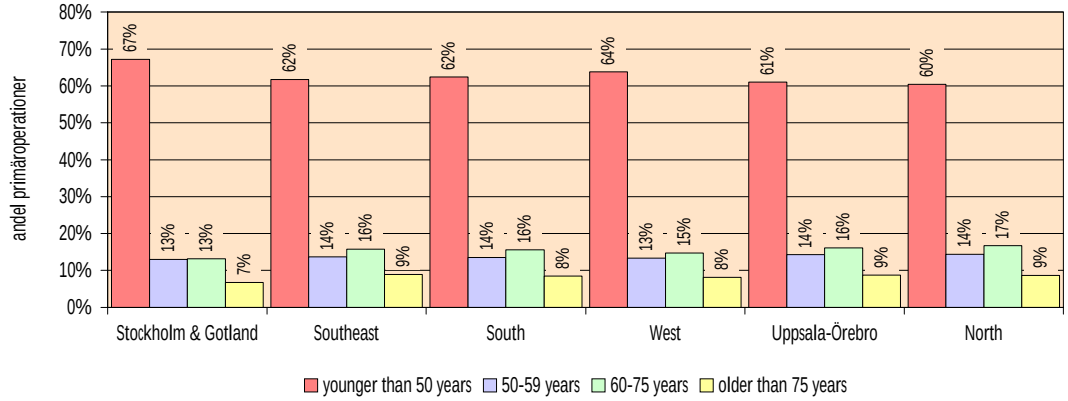
Distribution of Age at primary THR

all primary THR 1992-2004



Distribution of Age in the Swedish population

according to Statistics Sweden 2004



In certain regions, prospective studies in which relatively large groups of patients are followed continuously are in progress. This probably means that the revision rate in these regions will increase somewhat as certain patients with, for example, osteolysis, are detected early and revised in spite of the absence of symptoms. The spread of the standardised follow-up routine will probably change this situation and at the same time reduce the incidence of major revisions requiring extensive resources.

In last year's annual report, we noted a relatively large regional difference in the percentage of primary THRs performed due to primary osteoarthritis and fracture (1992-2003). The indication primary osteoarthritis was highest in the Northern region, which at the same time performed the lowest relative percentage of arthroplasties due to fracture. During 2004, the variation in percentage of THRs performed due to primary osteoarthritis was smaller, between 78.3% (Western region) and 82.6% (Southern region). The variation may possibly be due to unequal distribution of resources and the fact that the county councils buy medical care from outside their own regional borders. The Southern and Northern regions performed the lowest percentage of primary arthroplasties due to fracture (8.9 and 10.0%). The Southeastern region performed the highest percentage (13.2%), followed by the Stockholm and Gotland and Western regions (12.2 and 12.1% respectively). These figures are difficult to interpret, however, since we have not been able to consider the percentage of hemi-arthroplasties. With the introduction of the new hemi-arthroplasty register, it will be possible to perform such analyses, however.

Several factors, often additive, may cause the results of the individual hospitals to vary. Demographic factors of importance for the outcome vary between different regions. Treatment of patients with a low incidence of complications is increasingly centralised to certain county and rural hospitals while patients with deviant pelvic and femoral anatomy are mainly operated upon at county and university hospitals. This means that the frequency of reoperation should vary between individual hospitals, which the diagram clearly demonstrates. The hospitals which have a high percentage of standard cases and still perform less well than average can, with this information and background, hopefully be stimulated to analyse their routines and make improvements.

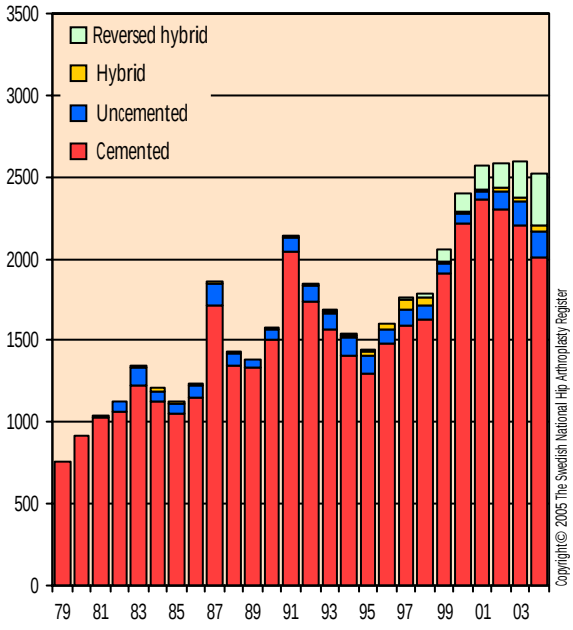
Region: Stockholm & Gotland

15 Most Common Implants

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share
Charnley (Charnley)	19,584	1,057	996	629	153	71	22,490	51.2%
Charnley Elite (Exeter Polished)	220	367	455	705	771	570	3,088	7.0%
Reflection All-Poly (Spectron EF Primary)	80	105	145	190	387	361	1,268	2.9%
Biomet Müller (CPT Steel)	201	189	214	212	133	1	950	2.2%
Lubinus All-Poly (Lubinus SP II)	414	125	135	137	82	76	969	2.2%
Charnley (Exeter Polished)	107	8	23	86	188	285	697	1.6%
Weber All-Poly (Straight-stem standard)	26	98	99	115	138	194	670	1.5%
Charnley Elite (ABG uncem.)	10	48	71	94	127	15	365	0.8%
Exeter All-Poly (Exeter Polished)	362	1	1	1	0	0	365	0.8%
Charnley Elite (Charnley Elite Plus)	224	57	13	1	0	0	295	0.7%
Charnley (Charnley Elite Plus)	120	30	68	12	0	0	230	0.5%
Romanus HA (Bi-Metric HA uncem.)	184	25	15	2	0	0	226	0.5%
OPTICUP (Lubinus SP II)	166	13	20	4	3	0	206	0.5%
Biomet Müller (CPT CoCr)	0	0	0	0	60	145	205	0.5%
FAL (Lubinus SP II)	0	0	0	60	71	67	198	0.5%
Others (total 292)	9,443	296	341	385	495	747	11,707	26.6%
Total	31,141	2,419	2 ,596	2,633	2,608	2,532	43,929	100%

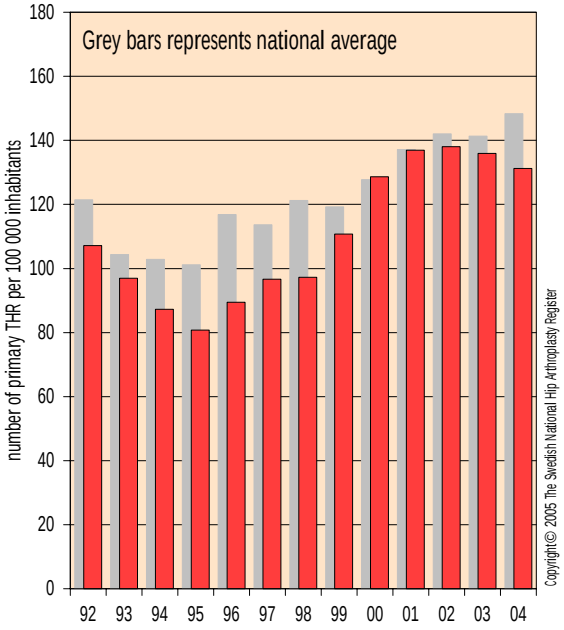
Number of Primary THR

per type of fixation, 1979-2004



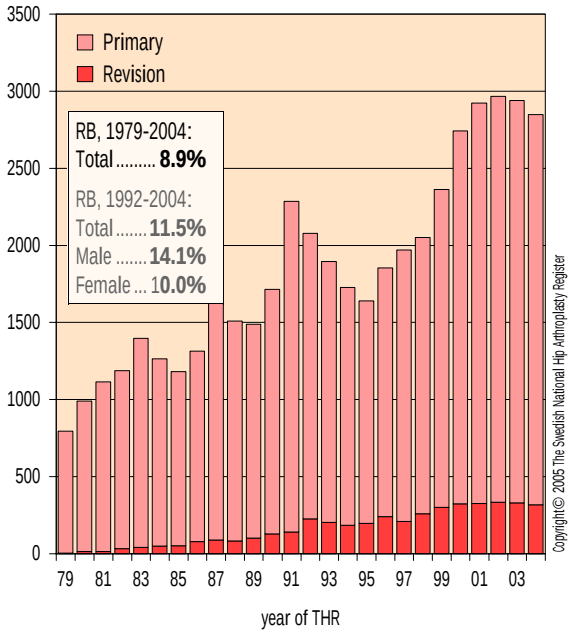
Frequency of Procedure

all primary THR included



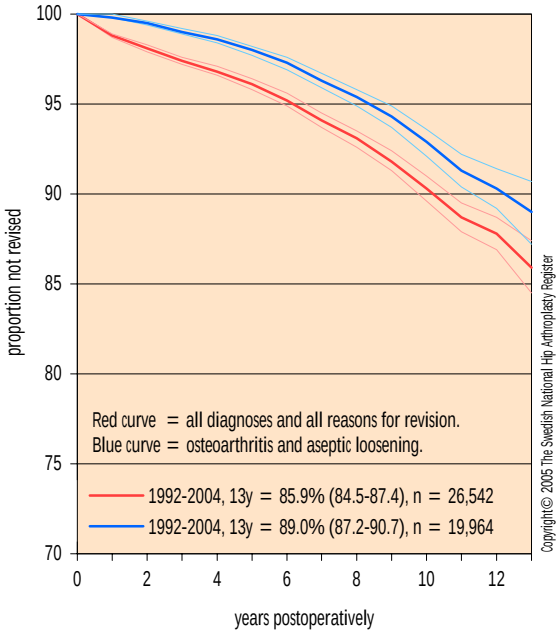
Number of THR per Year

43,929 primary THR, 4,283 revisions, 1979-2004



Implant Survival

1992-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	9,723	1,905	2,051	2,145	2,118	2,022	19,964	75.2%
Fracture	1,632	310	285	263	265	308	3,063	11.5%
Inflammatory arthritis	603	51	65	46	55	56	876	3.3%
Idiopathic femoral head necrosis	434	63	82	74	64	62	779	2.9%
Childhood disease	112	64	83	85	79	60	483	1.8%
Secondary osteoarthritis	152	0	0	1	3	2	158	0.6%
Tumor	49	25	22	15	12	11	134	0.5%
Secondary arthritis after trauma	41	1	8	4	12	11	77	0.3%
(missing)	1,008	0	0	0	0	0	1,008	3.8%
Total	13,754	2,419	2,596	2,633	2,608	2,532	26,542	100%

Mean Age per Gender and Year

Gender	1992-1999	2000	2001	2002	2003	2004	Total
Male	67.9	67.6	66.7	67.5	66.3	65.9	67.3
Female	70.6	71.0	70.1	69.9	69.8	69.9	70.4
Total	69.7	69.9	68.9	69.0	68.5	68.3	69.3

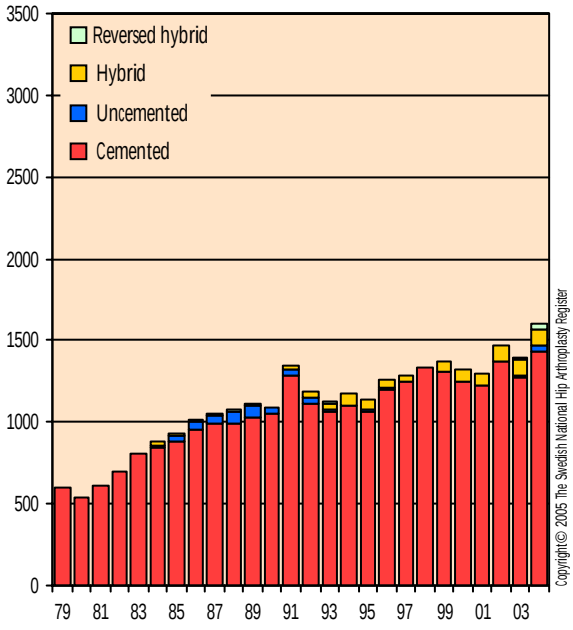
Region: Southeast

15 Most Common Implants

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share
Lubinus All-Poly (Lubinus SP II)	6,736	786	741	827	795	1,168	11,053	38.4%
FAL (Lubinus SP II)	20	210	283	315	290	160	1,278	4.4%
Exeter All-Poly (Exeter Polished)	937	8	1	2	0	0	948	3.3%
SHP (Lubinus SP II)	537	20	0	5	1	3	566	2.0%
Exeter Duration (Exeter Polished)	152	140	140	107	16	1	556	1.9%
Charnley Elite (Exeter Polished)	162	41	24	27	20	28	302	1.1%
Contemporary Hooded Duration (Exeter Polished)	0	0	6	67	134	41	248	0.9%
Charnley Elite (Lubinus SP II)	177	31	11	16	7	3	245	0.9%
OPTICUP (Lubinus SP II)	230	0	0	0	0	0	230	0.8%
Lubinus All-Poly (Lubinus IP)	3,296	0	0	0	0	0	3,296	11.5%
Trilogy HA (Lubinus SP II)	12	19	29	17	40	42	159	0.6%
Charnley (Charnley)	3,803	0	0	0	0	0	3,803	13.2%
Biomex HA (Lubinus SP II)	0	19	18	33	30	3	103	0.4%
Mallory-Head uncem. (Lubinus SP II)	77	4	4	6	2	2	95	0.3%
Reflection HA (Lubinus SP II)	7	17	12	19	15	23	93	0.3%
Others (total 145)	5,516	33	43	27	40	127	5,786	20.1%
Total	21,662	1,328	1,312	1,468	1,390	1,601	28,761	100%

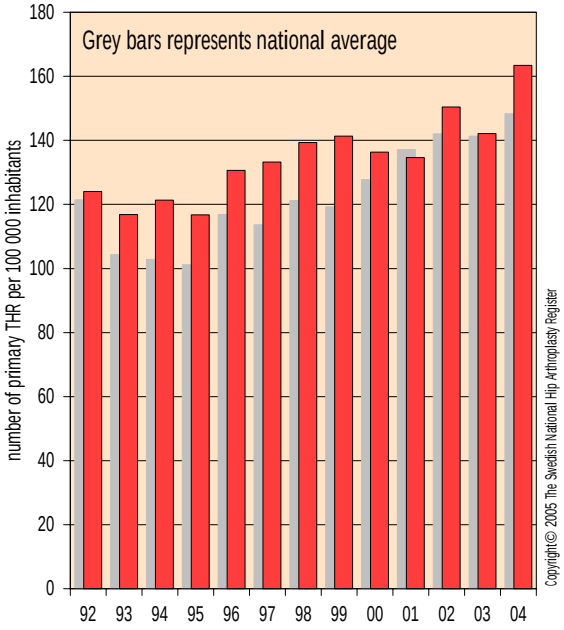
Number of Primary THR

per type of fixation, 1979-2004



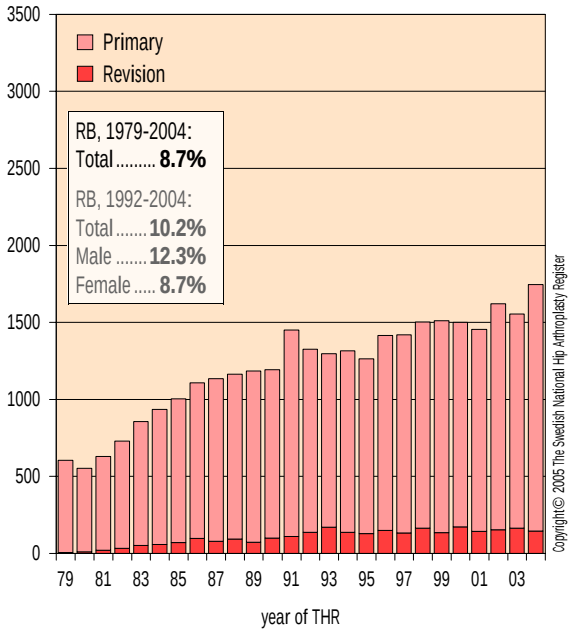
Frequency of Procedure

all primary THR included



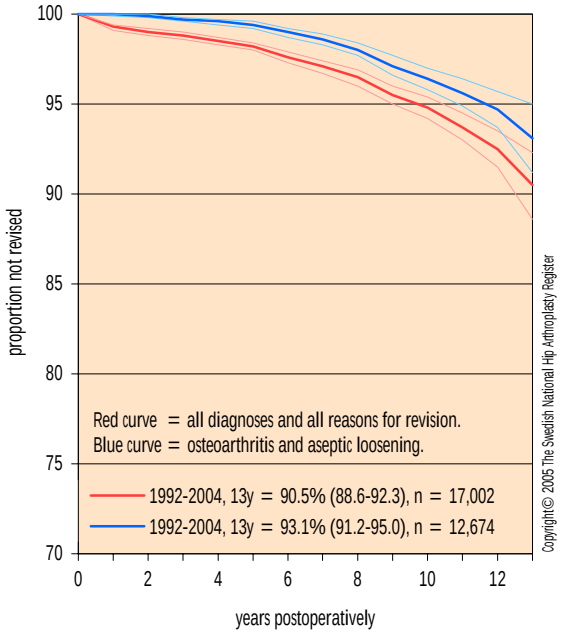
Number of Primary THR

28,761 primary THR, 2,731 revisions, 1979-2004



Implant Survival

1992-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	7,113	976	1,032	1,152	1,102	1,299	12,674	74.5%
Fracture	1,326	238	172	206	183	212	2,337	13.7%
Inflammatory arthritis	602	45	46	38	42	27	800	4.7%
Idiopathic femoral head necrosis	328	41	34	31	39	30	503	3.0%
Secondary osteoarthritis	272	0	0	0	0	0	272	1.6%
Childhood disease	88	24	23	30	12	21	198	1.2%
Tumor	16	4	4	11	10	10	55	0.3%
Secondary arthritis after trauma	34	0	1	0	2	2	39	0.2%
(missing)	124	0	0	0	0	0	124	0.7%
Total	9,903	1,328	1,312	1,468	1,390	1,601	17,002	100%

Mean Age per Gender and Year

Gender	1992-1999	2000	2001	2002	2003	2004	Total
Male	69.0	69.2	68.0	68.0	68.3	68.3	68.7
Female	71.5	71.9	70.8	71.0	71.0	70.9	71.3
Total	70.5	70.8	69.6	69.7	69.9	69.8	70.3

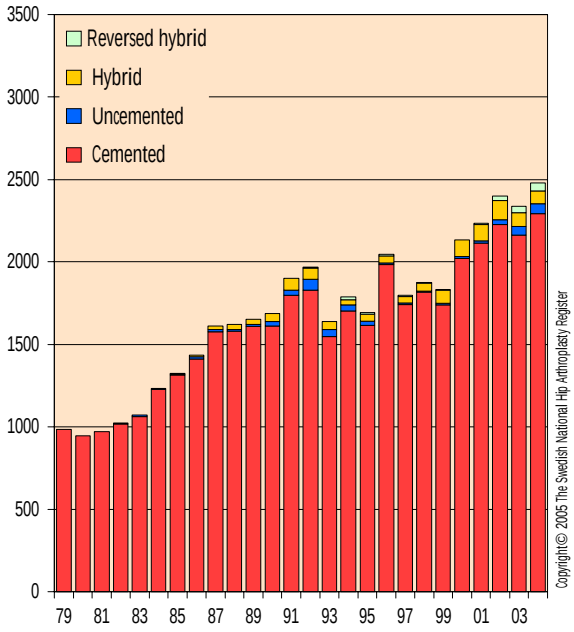
Region: South

15 Most Common Implants

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share
Lubinus All-Poly (Lubinus SP II)	3,904	524	627	701	578	696	7,030	16.0%
Exeter Duration (Exeter Polished)	265	681	775	930	962	979	4,592	10.5%
Exeter All-Poly (Exeter Polished)	2,583	95	9	13	6	10	2,716	6.2%
OPTICUP (Scan Hip II Collar)	792	387	365	279	125	10	1,958	4.5%
Charnley (Charnley)	6,064	34	20	9	5	3	6,135	14.0%
Charnley (Charnley Elite Plus)	800	120	31	0	0	0	951	2.2%
Scan Hip Cup (Scan Hip Collar)	5,344	11	0	0	0	0	5,355	12.2%
Charnley Elite (Exeter Polished)	3	2	86	99	158	190	538	1.2%
Trilogy HA (Lubinus SP II)	126	67	69	53	40	34	389	0.9%
Weber All-Poly (MS30 Polished)	2	8	4	28	114	150	306	0.7%
Charnley Elite (Charnley Elite Plus)	167	109	44	0	0	0	320	0.7%
OPTICUP (Optima)	289	0	0	0	0	0	289	0.7%
Contemporary Hooded Duration (Exeter Polished)	0	1	0	8	87	119	215	0.5%
Charnley (Exeter Polished)	8	2	65	51	44	43	213	0.5%
Scan Hip (Scan Hip II Collar)	186	0	0	0	0	0	186	0.4%
Others (total 221)	11,757	96	139	228	219	249	12,688	28.9%
Total	32,290	2,137	2,234	2,399	2,338	2,483	43,881	100%

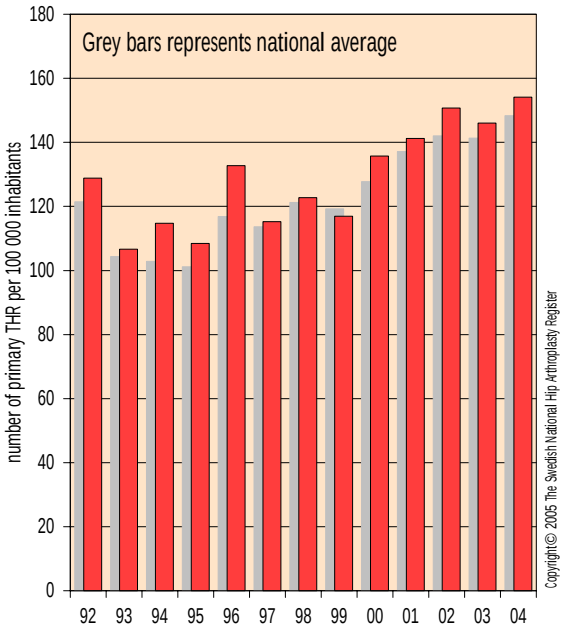
Number of Primary THR

per type of fixation, 1979-2004



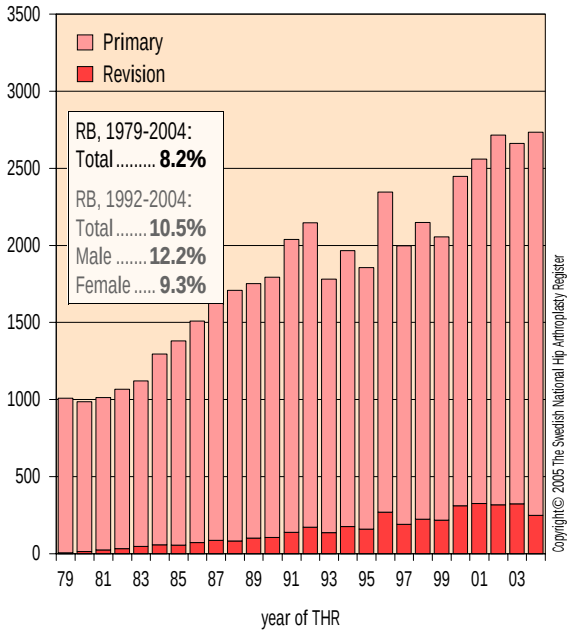
Frequency of Procedure

all primary THR included



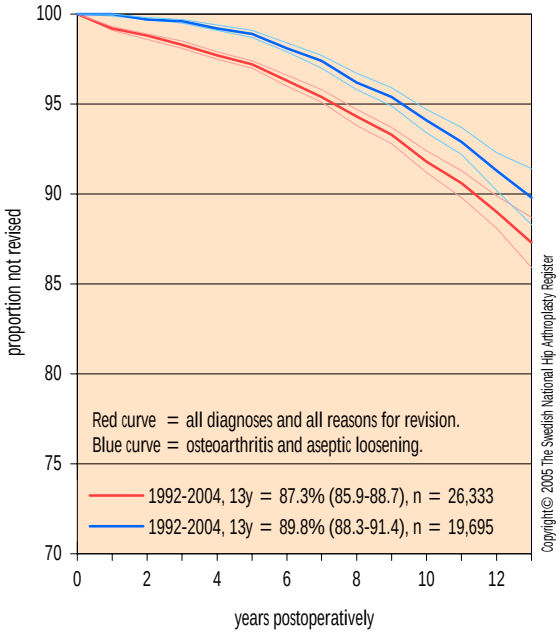
Number of THR per Year

43,881 primary THR, 3,907 revisions, 1979-2004



Implant Survival

1992-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	10,367	1,698	1,766	1,958	1,855	2,051	19,695	74.8%
Fracture	2,040	222	233	223	243	220	3,181	12.1%
Inflammatory arthritis	936	99	106	80	83	65	1,369	5.2%
Idiopathic femoral head necrosis	460	73	69	77	83	79	841	3.2%
Childhood disease	181	30	44	48	47	43	393	1.5%
Tumor	97	13	13	9	17	20	169	0.6%
Secondary osteoarthritis	142	1	0	0	0	0	143	0.5%
Secondary arthritis after trauma	28	1	3	4	10	5	51	0.2%
(missing)	491	0	0	0	0	0	491	1.9%
Total	14,742	2,137	2,234	2,399	2,338	2,483	26,333	100%

Mean Age per Gender and Year

Gender	1992-1999	2000	2001	2002	2003	2004	Total
Male	68.3	68.0	68.2	66.8	67.6	66.9	67.9
Female	70.8	70.5	69.9	70.0	69.9	70.3	70.5
Total	69.8	69.5	69.2	68.7	69.0	68.9	69.5

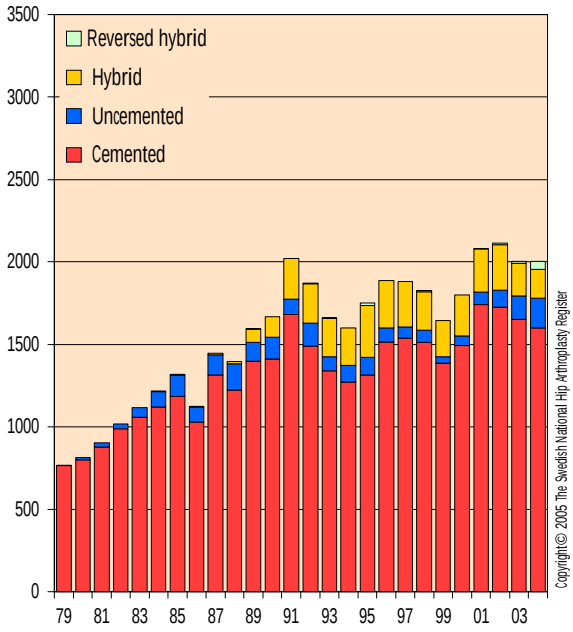
Region: West

15 Most Common Implants

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share
Lubinus All-Poly (Lubinus SP II)	4,560	730	1,157	1,184	1,157	1,113	9,901	24.4%
Reflection All-Poly (Spectron EF Primary)	1,328	386	442	400	382	355	3,293	8.1%
Biomet Müller (RX90-S)	1,158	197	7	0	0	0	1,362	3.3%
Trilogy HA (Spectron EF Primary)	247	146	173	169	127	107	969	2.4%
Charnley (Charnley)	4,668	3	0	0	0	0	4,671	11.5%
OPTICUP (Optima)	449	0	0	0	0	0	449	1.1%
Contemporary (Exeter Polished)	349	7	2	2	1	0	361	0.9%
Charnley Elite (Spectron EF Primary)	48	28	36	20	36	37	205	0.5%
ZCA (Stanmore mod)	0	14	16	56	53	55	194	0.5%
Reflection All-Poly (Spectron EF)	1,212	0	0	0	0	0	1,212	3.0%
ABG HA (Lubinus SP II)	270	0	0	0	0	0	270	0.7%
Romanus (RX90-S)	174	7	0	0	0	0	181	0.4%
ABG II HA (Lubinus SP II)	81	38	21	10	2	3	155	0.4%
ABG II HA (ABG ocem.)	19	29	29	42	12	9	140	0.3%
Trilogy HA (Versys)	0	1	10	23	53	43	130	0.3%
Others (total 282)	16,088	216	190	209	180	283	17,166	42.2%
Total	30,651	1,802	2,083	2,115	2,003	2,005	40,659	100%

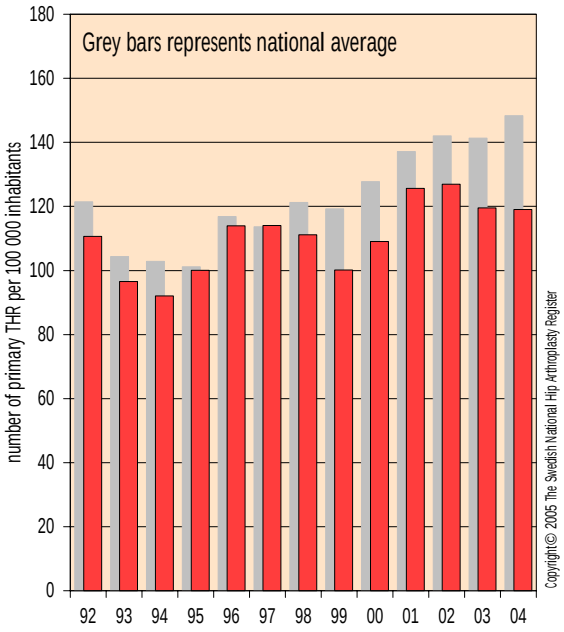
Number of Primary THR

per type of fixation, 1979-2004



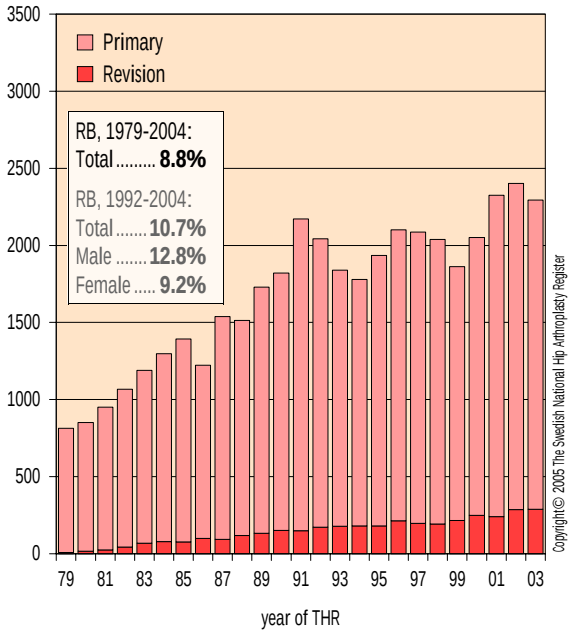
Frequency of Procedure

all primary THR included



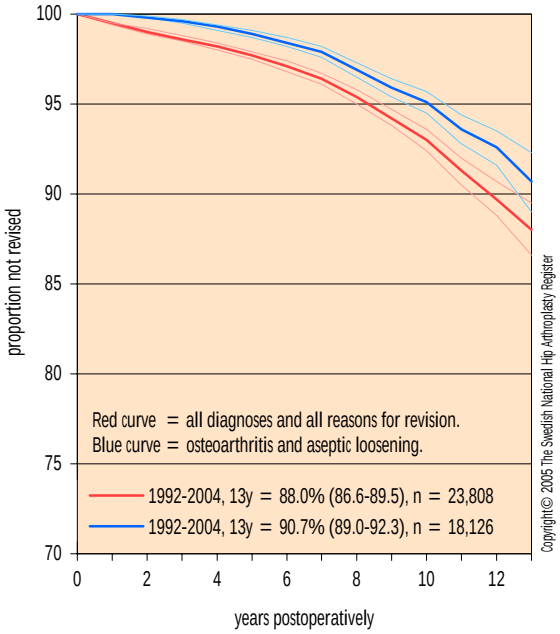
Number of THR per Year

40,659 primary THR, 3,910 revisions, 1992-2004



Implant Survival

1992-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	10,403	1,348	1,609	1,646	1,550	1,570	18,126	76.1%
Fracture	1,387	292	323	287	296	242	2,827	11.9%
Inflammatory arthritis	734	57	61	74	65	76	1,067	4.5%
Idiopathic femoral head necrosis	269	53	39	44	44	50	499	2.1%
Childhood disease	259	38	37	51	33	49	467	2.0%
Secondary osteoarthritis	270	0	0	0	0	0	270	1.1%
Tumor	36	11	14	11	9	12	93	0.4%
Secondary arthritis after trauma	24	3	0	2	6	6	41	0.2%
(missing)	418	0	0	0	0	0	418	1.8%
Total	13,800	1,802	2,083	2,115	2,003	2,005	23,808	100%

Mean Age per Gender and Year

Gender	1992-1999	2000	2001	2002	2003	2004	Total
Male	67.8	67.4	67.3	67.2	68.1	66.9	67.6
Female	70.0	70.0	70.8	70.4	70.2	69.6	70.1
Total	69.1	69.0	69.4	69.1	69.4	68.5	69.1

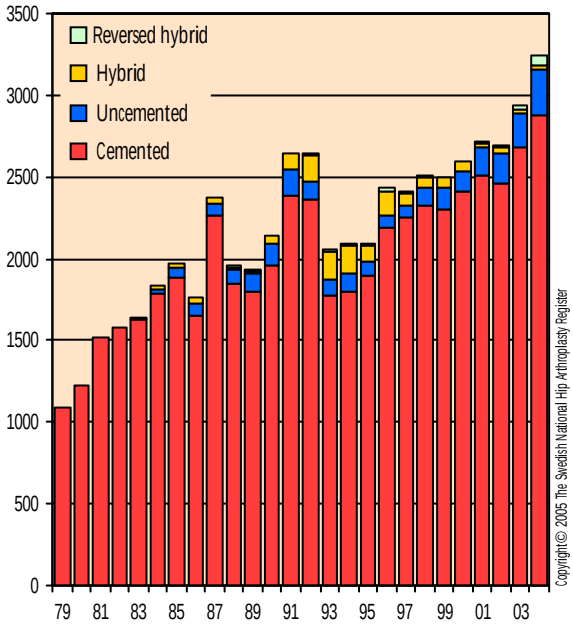
Region: Uppsala-Örebro

15 Most Common Implants

Cup (Stem)	1979-1999	2000	2001	2002	2003	2004	Total	Share
Lubinus All-Poly (Lubinus SP II)	4,468	714	679	761	1,033	1,138	8,793	15.5%
Charnley (Charnley)	14,350	508	583	287	122	7	15,857	28.0%
Exeter Duration (Exeter Polished)	243	324	335	303	212	161	1,578	2.8%
FAL (Lubinus SP II)	0	0	23	295	451	473	1,242	2.2%
Exeter All-Poly (Exeter Polished)	1,250	15	5	3	0	0	1,273	2.2%
Cenator (Cenator)	1,016	134	0	0	0	0	1,150	2.0%
Müller All-Poly (Müller Straight)	3,911	48	72	61	60	75	4,227	7.5%
Contemporary Hooded Duration (Exeter Polished)	0	0	9	177	271	288	745	1.3%
Cenator (Exeter Polished)	275	187	195	3	1	0	661	1.2%
Reflection All-Poly (Spectron EF Primary)	88	69	85	103	120	154	619	1.1%
Charnley Elite (Charnley Elite Plus)	360	88	94	9	0	0	551	1.0%
Stanmore (Stanmore mod)	0	71	212	183	18	0	484	0.9%
Charnley Elite (Exeter Polished)	8	23	34	80	110	201	456	0.8%
Exeter Duration (Lubinus SP II)	60	39	45	70	110	113	437	0.8%
Charnley (Exeter Polished)	406	18	14	22	46	102	608	1.1%
Others (total 308)	16,048	363	332	350	390	535	18,018	31.8%
Total	42,483	2,601	2,717	2,707	2,944	3,247	56,699	100%

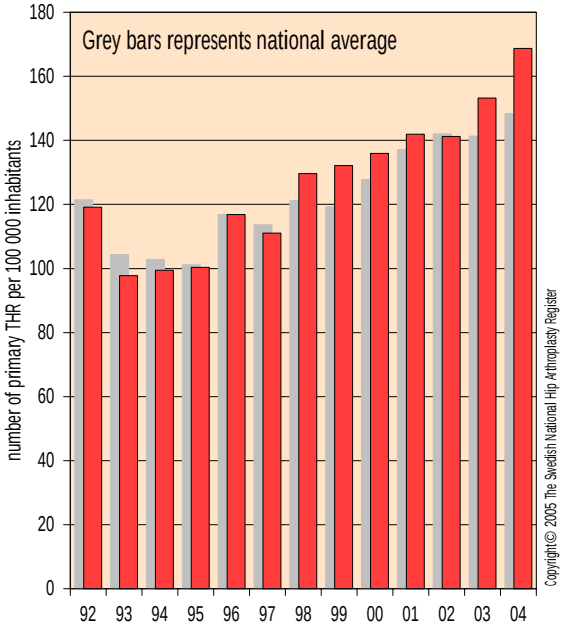
Number of Primary THR

per type of fixation, 1979-2004



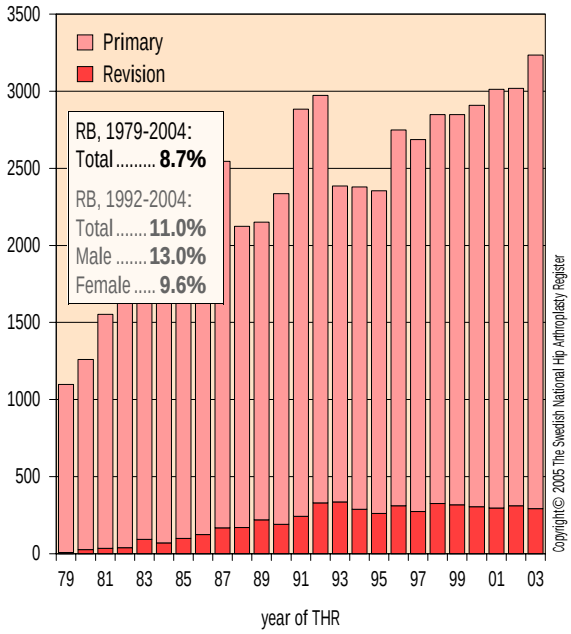
Frequency of Procedure

all primary THR included



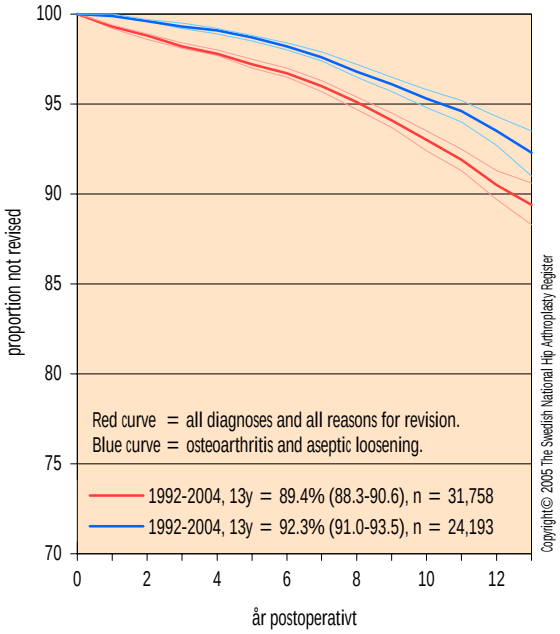
Number of THR per Year

56,699 primary THR, 5,427 revisions, 1979-2004



Implant Survival

1992-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	13,080	2,005	2,075	2,126	2,302	2,605	24,193	76.2%
Fracture	1,942	328	373	336	370	337	3,686	11.6%
Inflammatory arthritis	1,076	106	117	99	100	95	1,593	5.0%
Idiopathic femoral head necrosis	543	103	91	78	83	92	990	3.1%
Childhood disease	292	43	45	49	69	101	599	1.9%
Secondary osteoarthritis	193	0	0	0	0	0	193	0.6%
Tumor	70	13	12	16	13	14	138	0.4%
Secondary arthritis after trauma	48	3	4	3	7	3	68	0.2%
(missing)	298	0	0	0	0	0	298	0.9%
Total	17,542	2,601	2,717	2,707	2,944	3,247	31,758	100%

Mean Age per Gender and Year

Gender	1992-1999	2000	2001	2002	2003	2004	Total
Male	68.0	67.9	67.3	67.6	68.0	66.9	67.8
Female	70.4	70.7	70.8	70.8	70.3	70.0	70.4
Total	69.4	69.6	69.4	69.5	69.4	68.7	69.4

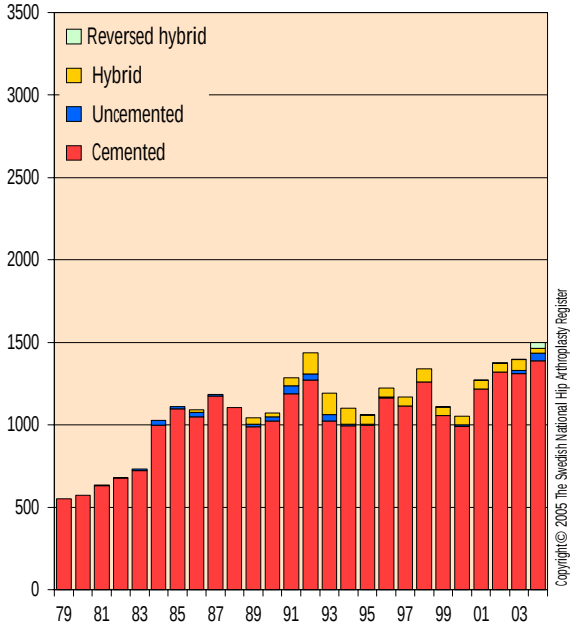
Region: North

15 Most Common Implants

Cup (Stem)	1979-1998	1999	2000	2001	2002	2003	Total	Share
Lubinus All-Poly (Lubinus SP II)	8,302	651	869	974	1,061	1,191	13,048	45.8%
Exeter Duration (Exeter Polished)	154	231	249	196	224	187	1,241	4.4%
Exeter All-Poly (Exeter Polished)	1,104	17	8	4	2	0	1,135	4.0%
Scan Hip (Optima)	404	18	1	0	0	0	423	1.5%
Charnley (Charnley)	2,416	13	1	1	1	0	2,432	8.5%
FAL (Lubinus SP II)	1	1	41	140	20	6	209	0.7%
Trilogy HA (Lubinus SP II)	1	23	33	53	61	30	201	0.7%
Reflection (Spectron EF Primary)	83	26	2	0	0	0	111	0.4%
Scan Hip (Scan Hip Collar)	764	1	0	0	0	0	765	2.7%
Reflection All-Poly (Spectron EF)	108	0	0	0	0	0	108	0.4%
Reflection HA (Lubinus SP II)	80	2	0	0	0	0	82	0.3%
Reflection HA (Spectron EF)	70	0	0	0	0	0	70	0.2%
Reflection HA (Spectron EF Primary)	49	1	0	0	0	0	50	0.2%
Exeter Duration (Omnifit)	3	2	3	0	0	16	24	0.1%
Spectron (Spectron EF)	21	0	0	0	0	0	21	0.1%
Others (total 163)	8,295	68	69	8	31	68	8,539	30.0%
Total	21,855	1,054	1,276	1,376	1,400	1,498	28,459	100%

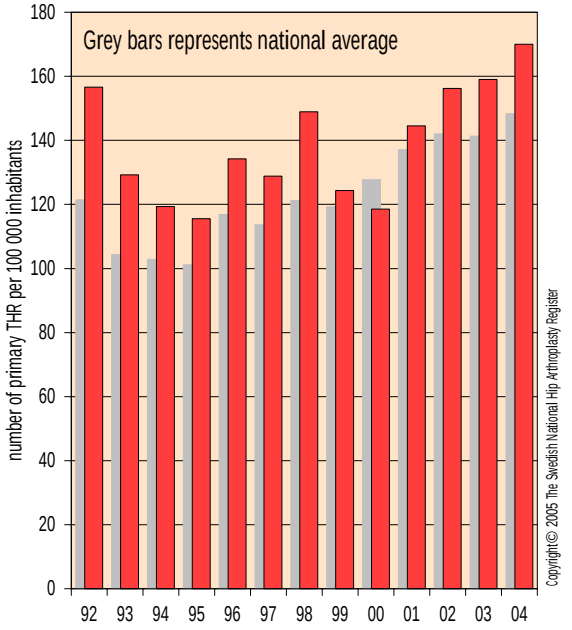
Number of Primary THR

per type of fixation, 1979-2004



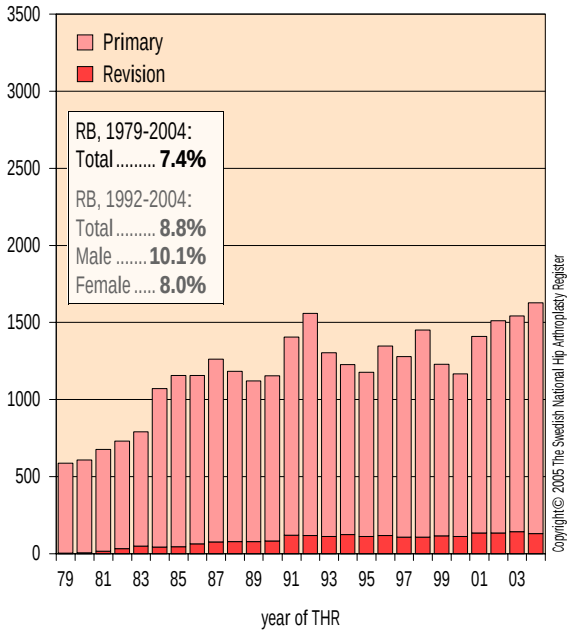
Frequency of procedure

all primary THR included



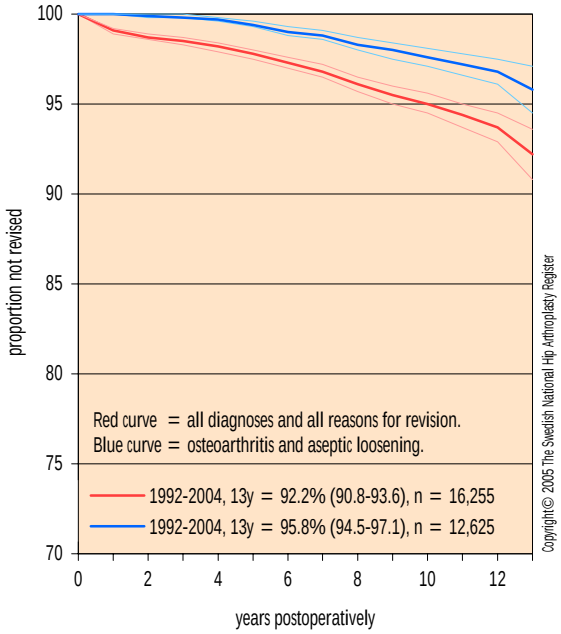
Number of THR per Year

28,459 primary THR, 2,275 revisions, 1979-2004



Implant Survival

1992-2004



Number of Primary THR per Diagnosis and Year

Diagnosis	1992-1999	2000	2001	2002	2003	2004	Total	Share
Primary osteoarthritis	7,158	855	1,031	1,162	1,189	1,230	12,625	77.7%
Fracture	815	100	136	117	113	149	1,430	8.8%
Inflammatory arthritis	532	41	31	37	31	34	706	4.3%
Idiopathic femoral head necrosis	318	26	47	27	30	30	478	2.9%
Secondary osteoarthritis	267	0	0	0	0	0	267	1.6%
Childhood disease	98	26	23	26	32	45	250	1.5%
Secondary arthritis after trauma	87	1	1	0	0	1	90	0.6%
Tumor	21	5	7	7	5	9	54	0.3%
(missing)	355	0	0	0	0	0	355	2.2%
Total	9,651	1,054	1,276	1,376	1,400	1,498	16,255	100%

Mean Age per Gender and Year

Gender	1992-1999	2000	2001	2002	2003	2004	Total
Male	67.9	67.9	68.4	67.5	67.2	67.3	67.8
Female	70.1	69.3	69.7	69.7	69.5	68.9	69.8
Total	69.3	68.8	69.2	68.7	68.5	68.3	69.0

Summary

The main purpose of the National Hip Arthroplasty Register is to give all the hospitals in the country the information they need to make essential improvements. The results constitute a basis for a continuous learning process, above all at the local level.

In this year's report, the focus is on two serious complications of total hip replacement: dislocation and periprosthetic fracture. In contrast to the general quality, which is very good, these two complications are increasing. This is particularly unfortunate as these complications are difficult to treat and in many cases lead to an increased number of reoperations with a poor outcome.

The structural changes in the health service are another factor that strongly influences elective prosthetic hip surgery. Large production units based on new organisational models are being created. The possibilities of the medical profession's controlling activities and their quality in the conventional way are greatly reduced. Orthopaedic surgeons are increasingly becoming itinerant consultants from outside organisations with no administrative connection with their actual place of work. This leads to reduced opportunities and incentive to influence activities and their quality. The essential continuity is lost when the possibilities of seeing and learning from one's mistakes no longer exist, with reduced commitment to quality assurance as a whole. This year's report includes the first analysis of the free choice of care and our fears have to some extent been confirmed.

The number of primary arthroplasties has increased and 13 366 operations were performed in 2004. For the first time, we have a limited loss of data (mainly from two hospitals) on reported reoperations. The number of fully reported revisions in 2004 was 1 058, compared to 1 250 in 2002 and 2003. We know from preliminary Internet reporting that the figure for 2004 should be approximately 1 200. This figure is essentially unchanged compared to previous years and we see no alarming increase in the revision rate.

Clinical development

This year's analyses show that the positive development has continued, with a very low revision rate (exchange or removal of the implant) within 10 years. The total revision rate as well as the rate of revision for mechanical loosening (the most common complication) is only a third for those operated upon in 1991 and 1995 compared to the first year of the study period (1979).

A growing problem we already noted last year is that the number of revisions due to dislocation is increasing continuously. The figures are low but the trend is unequivocally negative. A separate analysis of dislocations during the first two years after primary THR yielded several interesting findings. Young patients with sequelae to childhood disease and women have a significantly increased risk for this serious complication. Since they also have a high loosening rate, treatment of these cases should be centralised to units with special experience and competency. The type of incision is another factor of importance known from previous studies.

An anterolateral incision in the lateral position reduces the risk compared to others, where a posterolateral incision in the supine position dominates. If a posterior incision is used, meticulous surgical technique with suture of the capsule and musculature according to international experience reduce this risk considerably. This is underlined by the very large variations between individual hospitals. From 0 up to 30-40 % of the revision cases during the last five years have been due to dislocation. This variation is much more important than the difference between different categories of hospitals, which has many natural explanations. It is also important to establish that revision due to early dislocation is generally not influenced by the type of implant.

In their confidential report, the units receive annual information about the distribution of the problems that have led to revision. Especially in view of the large variation in the occurrence of dislocation and deep infection, there is room for local efforts to improve the results. This difference between the hospitals is as evident for rural hospitals as for county and university hospitals.

Implant survival, i.e. absence of reoperation, as a quality indicator has been studied during different time periods. The 10-year survival has improved from 89.4% to 92.5% between the two periods 1979-1991 and 1992-2003. In this year's report, we have divided the last decade into two 5-year periods. We find that the improvement is continuing and the national average for 5-year survival improved from 97.0% to 97.7% between the last two 5-year periods.

57% of the units did not differ from the national average during the period 1992-1997 and the corresponding figure for the period 1998-2004 is 60%. We are thus becoming steadily better and more uniform as regards the quality of our prosthetic hip surgery but this does not exclude the existence of local differences mainly due to individual units' patient profiles (case mixes), which strongly influence their results.

On analysis of the environmental profile / technical database, we find as previously that approximately 15% of the hospitals do not use modern cementing

technique fully. These clinics do not use proximal femoral seal, i.e. they do not employ high-pressure cementing. The reason why they hesitate to use this technique is undoubtedly concern about the increased risk of thromboembolic complications. This risk can, however, be reduced by thorough cleansing of the bone bed (high pulsatile lavage) prior to cementing, as has been scientifically demonstrated in several studies. The recommendation is quite clear: proximal sealing with high pulsatile lavage both before and after application of the distal femoral plug is essential for cement penetration and to reduce the risk of embolism.

In the open presentation of the results from each hospital, we have this year taken the variation in case-mix into consideration. In the tables showing implant survival per hospital, two new variables have been introduced. The percentage of patients with primary osteoarthritis and the percentage in the standardised age group 60-75 years are stated. This is a first attempt to define a so-called case-mix index and represents a simple description of the most common patient category. A high percentage of patients in these two groups represents the average picture that may be expected as regards nursing burden, surgical difficulty, costs and results. The risk of revision is 27% higher among patients who are outside this age interval or have diagnoses other than primary osteoarthritis. Against this background, it has been natural to separate the different diagnoses in the table and compare the results within each type of hospital with each other in a fairer way. It is difficult to define relevant risk factors but important to distinguish patients with differing demands of resources and risks of complications. Development work in this area will be continued in order to enable fairer comparisons to be made.

An essential part of the clinical development work is our annual meeting with the doctors and secretaries responsible for reporting to the register. The annual report, current trends and problem areas are presented and the quality of the prosthetic hip surgery is discussed. An important part is the meeting with representatives of all companies which market hip and knee implants in Sweden, which takes place at the same time. The companies subscribe to online information about their products' performance since the Internet application was introduced in 1999 and, in addition to their market share, they receive very important information about the revision rate for each implant component. This makes it possible to report data based on sales throughout the country and enables them to identify potential problems.

The results of the scientific studies are important information for the contact doctors and individual units at the annual meeting. During the past years, several articles and poster exhibitions have presented results in such areas as deep infection, reasons for multiple revisions and occurrence and analysis of periprosthetic fractures.

On our exhibition stand at the annual meeting of the Swedish Orthopaedic Association, the register's web application and model for registration of patient-related outcome were demonstrated. This practical demonstration is greatly appreciated and leads to increased acceptance of the importance and spread of our activities. The register's directors have worked hard to get this extended registration and standardised follow-up adopted by more hospitals. This has also led to intensive travel and direct contact with all regions and a large number of hospitals throughout the country during the past year. During 2004, 14 local register and standardised follow-up meetings were held, with participants from altogether 25 THR-producing units.

Achievement of goals

The aim of total hip replacement is a satisfied patient with optimal pain relief and satisfaction and an essentially normal quality of life. The results must also be lasting in the long term. The standardised follow-up of all patients, with self-rating of pain, satisfaction and quality of life, is being extended continuously to the whole country. At present, 40 hospitals are participating and 10 will start doing so within the near future. Our aim is to achieve nationwide standardised follow-up during 2006. A 1-year follow-up of 5 140 patients has been presented in this year's report. The great majority of the patients are satisfied with the results and report very good pain relief and a substantial self-rated health gain. Their quality of life is similar to that of an age-matched normal population.

It is interesting that a 10-year study from the Northern region demonstrates a patient-related outcome equal to that in the 1-year results of the prospective study. This extended definition of the results of hip arthroplasty provides us with an instrument which rapidly gives us individual-related information about the outcome. We believe this to be essential in view of the ongoing structural changes in the health service and the impending care guarantee. We need instruments which enable us to judge the quality of hip replacement surgery quickly and reliably. Open reporting of the patient-related results will be started when the routine is adopted throughout the country. This places increased demands on our ability to report each unit's demographics fairly as comorbidity strongly influences the results.

Registration of the change in quality of life after THR makes it possible to perform a health-economic calcula-

Age-specific Frequency of Procedure per 100 000 Inhabitants

development over time

	Male			Female		
Age	1994-1995	2003-2004	9 year increase	1994-1995	2003-2004	9 year increase
45-54	43	78	**81%**	55	75	**37%**
55-64	175	241	38%	210	288	37%
65-74	362	490	36%	458	653	42%
75-84	419	524	25%	544	727	34%
85 +	178	272	**53%**	288	324	**13%**

tion of the cost per quality adjusted life year (QALY). The objective of this work is that each hospital, by health-economic modelling and system development, will be able to monitor its cost effectiveness on line. Such an instrument will make it easier for administrators and politicians to make decisions about priorities.

Genus aspects

The sex distribution for primary hip arthroplasty is unchanged, 60.6% women and 39.4% men. For the first time, we have this year performed an analysis of the age-specific procedure frequency per 100 000 inhabitants. In men, we find an increase by 81% during the last nine years in the age interval 45-54 years and 53% in the age interval over 85 years. The corresponding increase in women is smaller, amounting to 37% and 13% respectively in these age intervals. There is a certain indication shift and we operate on steadily younger patients, above all men. The average age at primary THR is, as before, generally higher for women than for men except when the indication is sequelae to childhood disease.

The revision burden is generally significantly higher for men. In the age-group below 50 years, however, women have markedly poorer results than men, probably due to the dominance of women in the diagnostic groups sequelae to childhood diseases and inflammatory joint diseases. These diagnoses carry a markedly increased revision risk per se. If cemented fixation and hybrid fixation are used, we see an improvement of the results in women in the age-groups under 50 and 50-59 years. No such improvement exists for men in these age-groups.

Problem areas

Three problem areas are currently being studied in specific research projects under the National Hip Arthroplasty Register: periprosthetic fractures, patients aged under 50 at the time of primary THR and primary deep infections. The relevant articles and papers presented at international meetings during the past year are listed in the publications list.

During the last few years, periprosthetic fractures have been the second most frequent reason for revision on mid- to long-term follow-up. The reason is probably that the population of patients that have undergone THR is increasing continuously and that older patients are operated upon more often than formerly. This year's report includes 1 049 late periprosthetic fractures reported during the period 1979-2000. The last 321 cases are the subject of a special nationwide prospective multicentre study. The results of surgical treatment of this complication are not good, the survival after 10 years being only 73.2% for those cases that fracture after primary THR. The study shows that the majority of these fractures occur around a loose femoral component. In most cases, the loosening of the stem is not diagnosed. There are significant differences between different types of implants with respect to this complication, which is an important factor in the choice of prosthesis. The results of treatment are poor, with a high rate of complications and need of further surgical intervention. The results of these interventions can definitely be improved and these cases should if possible be centralised to special units. High competency in, and experience of, both fracture and prosthetic surgery are obviously needed.

The results underline the importance of regular clinical and radiological follow-up of all patients subjected to THR, i.e. a nationwide standardised follow-up routine. In the event of a loose femoral implant, revision should be recommended to the majority of the patients. Since more pronounced bone loss leads to poorer results, it is important to intervene in time in the event of mechanical failure of hip implants.

In all special studies, patient questionnaires are used, which means extra work for those involved in routine patient care. These studies have unique value, however, owing to the size of the material and the prospective registration of reoperations and revisions. The register's directors appreciate the contributions made by hospitals all over the country to the performance of the special studies and we are positive to collaboration with interested researchers throughout Sweden. Most of the Ph D students during the last few years have not been affiliated to the unit in Gothenburg.

Current trends

The trend that is most important to study is the centralisation of a large part of the prosthetic surgery to elective production units. No uniform follow-up routine exists for these patients and secondary measures after complications are usually performed at the patient's home hospital. The care guarantee that is shortly to be introduced means that the free flow across county and regional borders will increase. Against this background, we have considered it essential to analyse the free flow of primary THRs among operations performed in 2002 and 2003 (25 390 THRs in all). Comparable patient populations operated upon within and outside their own county were compared with respect to reoperation rate and reason for reoperation. The patient-rated outcome in the two groups was compared with the aid of a follow-up questionnaire. With short follow-up, the patients in the free-flow group were equally free from pain, equally satisfied and had the same self-rated health gain as those operated upon in their own county. One reservation, however, is that the free-flow patients had a markedly lower comorbidity and another demographic profile. They should therefore have had a higher quality of life and been somewhat more satisfied than the reference group.

There is a trend towards an increased rate of reoperation and revision of the patients operated upon under the free choice of care scheme, in spite of more favourable patient demographics. A very important finding is that the majority of the patients who require early revision undergo reoperation at their home hospital. Only 24% of the players in the free flow scheme take care of their own complications and reoperate on these patients themselves. The corresponding figure for a primary unit in the home region is 80%. This means that the feedback of a poor result which is necessary in order to be able to take measures to improve quality is lacking in the free-flow organisation. This may have extremely negative consequences in the long term and is contrary to the principle of learning from one's own mistakes.

We find it remarkable that none of the players in the free flow scheme participates in the standardised follow-up routine, which provides an opportunity to report and monitor one's results at an early stage. It should be obvious that this is not acceptable in the light of the tendency to quality differences that can be anticipated in the long-term perspective. Extension of the standardised follow-up to include the free-flow hospitals is important and is a prerequisite for planning studies of local quality in spite of the structural changes in the health service.

Final comment

The National Hip Arthroplasty Register collaborates with other orthopaedic registers under the National Competency Centre for Orthopaedics (NKO – www.nko.se). The objective is to coordinate techniques for collection and dissemination of data and utilise similar electronic systems. Several projects are in progress with the aim of simplifying reporting to the orthopaedic registers. The National Hip Arthroplasty Register has initiated collaboration with TietoEnator with the aim of gaining access to more extensive resources as regards high IT competency. Continuity is assured as Roger Salomonsson, who has been our computer consultant for many years, continues to participate in this collaboration. The register's independence and access to source codes are guaranteed under separate agreements.

We who are responsible for the National Hip Arthroplasty Register would like once again to thank everybody involved for their cooperation during the past year. It is obvious that our work together has becoming increasingly interactive as a result of registration of patient-rated health. Feedback of results of special studies in an active and constructive way is thereby stimulated. We welcome your views and comments on this report and look forward to continued good collaboration.

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Book Chapters

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2.1 Operative Steps: Acetabulum
Steffen J. Breusch, Henrik Malchau, John Older

2.2 Operative Steps: Femur
Steffen J. Breusch, Henrik Malchau

6.1 Optimal Cementing Technique – The Evidence: What Is Modern Cementing Technique?
Henrik Malchau, Steffen J. Breusch

7.3 Migration Pattern and Outcome of Cemented Stems in Sweden
Jeffrey Geller, Henrik Malchau, Johan Kärrholm

11 The Evidence from the Swedish Hip Register
Henrik Malchau, Göran Garellick, Peter Herberts

19 Economic Evaluation of THA
Marieke Ostendorf, Henrik Malchau

20 The Future Role of Cemented Total Hip Arthroplasty
Henrik Malchau, Steffen J. Breusch

Theses

Ahnfelt L. Re-opererade totala höftledsplastiker i Sverige under åren 1979-1983. Avhandling, Göteborgs universitet, Göteborg, Sverige 1986.

Strömberg C. Cemented revision total hip replacements. Clinical and radiographic results from a Swedish Multicenter Study. Avhandling, Göteborgs universitet, Göteborg, Sverige 1995.

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