Swedish Hip Arthroplasty Register

Annual Report 2006

TOTAL ARTHROPLASTY

270 031
PRIMARY
1979-2006

31 951
REOPERATIONS
1979-2006
(closed reduction excl.)

25 984
REVISIONS
1979-2006

2 156
ENVIRONMENTAL/
TECHNICAL PROFILES
1979-2006

37 143
PATIENT OUTCOME
2002-2006

HEMI ARTHROPLASTY

7 992
PRIMARY
2005-2006

296
REOPERATIONS
2005-2006

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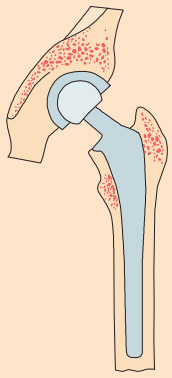
Östersund



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Swedish Hip Arthroplasty Register

Annual Report 2006

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Introduction

The Swedish Hip Arthroplasty Register is well-established, has national coverage and has a history of almost 29 years. Nevertheless, extensive changes have been made in the Registry's work over the past two years. For many years the Registry concentrated on elucidating results of different implants and surgical techniques. This important work is by no means concluded but will continue. Long-term results following total hip replacement surgery are nowadays so good (approximately 95% implant survival after ten years) that further 'technical development' will only marginally improve the result measured as need for reoperation. During the past few years the Registry has therefore increased its interest in the whole course of events for patients with hip disease – from symptom debut of hip pain to experienced effect postoperatively and long-term result. Such analyses are possible using patient-related variables and co-processing with various official, individual-based databases such as the CPP (cost-per-patient) databases, regional care databases, the National Board of Health and Welfare's Centre for Epidemiology (EpC), and other national quality registers. The national IT strategy adopted by parliament and the new Patient Data Act will simplify this type of co-processing technically, ethically and legally. Such 'combined databases' will create unique opportunities for operation-related, demographic and health-economic analyses.

Starting with the present Annual Report, the Hip Arthroplasty Registry will further increase the number of openly-reported result variables to eight per department. These variables are:

- Patient satisfaction at one-year follow-up (VAS)
- Pain relief at one-year follow-up (VAS)
- Gain in quality of life at one-year follow-up (EQ-5D)
- 90-day mortality
- Cost-per-patient (operation)
- Reoperation within two years
- Five-year implant survival
- Ten-year implant survival

The variables are presented partly in table form, but are also summarised graphically as a clinical value compass by hospital with comparisons with the national average. We have chosen this graphic presentation because tables can be awkward and hard to interpret. Using the clinical value compass, each department can see the areas (dimensions) where the department results deviate and it should therefore carry out a local in-depth analysis to initiate improvements. Linked to the outcome per department, there is also a graphic image of the department's patient demography.

The chief purpose of these openly-reported indicators is not to expose the individual department but to initiate measures to raise quality. Measuring outcome with standardised instruments and openly reporting these and then letting the departments compete to improve their results has earlier had dramatic effects. On 19 July 2006 the report Quality and Efficiency in Swedish Health Care – comparisons between county councils 2006 (in Swedish) was published. This report presented 57 national indicators of quality and efficiency in different sectors of health and medical care. The National Board of Health and Welfare, and Swedish Association of Local Authorities and Regions (SALAR) are now planning to publish Report number two in Autumn 2007. In the first report three indicators from the Hip Arthroplasty Register were chosen and in this year's Report, the same indicators will be published at county-council and regional levels:

- Reoperation within two years
- Ten-year implant survival
- Health-related Quality of Life gained at one-year follow-up (EQ-5D).

Register results are hard to interpret both outside and inside the profession, and the 'case-mix' factor (patient demography) is the single largest factor leading to misinterpretation. Every operation involving hip implants is associated with varying degrees of co-morbidity, technical difficulty and risk of post-operative complications. The cause of this is the great variation among the patient population undergoing surgery. Medical care today shows a tendency for patients with an expected low complication risk to undergo surgery at certain hospitals while other hospitals are expected to accept patients with greater demands on surgical competence. For this reason we have run analyses of the significance of patient demography for register results.

The arthroplasty registers in Norway, Denmark and Sweden have formed an association: the Nordic Arthroplasty Register Association. The purpose of this Nordic collaboration is partly to analyse patient demography in the various countries and to define a common and standardised 'case-mix' variable. This is needed to permit fair comparisons between countries, regions and individual units.

This year's Report introduces an in-depth study of the significance of the gender perspective for results of hip implant surgery. The results of this study show clear gender differences in choice of implant for operation and in outcome at follow-up. These results are presented in a separate section in the Report.

Last year we changed our name to the Swedish Hip Arthroplasty Register, partly to underline the fact that starting in 2005 we now also register hemi-arthroplasties. The indication for hemi-arthroplasty is primarily certain types of fracture of the neck of the femur. As a consequence of a modified care programme for this type of injury, the annual frequency of hemies in Sweden increased more than tenfold from just over 300 implants a year to around 4,000 a year. There was then a great need to 'quality control' this common orthopaedic operation. The infrastructure of the Hip Arthroplasty Register, with decentralised data capture, has been employed and registration coverage immediately became national. A first preliminary analysis of this new database is presented in this Report.

In Autumn 2005 the National Board of Health and Welfare and SALAR scrutinised the websites of web-based quality registers concerning readability, accessibility, openness and patient-oriented information. They then produced recom-

mendations for how websites should be designed. The Swedish Hip Arthroplasty Register consequently started a thorough reorganisation of its website in autumn 2006. Since the Registry conducts nearly all data entry and re-reporting via its website, the work on this new website has become very extensive and resource-consuming, both in time and cost. In the future all open results will be available directly through this new site. The website also focuses more on information to patients and decision-makers. The project is presented in more detail in the present Annual Report.

In step with the rapid development of information technology and the increasing spread of internet use, we have during the year conducted a pilot project to investigate the response frequency of follow-up questionnaires via the net. The result of this investigation is reported in the Report.

Degree of coverage

All units (77 hospitals in 2006), public and private, that carry out total hip arthroplasty are included in the Register. All 56 hospitals operating (often acutely) on hip fractures with hemi-arthroplasties report to the Registry. Coverage is complete. Individual registration of primary arthroplasty was introduced in 1992. Reoperations including revisions have been registered individually since the start in 1979. Demographic data from primary arthroplasty are reported, including age, gender and diagnosis. Choice of implant and fixation method, and surgical technique, are analysed to assist in an ongoing discussion of suitable development and of trends.

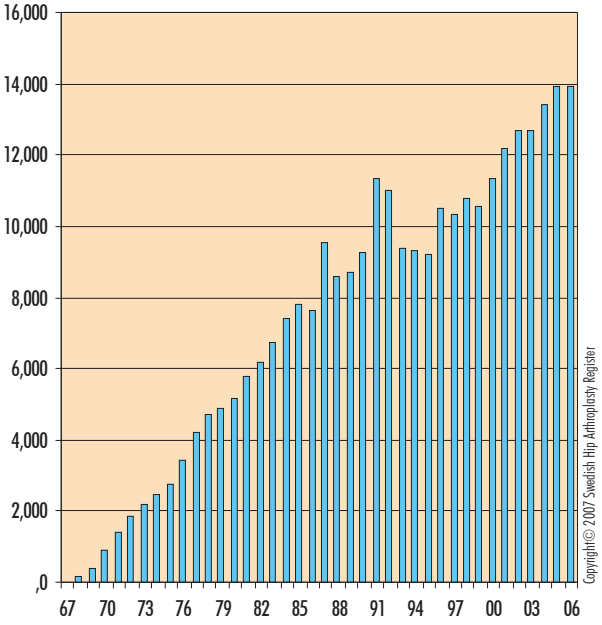
The individual health outcome is now documented from 88% of the country's departments.

The full number of reoperations following total hip arthroplasty continues to decrease. No hospital notes any sizeable delay in the reporting of reoperations (apart from Karolinska Hospital/Huddinge). This decrease is probably explained by a genuine reduction in the need for reoperation, that is, continued improvements in quality.

Receiving reports

Most departments report via the web application. Copies of patient records from reoperations are sent during the year with varying delay. Scrutiny of these journal copies and systematised and centralised data collection are needed for register analysis. The key variables in the Registry's databases are personal identification number, side and date of operation. Diagnosis and measures taken according to ICD10 are also entirely essential parameters. During the

Primary Total Hip Replacement in Sweden



The number of primary total hip replacements performed in Sweden between 1967 (6 operations) and 2006 (13,942 operations).

year the Registry has carried out a number of partial studies where we have unfortunately discovered 'carelessness' in diagnostics and the noting of adequate measure codes. To ensure high quality of data we urge all departments to make improvements!

Reporting

All publications, annual reports and scientific exhibitions are shown on our website. For more information see www.jru.orthop.gu.se. During the past few years the Report has grown in scope owing to an increase in in-depth analyses. Last year we proposed to the profession that the printed Annual Report be shortened and most results published on the website. However, a majority wished for the printed version of the report to continue and this is the case.

The Swedish Hip Arthroplasty Register is based on decentralised data capture, for which reason the work of contact secretaries and physicians at the departments is absolutely essential and invaluable for the function of the Registry. We wish to extend our great thanks for all contributions during the past year.

Göteborg August 2007.

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The new website

Background

In autumn 2005 the National Board of Health and Welfare and Swedish Association of Local Authorities and Regions (SALAR) scrutinised the web-based Register's website for readability, accessibility, openness and patient-oriented information. They have subsequently made recommendations as to how the websites should be designed. The Swedish Hip Arthroplasty Register received the justified criticism primarily that the website was partly in English and partly in Swedish, that open variables were difficult of access (available in the annual reports in pdf format) and that the website lacked patient information.

The project

During autumn 2006 a thorough reorganisation of the website was started. Since the Registry manages almost all data entry and reporting via its website, work on the new site has become very extensive and resource-consuming both in time and cost. A large part of the work will be devoted to the database and its information structure, for the following reasons.

The Registry's database has six parts (31/12/2006):

- **Primary operations with total hip replacement** (start: 1979) – 270,000 operations
- **Reoperations following total hip replacement** (start: 1979) – 32,000 operations
- **Environmental and technological profile** (start:1979) – 2,200 different operation profiles reported by the departments since the start
- **Patient-related results** (start: 2002) – 37,000 questionnaires in which patients state pain relief, satisfaction and health-related quality of life
- **Primary operations with hemi-arthroplasty** (start: 2005) – 8,000 operations
- **Reoperations following hemi-arthroplasty surgery** (start: 2005) – 300 operations.

The present system consists of two parts, an older system originating before the internet era (within the hospital's firewall) and a newer, web-based system. The two parts communicate in one direction only, from the internal system to the web server. This configuration leads mainly to one problem – older data (before 1999) cannot easily be collected and processed on the web server for the purpose of presenting results or supplying data. A system with several databases tends to lead to double storage, which in turn increases the risk of inconsistent results (see figures 1 and 2).

On 10 March 2006 Parliament adopted a resolution on a new national IT strategy for care and nursing. During 2006 SALAR ran a pilot project, termed the IFK project (Information Structure for Quality Registers) to investigate the possibility of creating a uniform information structure for the national quality registers and the existing digital patient record systems. This may in the future facilitate co-processing of different registers and create opportunities for transfer between electronic patient records and registers or vice-versa. The result of continued development in this area is being monitored, with a preparedness to adapt the re-worked database to the final standard.

The objective of the reorganisation is to consolidate and modernise the database so that it can be reached with great data security via the website. This increased accessibility would make it easier for participating departments to reach their own results, but would also ease the work of the register managers and associated researchers. This work will be costly in systems development and at the same time will not be 'noticed' by the daily user.

The website will not be completely reorganised until 2008. Parts of the new site, however, can already be reached via the 'old' home page. The parts published first (not complete versions) are information for patients and for decision-makers. The patient section contains information on joint diseases, what the patient himself or herself can do, an animated film of how the operation takes place, and rehabilitation. It is hoped that this part of the site will be used in daily care and that the patient will be referred to the site by, for example, general practitioners and physiotherapists.

Decision-makers in medical care visit our national quality registers to a very small extent and read our annual reports with an even lower frequency. The quality registers contain much data and results that can assist management and decision-makers in medical care, both in the long term and in the short term. For this reason we have also created an information part aimed at decision-makers. It is our hope that this group will now be better able to use the result-reporting function of the Hip Arthroplasty Register and its complete follow-up of work at departments and in county councils.

On the new website it will now be possible for all openly-reported results to be reached direct on the web (they will also be available in the annual reports, which have long been published on the site in PDF format).

Obviously the 'new website' is a large and costly project which we nevertheless view as a good investment, making it possible in the future to match the rapid development of information technology and improved accessibility to the world's largest database on hip arthroplasty.

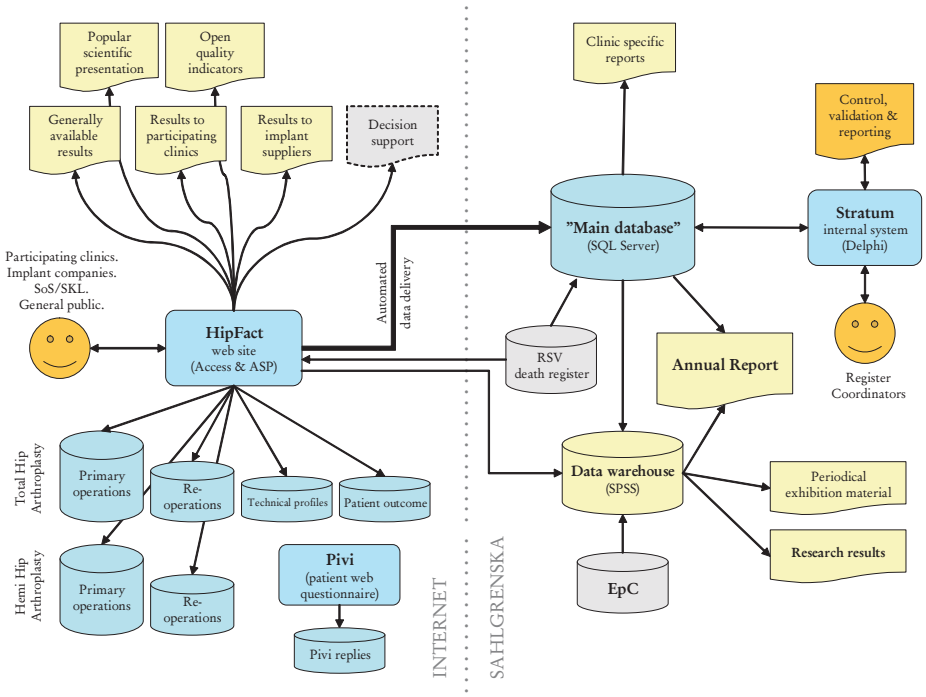


Figure 1. Before consolidation and reorganization of the system. The system consists of two main parts, an older system originating from before the internet (behind the hospital's firewall), and a newer, webbased system. The two parts are one-way connected, from the internal system to the web server. This configuration primarily leads to one problem – older data (before 1999) cannot easily be retrieved and processed on the web server in order to assemble results and deliver data. Another problem is that maintaining several databases leads to increased amounts of "doubled" data which, in turn, increases the risk of inconsistencies in the results.

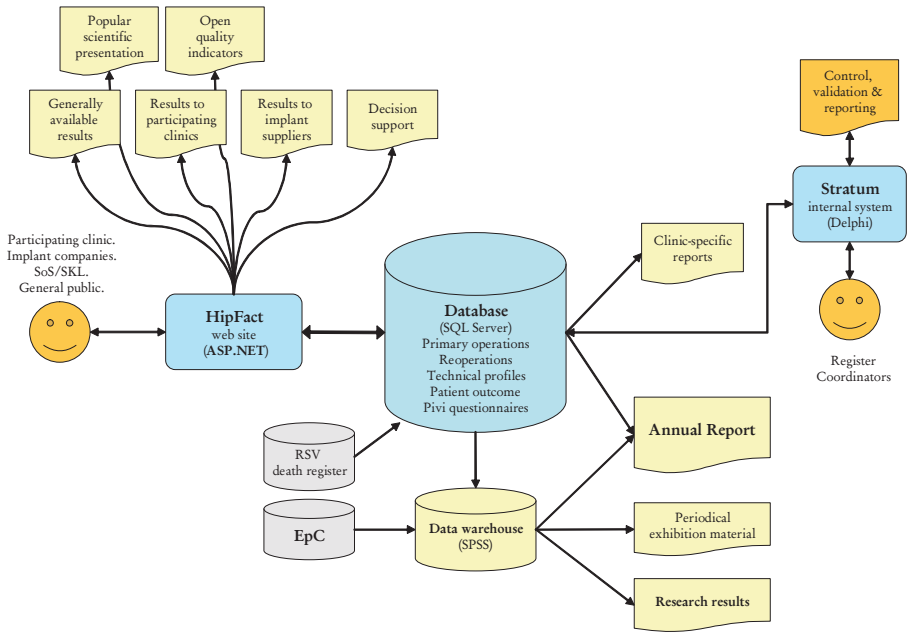


Figure 2. After consolidation and reorganization of the system. All data now resides in one database, without the need to transfer any data through a firewall. More comprehensive results and data can now be retrieved directly from the website. In addition to consolidating the databases, much of the work will be focused on rewriting and reconstructing the software that maintains and utilizes the new database.

The 'case-mix' factor

Background

Starting with this year's Report the Registry is presenting eight openly-reported parameters at county-council/ regional and hospital levels. The advantages of an open presentation are many, but problems of interpretation arise – perhaps first and foremost in the mass media. Misinterpreted massmedia reports of treatment results affect patients in the form of increased anxiety.

In all reporting it is necessary to detail the patients' demographic profile – the 'case- mix'. Conventional clinical trials most often employ a more homogeneous patient material, depending on the inclusion criteria specified in the study protocol. A national register study includes all patients, with a broad distribution of risk factors.

'Case-mix' and implant survival

Surgery involving hip prostheses is associated with varying degrees of co-morbidity, technical difficulty and risks of post-operative complications. Medical care shows a clear tendency for patients with expected low complication risk to be operated on at certain hospitals while other hospitals mainly accept patients with greater demands on surgical competence. Patients requiring special implants and with increased risk of peri- and post-operative complications, and hence longer and more costly care, are operated on at special units, most frequently university/regional and county hospitals. Use of resources and costs may therefore vary widely between different departments.

These aspects must be taken into account when interpreting the outcome of quality indicators such as revision at 2, 5 or 10 years. Using the demographic variables in the Hip Arthroplasty Register we have earlier constructed a 'case-mix' indicator to facilitate comparisons between different operating units. We found that patients with primary osteoarthritis and aged between 60 and 75 years exhibit a 50-60% lower risk of undergoing revision (replacement of one or more prosthesis components). The analysis comprised all operations between 1992 and 2004 with no specific limit for length of follow-up time.

However, there is reason to suspect that the most favourable 'case-mix' varies depending on length of observation period. Revision following dislocation, for example, occurs chiefly within the first two years of the primary operation, while other complications such as mechanical loosening or local destruction of bone tissue round the prosthesis (osteolysis) increase with the length of the observation period. In this year's report we have therefore calculated three 'case-mix' variables, one for each time interval, 2 years, 5 years and 10 years.

In calculating the 'case-mix' variable we used Cox regression analysis to adjust for interference between different variables and the follow-up period and outcome. We included all cases so as not to exclude any patient groups requiring special prostheses and operated on in fairly small numbers; but who may be expected to have a poorer outcome. The outcome parameter was revision, that is, the whole or part of the implant was replaced or extracted. In the analysis, the degree of clinical relevance was taken into account. Factors adding little or insignificant information, or which only marginally improved the degree of explanation afforded by the equation, were excluded because of uncertain clinical relevance. Thus in a strictly scientific account, more factors would have been presented.

The outcomes of the three analyses gave surprisingly similar results. The least risk of revision exists when the same three conditions are present and irrespective of length of observation period. The three factors together representing the most favourable combination (optimal 'case-mix') are female gender, 60 years or older and operation for primary osteoarthritis. Irrespective of whether the observation period is 2, 5 or 10 years, this combination relates to a reduction in the risk of revision within each time interval by half or just under half. Together, operations on these patients make up 37.1% of those included in the database between 1992 and 2006. The table shows how the risk of undergoing revision declines from a situation where none of the criteria in question are met (for example man, younger than 60 years with secondary osteoarthritis irrespective of cause) to one where all the favourable circumstances are present (woman, 60 or older with primary osteoarthritis). For the least favourable combination, the observed revision frequency rises from 2.1% at two years to 7.9% after ten years. Corresponding figures for a woman aged 60 or older with primary osteoarthritis are 0.8% at two years and 2.1% after ten years (Table 1)

In our earlier calculations of the 'case-mix' variable we found that patients undergoing surgery in the age interval 60-75 years had the most optimal outcome. The present calculations give a cut-off point at age 60. The reasons for this may be many. It is important that the observation time is shorter. Moreover the material has been supplemented with data from two more years of follow-up.

Case-mix and patient-related outcome

Another substantial problem of interpretation is that the younger and 'healthier' patients (with less co-morbidity) often obtain better values regarding patient-related outcome (satisfaction, pain relief and health gains) but at the same time in many cases have an increased risk of long-term loosening and need for revision surgery.

Back in 1972 John Charnley wrote of the need to describe the demographic profile of a patient group studied. He then published his simple patient classification Charnley

Number of positive factors	Revision within 2 years (%)		Revision within 5 years (%)		Revision within 10 years (%)	
	no	yes	no	yes	no	yes
0	97.9	2.1	96.1	3.9	92.1	7.9
1	98.3	1.7	96.9	3.1	94.4	5.6
2	98.7	1.3	97.8	2.2	96.5	3.5
3	99.2	0.8	98.7	1.3	97.9	2.1
Risk reduction if female, primary osteoarthritis, age ≥60 years	**0.53** *(0.48–0.59)*		**0.52** *(0.48–0.57)*		**0.50** *(0.47–0.53)*	

Table 1. 'Case-mix' with respect to revision surgery. Relative distribution of non-revised/revised patients related to the occurrence of positive predictive factors and length of observation time. The relative risk reduction when all factors are present is relatively equal, independent of the observation time. 95% confidence interval in italics.

A – unilateral disease, B – bilateral hip disease and C – multiple joint disease or other major medical condition impairing walking capacity. The Charnley classification has a major effect on the outcome of hip replacement surgery measured with both disease-specific and generic instruments. C-patients generally show poorer results. This applies mainly to total values. The values obtained (the difference between pre- and post-operative results) in a follow-up do not differ as much. For this reason, patients receiving hip replacement should be followed prospectively and not with cross-sectional studies. Age and gender also affect the patient-related outcome.

Further variables that affect outcome

Our calculations of factors that affect the outcome of hip arthroplasty are limited by the variables available and recorded in databases. Many other factors such as BMI, intercurrent disease, ethnicity and socioeconomics may also influence the outcome. In summary, we consider that continued work on 'case-mix' variables is of the greatest importance for correct and fair evaluation.

Nordic collaboration

The arthroplasty registers in Norway, Denmark and Sweden have formed an association: the Nordic Arthroplasty Register Association. One goal is to analyse patient demography in the different countries and find a common and standardised 'case-mix' variable.

Right diagnosis and measure according to ICD-10

In the analysis of patient demography, the treating physician's diagnosis according to ICD-10 is a decisive factor for the quality and validity of the database. During the past year we have conducted special studies and found insufficient 'sharpness' in the use of ICD-10. For example we have studied the outcome of total hip arthroplasty surgery following hip fractures during the period 1999-2005. All operation records were requisitioned (approximately 6,000) for laborious control study and it turned out that 14% of the patients had the wrong ICD-10 diagnosis code. There are also indications that patients with secondary osteoarthritis in some cases through carelessness received code M16.0-1 instead of M16.7 or M16.3. Naturally, it is also important to attempt to differentiate between primary osteoarthritis and inflammatory arthritis.

We have also found corresponding shortcomings in the measure codes given.

Total hip replacement surgery takes one-to-two hours. Entering the correct ICD-10 diagnosis takes a minute or so. The Registry management would urge contact physicians and managers to discuss this 'problem' at their department meetings.

For the 'case-mix' analysis to be adequate, it is of utmost importance that patients are given the correct diagnosis and measure codes.

Take an extra minute to put the correct diagnosis and measure according to ICD-10.

Primary THR

The register shows primary total hip replacements performed in Sweden since 1979. Up to and including 1991 data were collected from individual departments. Starting in 1992 data on primary operations was individually based. This means that factors such as age, gender, diagnosis, surgical technique and choice of cup and stem could be registered for each operation. Until and including 1991 the reports were based partly on well-validated estimates.

Starting in 1999 two important changes were introduced. The first was that registration via the internet was made possible, and during 2006 this was used by 74 of the 77 departments that perform hip arthroplasty in Sweden. The other three departments report using data files.

The second change was that registration was supplemented with the article numbers for the various prosthesis components used in each operation. Thus each patient's prosthesis and its parts can be identified in detail. One practical example of this opportunity for extended analysis was implemented in the 2005 Annual Report where we examined how factors such as stem size, choice of neck length and offset affected the outcomes for the three most used implants. As well as generating explanatory models for observed departmental complications, data from this type of analysis can give a direct guide in the choice of implant for the individual patient. Between 1979 and 2006, 270,240 primary hip arthroplasties were registered (1992-2006: 169,623). The number of primary procedures increased marginally during 2006 to 13,942 compared with 13,848 in 2005. The fifteen most common implant combinations during the past ten years are shown in table form. During this period there was a change in favour of uncemented fixation where the transfer to uncemented stems is now tending to occur somewhat more rapidly (see Figure 1). Cement is still used in the majority of cases: during 2006 it was used for 86% of the cups and 84% of the stems.

The first tables (pages 12-13) show the most common implant combinations and their market shares. These are calculated from their use during the past ten years. The overwhelming majority consist of entirely cemented implants. The total number of primary procedures and the number of revisions per year with the four fixation principles entirely cemented, entirely uncemented, hybrid and reversed hybrid procedures, is shown in four figures on page 18. The tables on pages 19-20 are affected to some extent by historical data. What follows is therefore an outline of the present situation.

All-cemented prostheses represent a decreasing proportion of the total number. Starting in 2001 the relative proportion decreased successively from 91.7% to 80.3% during 2006. During the whole period, six of the reported cup/stem combinations were implanted in more than 6,000 hips. The Charnley stem has almost entirely disappeared, chiefly in favour of the Lubinus SPII and the Exeter stems. During 2006 the use of both these stems in all-cemented procedures declined marginally in absolute figures. Relatively speaking, the Exeter stem increased by about 1% to 28.4% and the SPII stem by 0.2% to 57.0%. Together they were used during 2006 in 85.0% of all all-cemented primary hip arthroplasties. On the cup side the Lubinus All-poly, Charnley Elite and Exeter Duration predominate, all used in more than 1,000 fully-cemented arthroplasties. In all cases their relative proportions increased from 0.6% to 1.5% between 2005 and 2006 in the segment fully-cemented arthroplasties.

All-uncemented prostheses constitute the fixation type that increased most between 2005 and 2006, from 7.3% to 9.9% of all total hip arthroplasties. On the stem side the Spotorno stem (CLS) predominated, with just over 50% of the total. Even though the number of stems increased during 2006, its relative proportion remains fairly constant (2005: 54.8%, 2006: 53.1%). Different varieties of the Bimetric stem together represent 15% (2005: 14%) followed by the Accolade (8.6%) Symax (5.0%), Corail (4.5%), ABG II (4.4%) and Cone (3.1%). The other twelve variants were used in fewer than 2% of cases, representing 6% of the total number in 2006. On the cup side, the Trilogy ±HA (36.7%) predominated, followed by the Trident HA (16.9%), CLS Spotorno (12.0%) Allofit (10.1%), N2A (6.5%) and Pinnacle ±HA (3.7%). The other 19 types used during 2006 represented 14% of all uncemented prostheses.

Hybrid prostheses were dominated in 2006 on the stem side by the Spectron EF Primary (22.5%), BHR (22.3%), Lubinus SP II (19.6%), Durom (13.6%), ASR Head (9.5%), and ABG II (4.7%). The other six variants were used in 2% or fewer of the cases (7.8% of the total). On the cup side were the Trilogy ±HA (36.6%), BHR (21.9%), Durom (13%), ASR cup (9.7%) and Trident ±HA (9.5%). The other 15 varieties were used during 2006 in 9.3% of the cases.

Different variants of the Biometric stem were used in almost half of all reversed hybrids (42.3%). CLS and ABG were used in 22.4% and 19.6% of hips, respectively, followed by the Corail (7.0%). Thirteen different prosthesis types were used in the other cases (8.5%). The Charnley Elite and the Charnley cup 35.7%, the Lubinus All-Poly and FAL 19.3%, the Contemporary Hooded Duration and Extra Duration 19.1%, the ZCA 9.9% and Biomet Miller 9.7% dominated on the cup side. Six other types were used in the remaining 6.3%.

In summary a limited number of prosthesis designs is being used nowadays, commonly with good documentation, for the large majority of patients. In the various fixation groups a varying number of prostheses are being used only in a few cases. In the majority of cases, these are implants documented earlier or prosthesis types chosen specially for specific requirements or for evaluation. This shows that the diversification observed on the implant side is by and large well-warranted.

Resurfacing has been used conservatively. Between 2003 and 2005 the number increased from 71 to 217. During 2006 a more moderate increase was seen, to 233 cases. This may be explained by the fact that the type has a limited indication area and that the Australian register has reported a certain increased risk of revision.

During the past ten years the proportion of operations carried out at university/regional hospitals has decreased from 17.7% to 9.8%, a trend that was constant during the period. County hospitals declined from 48.5% to 39.6% in 2005 to increase by about 1% during 2006. At the county hospitals there was a constant increase to 41.3% in 2005, unchanged in 2006. The private hospitals show a small increase for each year (except 2004), having risen from 1.8% in 1997 to 8.6% in 2006.

This development has certain advantages but also disadvantages and risks. The university/regional hospitals are responsible for research development and teaching. When the procedure frequency of standard cases declines strongly at these types of hospital, the basis for the important R&D task shrinks, which in turn can result in future stagnation and deterioration of quality in the area.

The figures specify the revision burden (RB). This concept is the quotient of number of revisions in the form of replacement or extraction of the whole or parts of the prosthesis and the sum of primary operations and revisions. The RB is an important key number but must be related to the patient group in question. In terms of department, the RB is chiefly a way of describing the type of surgery carried out, since patients undergoing primary operation at a different department are not included in the same way as that department's own primary cases who require revision. Hence the revision burden is not a good variable for comparisons between departments.

However, for comparisons between large regions or internationally, where primary cases requiring further measures are treated within the same region, the RB concept is valuable and relevant. In these diagrams the revision burden is reported for whole cohorts of each prosthesis type. Given the continuous development in prosthesis design, surgical technique and choice of implant, it is important to study prosthesis survival in the separate survival tables and diagrams that are more specific.

To further increase the informational value of register data, more detailed analyses of different areas are also carried out. In the present Report we have produced more detailed data for the younger patient group (up to and including 50 years).

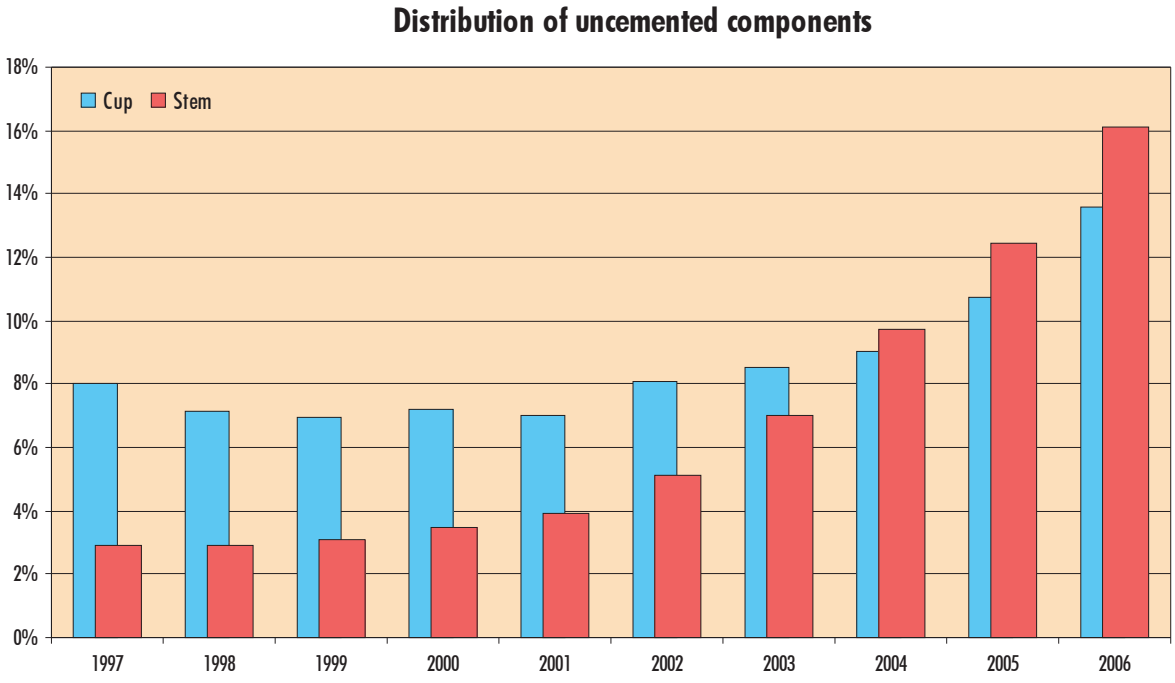


Figure 1. Distribution of uncemented components, including entirely uncemented, hybrid and inverse hybrid. Uncemented cup dominated during the early part of this period. From 2004 uncemented stem became more common.

15 Most Common Implants

most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Lubinus All-Poly (Lubinus SP II)	36,138	4,584	4,711	5,397	5,705	5,521	62,056	35.5%
Charnley (Charnley)	54,122	927	282	81	8	2	55,422	8.5%
Exeter Duration (Exeter Polished)	3,744	1,548	1,418	1,329	1,121	1,122	10,282	8.4%
Reflection (Spectron EF Primary)	3,034	693	889	871	788	671	6,946	5.5%
Charnley Elite (Exeter Polished)	1,442	915	1,061	998	980	1,153	6,549	5.4%
FAL (Lubinus SP II)	579	810	831	707	599	533	4,059	3.3%
Exeter All-Poly (Exeter Polished)	6,523	23	8	10	2	2	6,568	2.5%
Contemporary Hooded Duration (Exeter Polished)	18	278	561	514	574	600	2,545	2.1%
Charnley (Exeter Polished)	658	159	281	433	517	282	2,330	1.6%
OPTICUP (Scan Hip II Collar)	1,566	279	125	10	0	1	1,981	1.5%
Charnley (Charnley Elite Plus)	1,500	14	2	0	0	0	1,516	1.0%
Trilogy HA (Spectron EF Primary)	591	174	127	107	88	102	1,189	1.0%
Charnley Elite (Charnley Elite Plus)	1,159	10	0	0	0	0	1,169	0.9%
Charnley Elite (Lubinus SP II)	430	76	140	176	187	124	1,133	0.8%
Weber All-Poly (Straight-stem standard)	222	115	137	195	164	125	958	0.8%
Others (total 1,053)	91,945	2,072	2,108	2,566	3,212	3,704	105,607	
Total	203,671	12,677	12,681	13,394	13,945	13,942	270,310	

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)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
CLS Spotorno (CLS Spotorno)	434	56	69	68	110	163	900	11.8%
Trilogy HA (CLS Spotorno)	10	19	24	80	178	283	594	10.8%
Allofit (CLS Spotorno)	35	91	94	87	127	128	562	10.2%
Trilogy (CLS Spotorno)	52	24	58	78	86	88	386	7.0%
Trilogy HA (Versys stem)	27	41	80	75	25	9	257	4.7%
Trident HA (Accolade)	0	0	0	33	69	118	220	4.0%
ABG II HA (ABG uncem.)	91	53	19	14	18	2	197	3.5%
Romanus HA (Bi-Metric HA uncem.)	248	4	1	5	3	0	261	3.5%
Trilogy HA (Bi-Metric HA uncem.)	31	42	61	28	22	4	188	3.4%
Trilogy (Cone uncem.)	71	15	15	35	23	23	182	3.3%
Trilogy (SL plus stem uncem.)	37	15	17	26	31	9	135	2.4%
ABG II HA (Meridian)	42	31	32	9	0	0	114	2.1%
M2a (Bi-Metric HA lat)	0	0	7	21	26	47	101	1.8%
Press-Fit (CLS Spotorno)	10	9	12	16	22	28	97	1.8%
SL Ti (CLS Spotorno)	39	5	13	9	12	8	86	1.6%
Others (total 219)	5,353	33	75	172	259	465	6,357	
Total	6,480	438	577	756	1,011	1,375	10,637	

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)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Trilogy HA (Spectron EF Primary)	591	174	127	107	88	102	1,189	22.6%
Trilogy HA (Lubinus SP II)	458	131	144	114	73	51	971	18.0%
BHR Acetabular Cup (BHR Femoral Head)	25	45	44	74	118	110	416	8.1%
Durom (Durom)	0	23	25	33	75	66	222	4.3%
ABG II HA (Lubinus SP II)	181	14	5	6	0	3	209	4.1%
Reflection HA (Lubinus SP II)	119	19	15	23	10	1	187	3.0%
TOP Pressfit HA (Lubinus SP II)	33	32	24	31	16	5	141	2.8%
Biomex HA (Lubinus SP II)	39	33	30	3	0	0	105	2.0%
Reflection HA (Spectron EF Primary)	99	0	0	0	0	0	99	1.9%
ABG HA (Lubinus SP II)	338	0	0	0	0	0	338	1.9%
Duralock (uncem.) (Spectron EF Primary)	114	0	0	0	0	0	114	1.8%
Trilogy HA (Stanmore mod)	13	34	15	9	8	7	86	1.7%
Allofit (MS30 Polished)	48	22	4	0	3	2	79	1.5%
Mallory-Head uncem. (Lubinus SP II)	86	6	2	3	2	1	100	1.4%
ASR Cup (ASR Head)	0	0	0	1	22	48	71	1.4%
Others (total 232)	4,925	53	66	47	70	110	5,271	
Total	7,069	586	501	451	485	506	9,598	

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	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Lubinus All-Poly	58,258	4,598	4,744	5,469	5,825	5,675	84,569	36.0%
Charnley	57,585	1,202	617	663	635	330	61,032	11.7%
Exeter Duration	3,942	1,631	1,533	1,471	1,264	1,282	11,123	9.1%
Charnley Elite	4,141	1,258	1,501	1,456	1,407	1,627	11,390	8.7%
Reflection	4,419	718	913	888	831	708	8,477	5.7%
FAL	581	819	842	728	618	557	4,145	3.4%
Trilogy HA	1,447	454	486	467	460	566	3,880	3.0%
Exeter All-Poly	6,749	25	8	10	2	2	6,796	2.6%
OPTICUP	3,144	312	181	91	62	37	3,827	2.4%
Contemporary Hooded Duration	18	278	565	561	690	801	2,913	2.4%
Biomet Müller	4,309	257	235	205	211	174	5,391	2.2%
Cenator	2,639	3	3	6	0	0	2,651	1.6%
Weber All-Poly	303	150	259	362	197	152	1,423	1.2%
ZCA	193	86	71	134	478	239	1,201	0.9%
Müller All-Poly	5,085	72	70	89	128	105	5,549	0.9%
Others (total 162)	50,858	814	653	794	1,137	1,687	55,943	
Total	203,671	12,677	12,681	13,394	13,945	13,942	270,310	

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

15 Most Common Stem Components

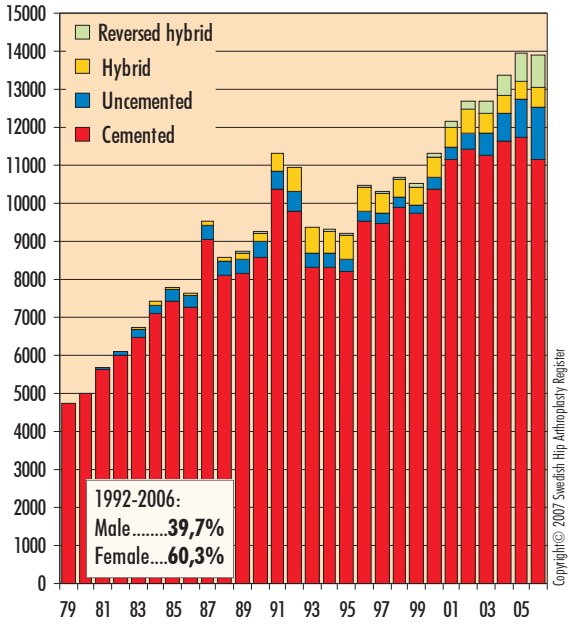
most used during the past 10 years

Stem	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Lubinus SP II	41,953	5,815	6,086	6,688	6,820	6,467	73,829	43.1%
Exeter Polished	22,983	2,956	3,360	3,300	3,218	3,182	38,999	21.0%
Charnley	55,243	928	282	81	9	2	56,545	8.5%
Spectron EF Primary	4,283	966	1,077	1,041	928	824	9,119	7.2%
CLS Spotorno	773	220	309	448	698	923	3,371	2.5%
Charnley Elite Plus	3,049	30	2	0	0	1	3,082	2.2%
Scan Hip II Collar	1,863	280	125	10	0	1	2,279	1.8%
CPT (steel)	955	279	198	48	3	1	1,484	1.1%
Straight-stem standard	333	120	145	207	208	172	1,185	1.0%
Stanmore mod	558	303	91	80	50	71	1,153	0.9%
MS30 Polished	193	78	141	183	267	287	1,149	0.9%
Müller Straight	4,450	103	98	98	115	109	4,973	0.8%
Bi-Metric HA uncem.	611	81	114	127	144	51	1,128	0.8%
RX90-S	1,697	2	0	1	0	0	1,700	0.7%
CPT (CoCr)	0	0	64	224	317	204	809	0.7%
Others (total 171)	64,727	516	589	858	1,168	1,647	69,505	
Total	203,671	12,677	12,681	13,394	13,945	13,942	270,310	

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

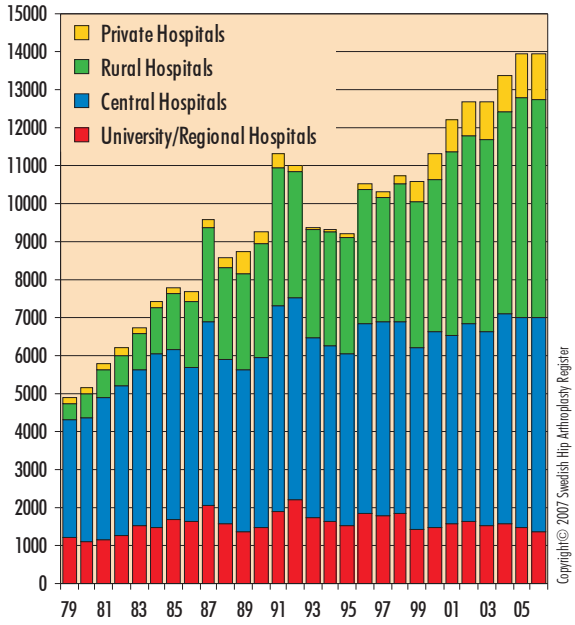
Number of Primary THRs

per type of fixation, 1979-2006



Number of Primary THRs

per type of hospital, 1979-2006



Number of Primary THRs per Hospital and Year

Hospital	1979-2001	2002	2003	2004	2005	2006	Total	Share
Alingsås	1,109	114	98	147	201	209	1,878	0.7%
Arvika	846	21	43	118	145	97	1,270	0.5%
Bollnäs	1,017	110	215	275	253	265	2,135	0.8%
Borås	4,177	127	151	198	234	211	5,098	1.9%
Carlanderska	950	72	42	50	56	69	1,239	0.5%
Danderyd	5,108	327	290	268	408	354	6,755	2.5%
Eksjö	3,297	177	151	190	191	189	4,195	1.6%
Elisabethsjukhuset	101	30	71	121	116	159	598	0.2%
Enköping	803	134	163	149	155	181	1,585	0.6%
Eskilstuna	3,555	75	66	65	75	106	3,942	1.5%
Falköping	1,200	260	223	213	227	274	2,397	0.9%
Falun	4,234	181	273	301	231	239	5,459	2.0%
Frölunda Specialistsjukhus	0	1	34	61	48	52	196	0.1%
GMC	5	0	0	17	42	50	114	0.0%
Gällivare	1,722	86	103	94	117	137	2,259	0.8%
Gävle	4,219	218	194	149	140	131	5,051	1.9%
Halmstad	2,821	203	171	164	177	267	3,803	1.4%
Helsingborg	3,186	176	100	102	73	85	3,722	1.4%
Hudiksvall	1,955	164	186	161	129	123	2,718	1.0%
Hässleholm-Kristianstad	4,427	483	581	710	670	751	7,622	2.8%
Jönköping	3,053	163	162	221	185	206	3,990	1.5%
Kalmar	3,126	189	203	225	235	182	4,160	1.5%
Karlshamn	1,136	122	210	174	149	164	1,955	0.7%
Karlskoga	1,713	135	156	111	90	100	2,305	0.9%
Karlskrona	2,115	50	40	44	31	35	2,315	0.9%
Karlstad	3,188	163	216	235	220	281	4,303	1.6%
Katrineholm	993	207	203	226	194	185	2,008	0.7%
KS/Huddinge	4,116	202	183	221	236	283	5,241	1.9%
KS/Solna	2,981	293	281	273	297	187	4,312	1.6%
Kungälv	1,410	198	175	124	229	169	2,305	0.9%
Köping	1,303	190	190	210	217	218	2,328	0.9%
Lidköping	1,341	111	102	118	149	140	1,961	0.7%
Lindesberg	1,308	133	138	161	119	147	2,006	0.7%
Linköping	4,508	249	208	123	76	40	5,204	1.9%
Ljungby	1,526	137	96	103	101	120	2,083	0.8%

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

Hospital	1979-2001	2002	2003	2004	2005	2006	Total	Share
Lund	3,854	74	103	103	105	83	4,322	1.6%
Lycksele	1,358	196	200	212	274	243	2,483	0.9%
Malmö	5,231	135	109	128	116	126	5,845	2.2%
Mora	2,015	133	139	144	158	132	2,721	1.0%
Motala	1,368	147	161	229	421	430	2,756	1.0%
Movement	0	0	8	6	90	112	216	0.1%
Nacka Närsjukhus Proxima	0	0	0	0	17	54	71	0.0%
Norrköping	3,931	219	177	243	171	70	4,811	1.8%
Norrtälje	845	107	92	87	116	86	1,333	0.5%
Nyköping	1,908	125	121	124	151	138	2,567	0.9%
Ortopediska Huset	333	144	179	244	297	379	1,576	0.6%
Oskarshamn	1,200	112	114	137	176	259	1,998	0.7%
Piteå	621	98	92	137	183	337	1,468	0.5%
S:t Göran	6,817	463	444	507	474	435	9,140	3.4%
Skellefteå	1,664	160	148	119	120	108	2,319	0.9%
Skene	618	83	87	89	71	65	1,013	0.4%
Skövde	4,494	143	173	150	160	160	5,280	2.0%
Sollefteå	1,071	130	123	150	136	154	1,764	0.7%
Sophiahemmet	3,708	175	163	257	348	209	4,860	1.8%
Stockhoms Specialistvård	76	99	130	136	207	168	816	0.3%
SU/Mölndal	2,160	123	118	88	93	37	2,619	1.0%
SU/Sahlgrenska	3,965	201	225	202	204	150	4,947	1.8%
SU/Östra	3,649	173	115	100	92	151	4,280	1.6%
Sunderby (inklusive Boden)	4,069	127	117	151	128	82	4,674	1.7%
Sundsvall	4,437	198	181	161	149	128	5,254	1.9%
Södersjukhuset	5,343	240	216	219	257	417	6,692	2.5%
Södertälje	500	125	145	122	110	127	1,129	0.4%
Torsby	1,012	74	58	71	74	67	1,356	0.5%
Trelleborg	2,099	165	196	167	487	496	3,610	1.3%
Uddevalla	3,557	289	292	256	321	347	5,062	1.9%
Umeå	3,752	44	58	77	77	75	4,083	1.5%
Uppsala	4,519	259	230	328	286	266	5,888	2.2%
Varberg	2,934	219	168	192	182	201	3,896	1.4%
Visby	1,607	83	71	61	102	122	2,046	0.8%
Värnamo	1,736	92	101	127	146	151	2,353	0.9%

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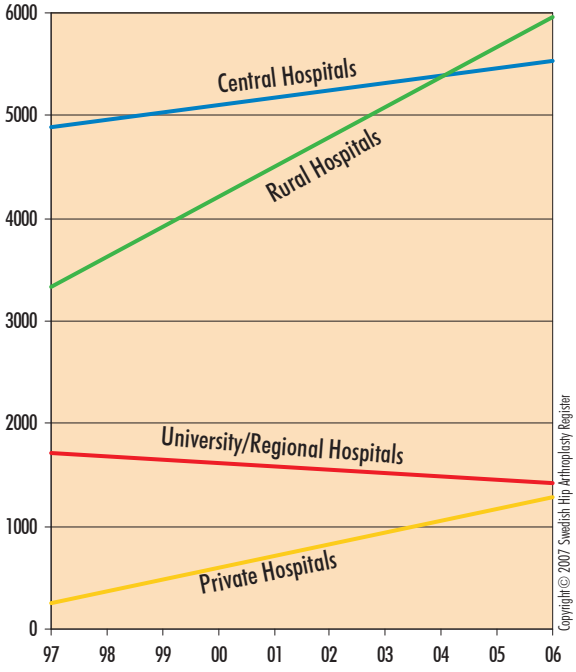
Number of Primary THRs per Hospital and Year (cont.)

Hospital	1979-2001	2002	2003	2004	2005	2006	Total	Share
Västervik	1,981	114	114	121	106	91	2,527	0.9%
Västerås	2,720	122	87	122	145	158	3,354	1.2%
Växjö	2,630	106	68	129	125	147	3,205	1.2%
Ystad	2,065	108	98	111	66	12	2,460	0.9%
Örebro	3,962	190	194	180	168	191	4,885	1.8%
Örnsköldsvik	1,722	127	102	154	149	168	2,422	0.9%
Östersund	3,117	128	181	158	215	204	4,003	1.5%
Others [1)]	20,474	1,126	1,065	773	256	0	23,694	8.1%
Total	203,671	12,677	12,681	13,394	13,945	13,942	270,310	100%

1) Includes hospitals that are no longer active or do not perform primary THRs any more.

Trends in Primary THR Surgery

during the last 10 years by type of hospital



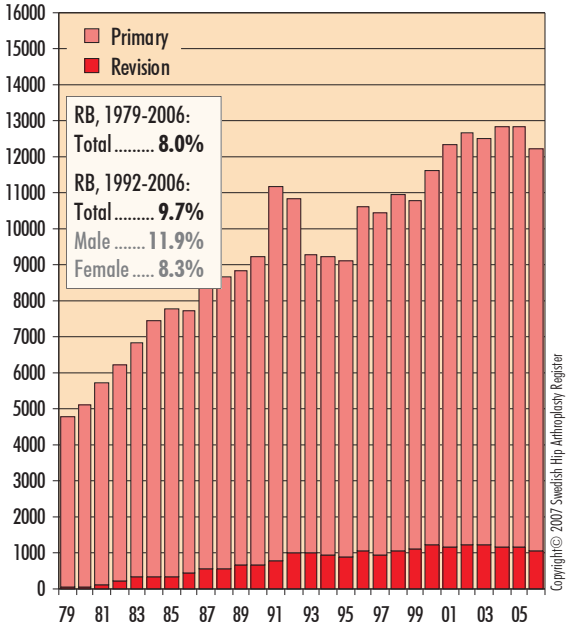
The structural transformation in Swedish elective orthopaedics is shown clearly in the figure opposite. The trend that increasing numbers of primary arthroplasties are carried out at rural and private hospitals has been accentuated. In 2006, Swedish private hospitals performed almost as many primary arthroplasties as the university/regional hospitals. This trend has clear advantages and disadvantages. It is possible that the productivity of prosthesis operations increases for certain patient groups. Since rural hospitals and above all private hospitals operate on 'healthier' patients with less co-morbidity, and on technically simpler cases, however, this may mean that accessibility for the 'more ill' and more complicated cases is worsened, which is actually in breach of Swedish medical care legislation! Other disadvantages in the long run:

- Opportunities for continual training of physicians and surgical staff become poorer since the training is concentrated to the university/regional hospitals.
- The base for clinical trials of primary arthroplasties decreases dramatically. This can in the long run slow down the development of hip replacement surgery in Sweden.
- Many private hospitals are not yet connected to the standardised follow-up routine of the register, for which reason this part of production cannot be adequately quality-assured.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
	1,792	1,823	1,426	1,480	1,556	1,630	1,512	1,555	1,489	1,361
	5,106	5,081	4,774	5,161	4,996	5,207	5,112	5,539	5,524	5,626
	3,253	3,613	3,849	4,005	4,829	4,958	5,057	5,330	5,759	5,755
	180	246	515	688	808	882	1,000	970	1,173	1,200

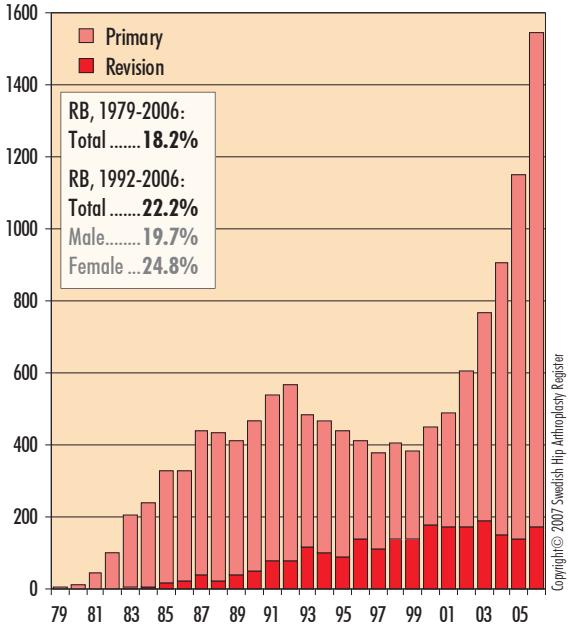
THR with Cemented Implants

245,883 primary THRs, 21,372 revisions, 1979-2006



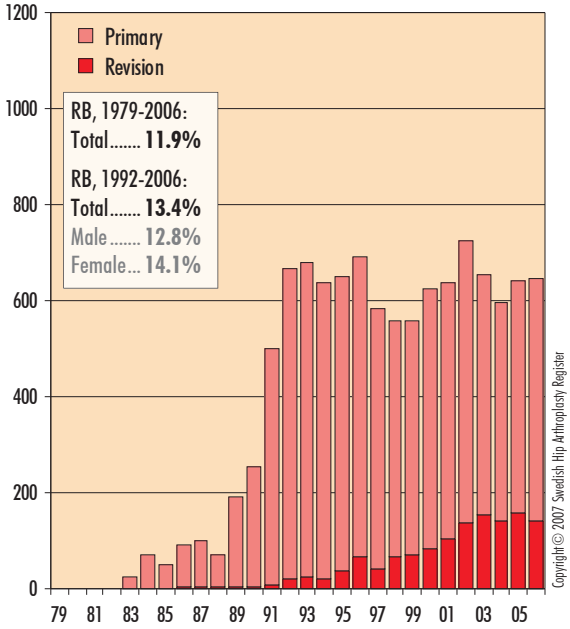
THR with Uncemented Implants

10,637 primary THRs, 2,368 revisions, 1979-2006



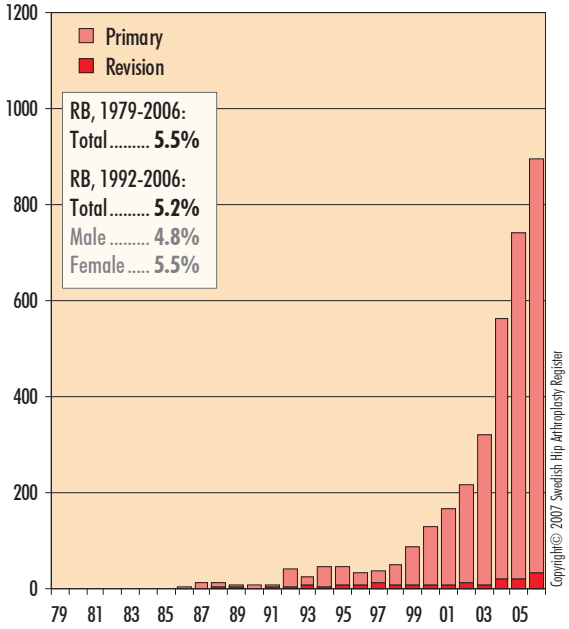
THR with Hybrid Implants

9,598 primary THRs, 1,297 revisions, 1979-2006



THR with Reversed Hybrid Implants

3,366 primary THRs, 190 revisions, 1979-2006



Number of Primary THRs Per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	76,191	10,186	10,117	10,783	11,582	11,659	130,518	76.9%
Fracture	12,136	1,415	1,466	1,484	1,331	1,247	19,079	11.2%
Inflammatory arthritis	5,325	374	378	355	325	306	7,063	4.2%
Idiopathic femoral head necrosis	3,083	330	343	343	339	350	4,788	2.8%
Childhood disease	1,544	289	272	322	270	294	2,991	1.8%
Secondary osteoarthritis	1,293	1	3	2	4	2	1,305	0.8%
Tumor	432	68	65	77	78	65	785	0.5%
Secondary arthritis after trauma	293	14	37	28	16	17	405	0.2%
(missing)	2,687	0	0	0	0	2	2,689	1.6%
Total	102,984	12,677	12,681	13,394	13,945	13,942	169,623	100%

Number of Primary THRs Per Diagnosis and Age

1992-2006

Diagnosis	< 50 years		50-59 years		60-75 years		> 75 years		Total	Share
Primary osteoarthritis	4,479	55.4%	18,135	80.4%	70,873	82.6%	37,031	69.7%	130,518	76.9%
Fracture	268	3.3%	949	4.2%	6,916	8.1%	10,946	20.6%	19,079	11.2%
Inflammatory arthritis	1,280	15.8%	1,368	6.1%	3,291	3.8%	1,124	2.1%	7,063	4.2%
Idiopathic femoral head necrosis	491	6.1%	602	2.7%	1,723	2.0%	1,972	3.7%	4,788	2.8%
Childhood disease	1,159	14.3%	923	4.1%	749	0.9%	160	0.3%	2 ,991	1.8%
Secondary osteoarthritis	99	1.2%	112	0.5%	474	0.6%	620	1.2%	1,305	0.8%
Tumor	96	1.2%	168	0.7%	346	0.4%	175	0.3%	785	0.5%
Secondary arthritis after trauma	58	0.7%	58	0.3%	142	0.2%	147	0.3%	405	0.2%
(missing)	150	1.9%	237	1.1%	1,316	1.5%	986	1.9%	2,689	1.6%
Total	8,080	100%	22,552	100%	85,830	100%	53,161	100%	169,623	100%

Number of Primary THRs with Uncemented Implants per Diagnosis and Age

1992-2006

Diagnosis	< 50 years		50-59 years		60-75 years		> 75 years		Total	Share
Primary osteoarthritis	1,380	58.1%	2,774	85.2%	1,433	90.3%	54	72.0%	5,641	77.3%
Childhood disease	441	18.6%	224	6.9%	50	3.2%	3	4.0%	718	9.8%
Inflammatory arthritis	253	10.6%	74	2.3%	32	2.0%	3	4.0%	362	5.0%
Idiopathic femoral head necrosis	149	6.3%	81	2.5%	22	1.4%	2	2.7%	254	3.5%
Fracture	53	2.2%	49	1.5%	29	1.8%	11	14.7%	142	1.9%
Secondary osteoarthritis	32	1.3%	7	0.2%	4	0.3%	1	1.3%	44	0.6%
Secondary arthritis after trauma	19	0.8%	3	0.1%	0	0.0%	1	1.3%	23	0.3%
Tumor	1	0.0%	5	0.2%	0	0.0%	0	0.0%	6	0.1%
(missing)	49	2.1%	37	1.1%	17	1.1%	0	0.0%	103	1.4%
Total	2,377	100%	3,254	100%	1,587	100%	75	100%	7,293	100%

Number of Primary THRs per Type of Fixation and Age

1992-2006

Type of Fixation	< 50 years		50-59 years		60-75 years		> 75 years		Total	Share
Cemented	3,288	40.7%	14,545	64.5%	80,303	93.6%	52,448	98.7%	150,584	88.8%
Hybrid	1,723	21.3%	3,292	14.6%	2,810	3.3%	363	0.7%	8,188	4.8%
Uncemented	2,377	29.4%	3,254	14.4%	1,587	1.8%	75	0.1%	7,293	4.3%
Reversed Hybrid	644	8.0%	1,419	6.3%	1,024	1.2%	134	0.3%	3,221	1.9%
(missing)	48	0.6%	42	0.2%	106	0.1%	141	0.3%	337	0.2%
Total	8,080	100%	22,552	100%	85,830	100%	53,161	100%	169,623	100%

Number of Primary THRs per Type of Fixation and Year — Younger than 60 Years

Type of Fixation	1992-2001	2002	2003	2004	2005	2006	Total	Share
Cemented	11,255	1,526	1,463	1,436	1,221	932	17,833	58.2%
Uncemented	2,660	352	458	545	713	903	5,631	18.4%
Hybrid	3,509	387	304	271	283	261	5,015	16.4%
Reversed Hybrid	442	149	198	366	442	466	2,063	6.7%
(missing)	62	5	3	3	5	12	90	0.3%
Total	17,928	2,419	2,426	2,621	2,664	2,574	30,632	100%

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

Type of Fixation	1992-2001	2002	2003	2004	2005	2006	Total	Share
Cemented	82,102	9,904	9,826	10,196	10,492	10,231	132,751	95.5%
Hybrid	2,150	199	197	180	202	245	3,173	2.3%
Uncemented	476	86	119	211	298	472	1,662	1.2%
Reversed Hybrid	134	58	111	178	281	396	1,158	0.8%
(missing)	194	11	2	8	8	24	247	0.2%
Total	85,056	10,258	10,255	10,773	11,281	11,368	138,991	100%

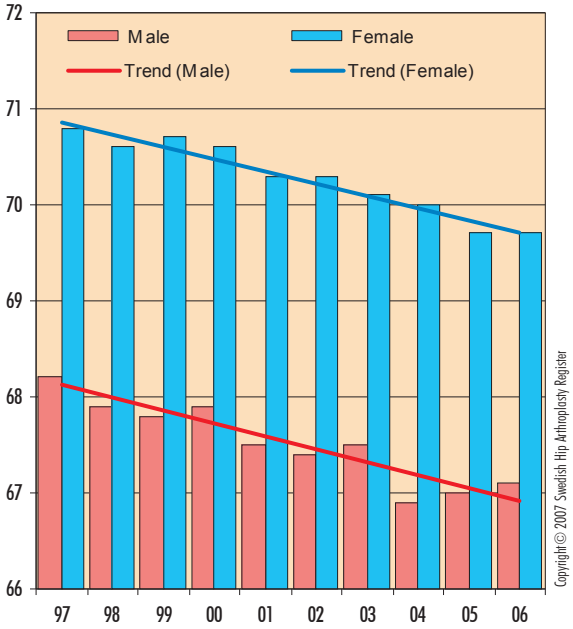
Number of Primary THRs per Brand of Cement and Year

Brand of Cement	1992-2001	2002	2003	2004	2005	2006	Total	Share
Palacos cum Gentamycin	75,512	8,709	6,389	6,033	4,976	0	101,619	59.9%
Refobacin Palacos R	97	2,628	4,799	5,511	6,576	0	19,611	11.6%
Palacos R	8,030	5	2	8	1	21	8,067	4.8%
Palacos R+G (Heraeus)	0	0	0	0	0	5,540	5,540	3.3%
Refobacin Bone Cement (Biomet)	0	0	0	0	0	5,176	5,176	3.1%
CMW with Gentamycin	751	13	6	7	1	0	778	0.5%
Cemex Genta System Fast	0	0	0	0	0	221	221	0.1%
Other	4,757	12	18	16	82	29	4,914	2.9%
(completely or partially cementless)	10,860	1,301	1,466	1,817	2,304	2,934	20,682	12.2%
(missing)	2,977	9	1	2	5	21	3,015	1.8%
Total	102,984	12,677	12,681	13,394	13,945	13,942	169,623	100%

The cement types "Palacos R+G" and "Refobacin Bone Cement" have replaced older types — see section "Environmental and technological profile" for details. Under each type of cement, only registrations where both cup and stem are cemented with the same type of cement are shown. Other registrations are displayed on the line "completely or partially cementless".

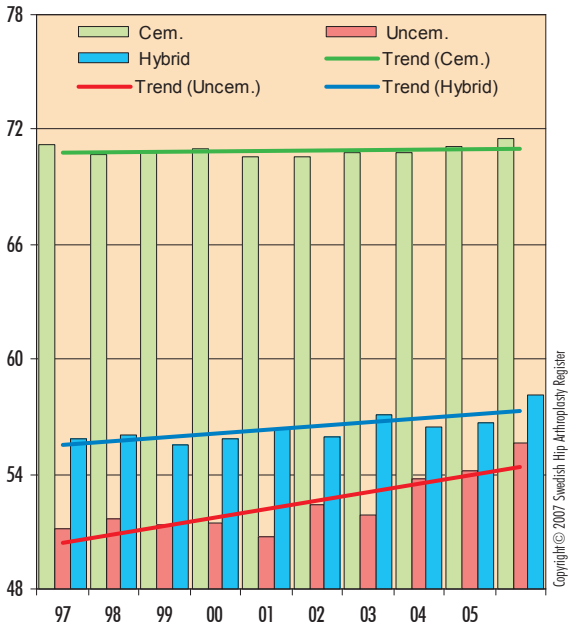
Average Age per Gender

the last 10 years, 121,519 Primary THRs



Average Age per Type of Fixation

the last 10 years, 121,519 Primary THRs



Average Age per Diagnosis and Gender

the last 10 years

Diagnosis	Male	Female	Total
Fracture	73.7	76.5	75.8
Secondary osteoarthritis after trauma	67.5	72.7	70.1
Idiopathic femoral head necrosis	61.5	72.5	69.0
Primary osteoarthritis	67.5	70.0	68.9
Secondary osteoarthritis	66.0	70.5	68.3
Tumor	69.0	61.7	65.0
Inflammatory arthritis	59.8	61.9	61.3
Childhood Disease	55.2	53.5	54.1
Total	67.5	70.2	69.1

Average Age per Type of Hospital and Gender

the last 10 years

Type of Hospital	Male	Female	Total
Central Hospitals	67.8	70.8	69.6
Rural Hospitals	68.3	70.5	69.6
Universitety/Regional Hospitals	64.7	68.7	67.2
Private Hospitals	65.4	68.2	67.0
Total	67.5	70.2	69.1

The patient group up to age 50 years

From 1992 to 2006, 9,264 primary total hip replacements were recorded in patients aged up to and including 50 years. The majority of the implants, 4,822 (52.1%), were inserted in women and 4,442 (47.9%) in men. Compared with the age group older than 50 years all types of secondary osteoarthritis except fracture sequelae were more common (Figure 1). Overall, the number of hips operated on during the interval increased from 529 to 771. Relatively speaking, however, the procedure frequency was fairly constant, (5.3% - 5.8%). The shifts in diagnosis distribution over time noted for the whole age interval do not differ appreciably in the young group (Figure 2).

Up until 2000-2001 the proportion of entirely uncemented implants declined but increased subsequently. In 2004 equally many all-cemented and uncemented fixations (32%-33%) were used. During 2005 and 2006 this trend continued so that just under half of all hip implants in this younger age group were entirely uncemented (Figure 3). Reversed hybrids (cemented cup and uncemented stem) also increased.

During the period 914 revisions were performed, of which 61 were done due to deep infection. The most common measure was change of cup or liner (n = 500), change of stem and cup/liner (n=284) followed by stem revision only (n=106). The mean follow-up time was 6.2 (SD 4.2) years. The outcome in the form of revision (excluding infection) was studied in a Cox regression analysis which included the variables age, gender, diagnosis group, incision technique, and fixation type. In yet another analysis the prosthesis types only used in a limited number of cases of either component were excluded (fewer than 100 for uncemented fixations, fewer than 500 for cemented fixations). This reduced the observation period to 6.1 (4.1) years.

The risk of revision of any component for all reasons except infection increases in secondary osteoarthritis owing to childhood diseases (Table 1). In selected cohorts, the risk is increased for uncemented prostheses. The lower limit of the confidence interval is close to 1 (1.003), so that this observation is somewhat uncertain. The risk of revision declines with increasing age and in inflammatory arthritis. The use of all-cemented prostheses gives a lower risk of revision during the observation period compared with the combined group where one or both components were fixed without cement (Figure 4).

In summary, the use of uncemented prostheses declined during the first part of the observation period only to increase markedly, becoming the most common way of anchoring an implant in this age group. The initial decline may be interpreted as disappointment with uncemented technology during the 1980s and 1990s, depending primarily on wear and osteolysis. The introduction of new articulations, highly cross-linked polyethylene, improved liner fixation and good long-term results for certain uncemented stems are probably important factors encouraging the increased use of entirely uncemented fixation.

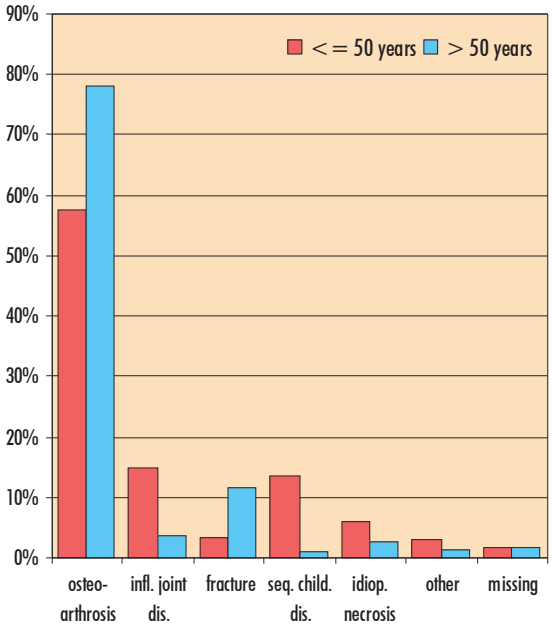


Figure 1. Distribution of diagnosis in the younger and older cohorts.

	All operations (n=9,264)		Most used implant (n=6,691)	
Increased risk				
Consequence of childhood disease	1.42	1.18-1.70	1.41	1.12-1.78
Entirely uncemented implant	-	-	1.24	1.00-1.54
Reduced risk				
Entirely cemented implant	0.68	0.59-0.79	0.68	0.55-0.85
Increasing age per year	0.97	0.96-0.98	0.98	0.97-0.99
Inflammatory arthritis	0.78	0.64-0.95	0.73	0.58-0.95

Table 1. Relatively increased and reduced risks of revision (>=50 years). Categorical variables are compared to all others within the group.

However the good results with certain uncemented stems are based chiefly on long-term studies outside Sweden. Wear measurements based on radiostereometry up to five-year follow-ups show that it is possible to reduce the wear problem with 'highly cross-linked' poly. The Registry is also carrying out a more detailed analysis of individual components. Hence data exists to show that the trend observed may involve a change for the better. In the absence of long-term results from controlled studies regarding some of the implants now used, a certain caution, particularly in the choice of uncemented cups, is still warranted (Table 2).

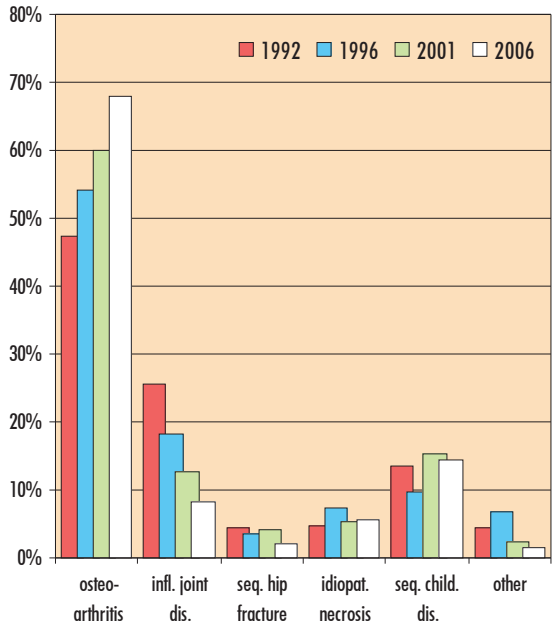


Figure 2. Distribution of diagnosis during 4 selected years within the interval observed (the group with unknown diagnosis excluded).

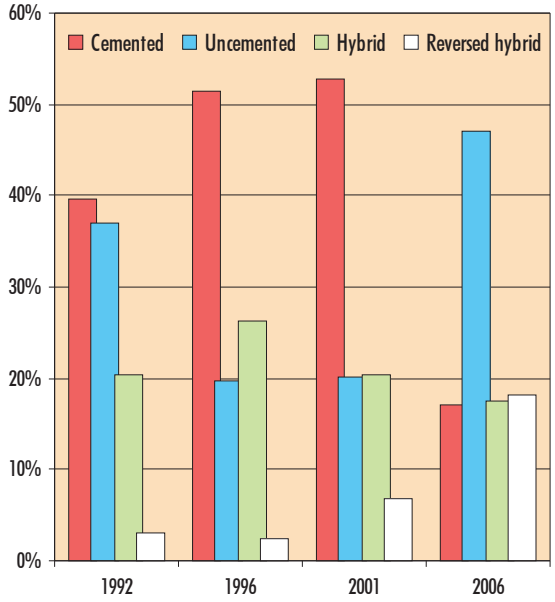


Figure 3. Distribution of type of fixation during 4 selected years within the interval observed.

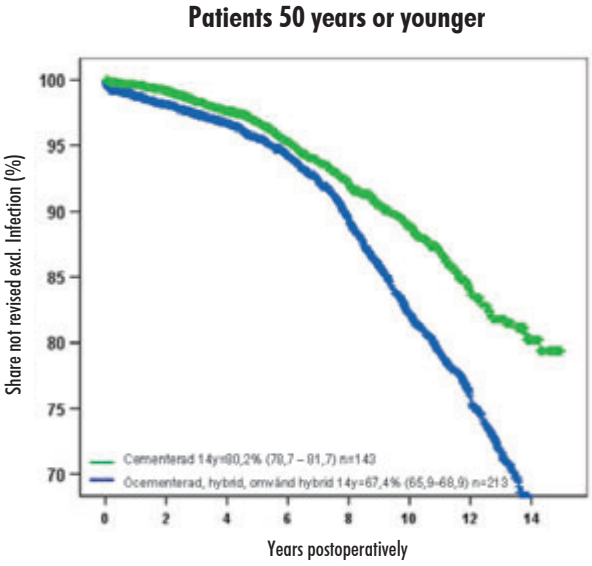


Figure 4. Implant survival on cemented (blue) and uncemented (green) fixation of one or both of the prosthetic parts. The curves diverge after 7-8 years.

	n	%
Cup		
Trilogy HA	226	32.8
Trilogy	67	9.7
Allofit	67	9.7
Trident HA	64	9.3
CLS Spotorno	55	8.0
M2a	54	7.8
Press-Fit cup	36	5.2
Others	119	17.3

	n	%
Stem		
CLS Spotorno	355	51.6
Bi-Metric lat	46	6.7
ABG II HA	44	6.4
Bi-Metric HA	42	6.1
Bi-Metric HA lat	40	5.8
Cone	35	5.1
Others	126	18.3

Table 2. Entirely uncemented implants inserted 2005-2006 (n=688) on patients up to 50 years of age. Designs used in more than 5% of the cases are specified. Eighteen and 14 different designs of cups/stems are included in the groups Others, respectively.

Gender perspective

In earlier reports we presented annually the procedure frequency related to gender, and in certain cases how this factor affects the risk of revision; but without adjustment for contributory factors. In general, women undergo total hip replacement more often than men. Since both primary and different types of secondary hip osteoarthritis afflict men and women with differing incidences, circumstances admit of more complex connections. In this year's Report we therefore offer a more detailed evaluation.

We investigated whether there are gender differences in two of the databases, the one that covers primary total hip replacements and the corresponding database with hemi-arthroplasties. Between 1992 and 2006 there were 169,623 registered total hip arthroplasties.

In the hemi-arthroplasties database, 7,920 operations were registered during 2005 and 2006. We limited the analysis primarily to fracture patients, in total 7,361 cases. The gender perspective was also studied for patient-related outcome. 9,842 observations of patients with complete data undergoing surgery between 2002 and 2005 are included.

The variables selected from the first two databases were age, diagnosis, side operated on, whether one or both hips were operated on during the time interval (bilaterality), surgical approach and fixation method. To maintain the factors constant, logical regression analysis was applied. We also investigated the outcome based on the occurrence of revision and adjusted for the variables studied, in a Cox regression analysis. The mean follow-up times in the two databases, total-hip-replacement and hemi-arthroplasty (±SV/B), were 5.6 ±3.9 and 0.8 ±0.5 years, respectively.

In the national follow-up database, EQ-5D and pain registered on VAS scales preoperatively and after one year were studied, as was satisfaction one year post-operatively. The outcome was adjusted for age, Charnley category, diagnosis, surgical approach and choice of implant fixing method.

Total hip replacement

As emerged from earlier register reports, the average age for the whole observation period is 2 – 3 years higher for women than for men at the time of total hip replacement (women 70.3 ±10.9 years, men 67.7 ±10.8 years). Women undergo surgery more often for secondary osteoarthritis (Figure 1). All the specific causes given in the figure emerge in the regression analysis. Women are also operated on the right side more frequently than men (Figure 2). The occurrence of bilaterality is equally distributed between the sexes.

In the choice of surgical approach there is a small but statistically significant preference for the posterior approach when operating on men (Figure 3). Women more frequently receive cemented total hip arthroplasty, while hybrid fixation is used more often in men. The other methods of fixation (uncemented, reversed hybrid) do not differ between the sexes in regression analysis (Figure 4). In general women

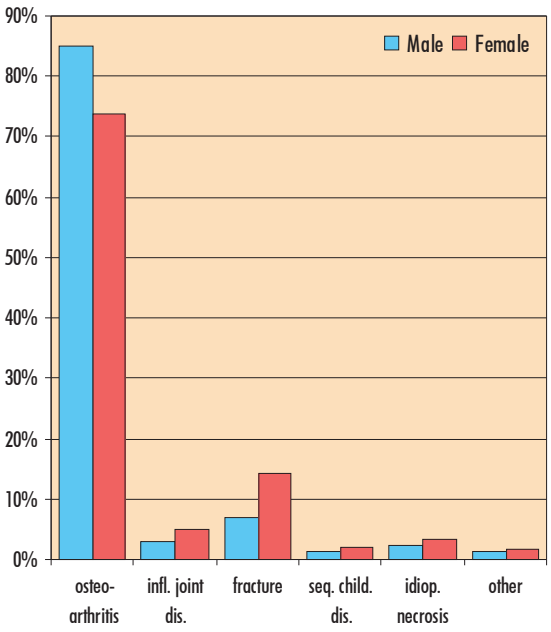


Figure 1. Distribution of diagnosis men/women at operation with total hip arthroplasty.

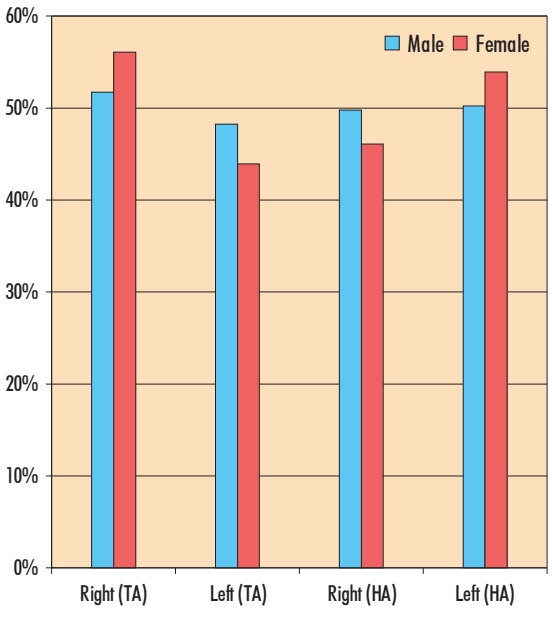


Figure 2. Operated side at total hip arthroplasty (TA) resp. hemi-arthroplasty (HA) related to gender.

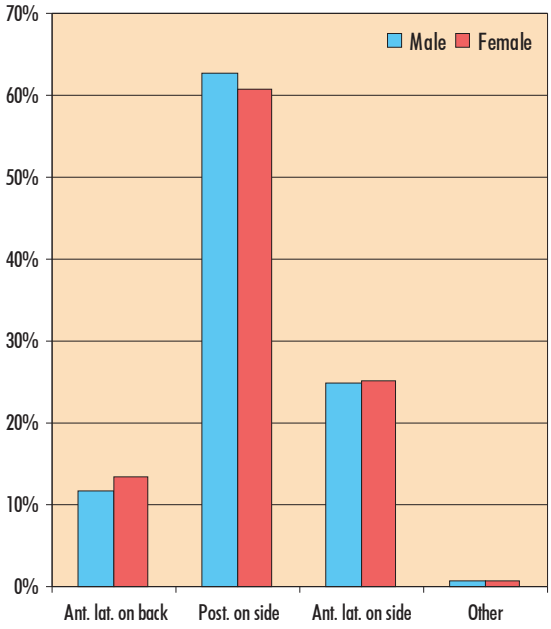


Figure 3. Total hip arthroplasty – choice of surgical approach. Anterior approach is more often used on men.

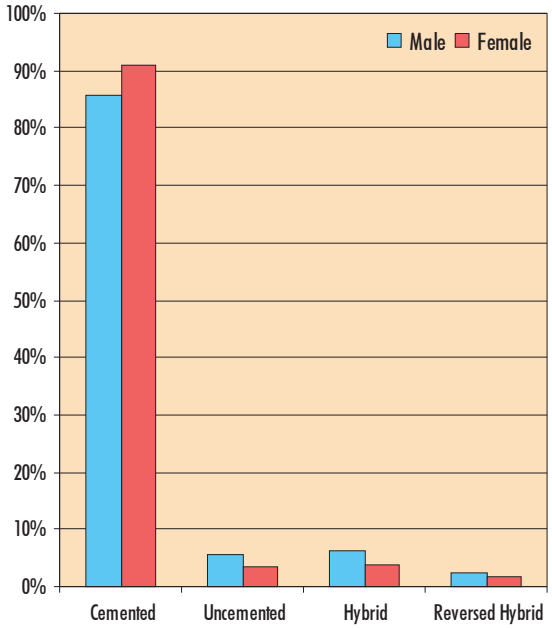


Figure 4. Total hip arthroplasty – type of fixation. Surgery on women is more often done with both components cemented. Surgery on men is more often done with cemented stem and uncemented cup (hybrid implant).

run a 30% smaller risk of revision than men within this time interval (RR women/men: 0.70 [0.67-0.74]) based on all observations and with adjustment for the factors mentioned above. Turning to patient-related outcome, women report more pain on a VAS scale before the operation, they have lower EQ-5D at the one-year follow-up and state that they are not so completely satisfied. The effect of the operation measured as change in EQ-5D and pain between the preoperative investigation and the follow-up at one year, however, is somewhat better.

The gender perspective in terms of patient-related outcome is in concordance with international literature where a number of studies report poorer outcome in health-related quality of life, pain relief and satisfaction following pain surgery among women than among men.

Hemi-arthroplasty

Women are almost one year older than men when undergoing hemi-arthroplasty surgery (women: 83.8 ±6.7, men 83.0 ±6.7 years). As opposed to the situation for total hip arthroplasty (which is carried out primarily for primary osteoarthritis), the left side predominates in hemi-arthroplasty surgery following hip fracture. This predominance is especially pronounced among women.

We found no statistically significant differences regarding choice of prosthesis type or method of fixation in these patients.

	Preoperatively		1 year		Difference preoperatively – 1 year	
	male	female	male	female	male	female
EQ-5D	0.43 (0,31)	0.36 (0.32)	0.80 (0.23)	0.75 (0.25)	0.36 (0.34)	0.39 (0.35)
Pain (VAS)	59 (17)	64 (16)	13 (17)	15 (19)	-46 (23)	-49 (24)
Satisfaction (VAS)			17 (22)	20 (24)		

Table 1. EQ-5D, Pain and Satisfaction. Mean, SD (within parenthesis). Variables that in a regression analysis differ among men and women are shown in red. Pain (VAS, 0=none — 100=maximal), Satisfaction (VAS, 0=completely satisfied — 100=unsatisfied).

Follow-up model for patient-related outcome

THR follow-up after five years

The standardised follow-up of patients undergoing total hip replacement started on 1 January 2002 in the Western Region of Sweden. Since then the routine has been successfully introduced in more county councils/regions. At present, 68 hospitals are connected (68 of 77 active departments in 2006 = 88%). Variables from the hip arthroplasty survey database have been selected by the National Board of Health and Welfare and SALAR as national quality indicators and are also included in the clinical value compass which in turn may lead to health-economic analysis and complete follow-up of activities. Those hospitals and relevant county councils that are not connected can thus not supply data, which will be stated in the forthcoming report 'Quality and Efficiency in Swedish Health Care . . .'. A number of the larger private enterprises are not connected to the follow-up routine, either.

Which hospitals are connected and which are not is shown in the table on page 28. A problem arising during 2006 was that certain hospitals in Skåne have chosen their own IT solution for data capture regarding patient-related outcome. This involves increased manual work for the register coordinators and system administrators and also a loss of validation of incoming data.

Summary of logistics and method

Since not all departments are yet connected, method and goal are here repeated once more. All patients complete a preoperative survey with ten questions (Charnley category, pain VAS and EQ-5D). The same survey with a supplementary question on satisfaction (VAS) is sent to the patient after one year. The procedure is repeated after six and ten years when the patient is also X-rayed. For the radiographic evaluation a short questionnaire with six questions has been produced (see Annual Report 2003-2004). The radiographic follow up within the follow-up system is to start in the Western Region on 1 January 2008.

Overall objectives

- include patient-related outcome in the register which is included in national quality indicators for hip replacement surgery
- increase the sensitivity of the register analyses
- identify 'silent' radiographic changes for possible early surgical intervention in cases with ominous signs of loosening and/or osteolysis
- create a methodologically adequate health-economic instrument for cost effectiveness analysis and resource allocation
- reduce the number of routine visits following hip arthroplasty.

Results

On 4 May 2007 the prospective preoperative database (68 departments) contained 21,755 patients. The one-year follow up contained 15,094 patients. The national mean for the included variables has varied little over the years during which we have collected data. The variation among hospitals, however, is substantial. See table on page 28.

The reason for this variability is multifaceted: patient demography including socioeconomic parameters, gender distribution, age distribution, the differing indications for surgery, accessibility and the competence at the department are factors that may affect these individual-based variables. A relevant in-depth analysis at hospital level is not yet possible since many hospitals have only just started their one-year follow-up. In the beginning of 2006, a number of departments had too small materials for analysis. However we can already confirm that there is great variability even among the hospitals with fairly large follow-up material.

To analyse a homogeneous material we observed the following inclusion criteria in a sub-study:

- Patients with diagnosed primary osteoarthritis
- Charnley category A, i.e. patients with a diseased hip without intercurrent disease affecting walking ability
- Departments with 100 or more patients followed-up at one year with complete data.

With these criteria the material consists of just over 3,000 patients distributed over 26 departments (Table 1).

The distribution of mean age in this material was fairly small (69-73 years), for which reason this variable probably does not affect the result to any extent.

Gender perspective

Larger variability was observed in gender distribution with anything from 40% - 60% of women (national average 1992-1996 was 60%) in the material from the different departments. According to many studies, women have lower EQ-5D than men of the same age: see further the discussion in the section *"Gender perspective"* on page 24. It is hoped that when all units are connected to the system an analysis of this database will prove of importance regarding the variability of indication, production follow-up and resource allocation.

Prediction of outcome

As the follow-up material grows throughout the country and the six-year follow-up starts, the patient-related outcome database will give many 'spin-off' effects in terms of analysis of outcome correlated to patient demography. This in turn can create instruments for predicting results that can be used in health-economic studies and in setting priorities and making allocations.

In a sub-study of 6,158 one-year-followed-up patients who had undergone surgery for primary osteoarthritis (37 hospitals), we found three significant entry variables that affected the outcome: Charnley category (co-morbidity) and gender. Category C and female gender demonstrated a significant correlation to poorer outcome as measured with individual-based parameters. This connection has been shown earlier in a number of international and Swedish studies. The third variable was whether the patients had stated preoperatively that they had problems in the fifth dimension of the EQ-5D instrument, i.e. that they noted some form of anxiety/depression. To exclude those patients who for natural reasons were anxious about the operation, those who stated that they had no problems regarding the fifth dimension at the follow-up were excluded, thus creating a group with 'permanent anxiety'.

This group of patients had significantly more pain preoperatively and significantly worse outcome in terms of pain relief, satisfaction and EQ-5D gain. In addition, at the one-year control, this group had greater problems in the mobility dimension. Lastly, the 'permanent anxiety' group had about 55% higher cost for a quality-adjusted-life-year at the one year follow-up (cost/QALY gained). This register-based and hypothesis-generated study will be followed by a prospective study (at a number of hospitals) in which we will supplement the present survey protocol with a more sensitive psychometric and a socioeconomic test.

Health-economic studies

The Registry has ongoing collaboration with health economists. During 2005 and 2006 we carried out a study (about 2,700 patients at 20 hospitals) of the direct and indirect costs (costs outside medical care) of waiting time. The analysis is still going on and will be reported in the next Annual Report. The result of this study will be of major significance as a 'baseline' for future health-economic studies of hip arthroplasty surgery.

26 hospitals	EQ-5D index preoperatively	EQ-5D index after 1 year	EQ-5D gained after 1 year	Pain relief mm VAS	Satisfaction mm VAS [1)]
mean	0.45	0.84	0.39	48	16
min	0.34	0.74	0.30	57	8
max	0.55	0.92	0.47	40	34

Table 1. Mean of individually-based parameters (Charnley A + primary osteoarthritis) at 26 hospitals.
[1)] Satisfaction VAS: 0–100, where 0 means completely satisfied – 100 means dissatisfied.

Patient-related Outcome per Hospital

2002-2006

Hospital	Preoperative				Follow-up after 1 year				EQ-5D index gained [3]	Comments
	No.	C-cat.[1]	EQ-5D	Pain	No.	EQ-5D	Pain	Satisf.[2]		
University/Regional Hospitals										
KS/Huddinge										Not joined
KS/Solna										Joined 2007
Linköping										THR surgery in Motala
Lund	172	49%	0.29	65	149	0.66	16	16	0.37	
Malmö	125	47%	0.28	65	191	0.67	20	20	0.39	
SU/Sahlgrenska	737	51%	0.35	61	746	0.70	16	19	0.35	
SU/Östra	538	43%	0.35	64	442	0.72	18	22	0.37	
Umeå	194	46%	0.28	66	158	0.72	17	18	0.44	
Uppsala										Joined 2007
Central Hospitals										
Borås	678	47%	0.41	58	591	0.73	15	19	0.32	
Danderyd	308	42%	0.36	63	54	0.79	12	12	0.43	
Eksjö	285	41%	0.41	63	179	0.78	14	16	0.37	
Eskilstuna	121	56%	0.25	66	37	0.64	18	21	0.39	
Falun										Joined 2007
Gävle	101	48%	0.33	64						Joined 2006
Halmstad	239	37%	0.37	64	156	0.73	15	20	0.36	
Helsingborg										Not joined
Hässleholm-Kristianstad	584	52%	0.39	62						Joined 2006
Jönköping	351	30%	0.34	65	166	0.76	12	15	0.42	
Kalmar	160	46%	0.46	58						Joined 2006
Karlskrona	14	29%	0.31	52	4	0.61	18	20	0.30	
Karlstad										Joined 2007
Norrköping										THR surgery in Motala
S:t Göran										Joined 2007
Skövde	464	47%	0.34	62	497	0.69	17	21	0.35	
SU/Mölndal	259	38%	0.37	62	375	0.71	17	22	0.34	
Sunderby (inklusive Boden)	289	44%	0.29	68	292	0.72	16	20	0.43	
Sundsvall	344	44%	0.37	65	309	0.73	17	21	0.36	
Södersjukhuset	455	44%	0.36	56	133	0.70	20	25	0.34	
Uddevalla	1,041	47%	0.37	62	1,027	0.71	17	21	0.34	
Varberg	343	49%	0.42	60	158	0.76	12	17	0.34	
Västerås	203	41%	0.32	67	58	0.75	10	14	0.43	
Växjö	183	51%	0.42	57	34	0.82	17	17	0.40	
Ystad										THR surgery in Trelleborg
Örebro	161	57%	0.41	57	18	0.89	8	11	0.48	
Östersund	651	33%	0.36	63	437	0.77	13	15	0.41	
Rural Hospitals										
Alingsås	637	49%	0.44	58	524	0.78	14	18	0.34	
Arvika										Joined 2007
Bollnäs	291	41%	0.42	65						Joined 2006
Enköping										Joined 2007
Falköping	1,196	35%	0.45	58	887	0.81	12	13	0.36	
Frölunda Specialistsjukhus	194	34%	0.37	64	136	0.76	15	18	0.39	

(continued on next page)

Patient-related Outcome per Hospital (cont.)

2002-2006

Hospital	Preoperative				Follow-up after 1 year				EQ-5D index gained [3]	Comments
	No.	C-cat.[1]	EQ-5D	Pain	No.	EQ-5D	Pain	Satisf.[2]		
Gällivare	299	47%	0.39	64	232	0.77	17	20	0.38	
Hudiksvall	100	47%	0.37	65						Joined 2006
Kalix	112	47%	0.33	65	117	0.76	16	19	0.43	
Karlshamn	174	38%	0.39	62	48	0.84	18	16	0.45	
Karlskoga	37	41%	0.41	62						Joined 2006
Katrineholm	242	46%	0.37	64	71	0.80	10	15	0.43	
Kungälv	826	49%	0.42	58	678	0.75	14	18	0.33	
Köping	330	33%	0.39	65	70	078	19	19	0.39	
Landskrona	203	34%	0.41	64	203	0.81	13	14	0.40	
Lidköping	592	45%	0.43	57	434	0.77	14	18	0.34	
Lindesberg	286	36%	0.48	57	168	0.80	13	14	0.32	
Ljungby	133	36%	0.42	61	35	0.78	10	16	0.36	
Lycksele	660	45%	0.39	65	473	0.78	13	15	0.39	
Mora										Joined 2007
Motala	130	40%	0.45	61						Joined 2006
Norrtälje										Not joined
Nyköping										Not joined
Oskarshamn	258	37%	0.47	56						Joined 2006
Piteå	598	46%	0.36	66	315	0.76	15	20	0.40	
Skellefteå	371	44%	0.38	64	275	0.76	14	15	0.38	
Skene	351	39%	0.40	61	311	0.77	14	19	0.37	
Sollefteå	407	44%	0.45	62	303	0.81	12	15	0.36	
Södertälje										Joined 2007
Torsby										Joined 2007
Trelleborg	998	43%	0.40	63	532	0.76	15	18	0.36	
Visby										Joined 2007
Värnamo	240	45%	0.50	53	107	0.79	13	13	0.29	
Västervik	70	36%	0.46	59						Joined 2006
Örnsköldsvik	445	48%	0.37	63	339	0.78	14	16	0.41	
Private Hospitals										
Carlanderska	87	28%	0.40	62	49	0.84	23	28	0.44	
Elisabethsjukhuset	42	33%	0.50	57						Joined 2006
Gothenburg Medical Center										Not joined
Movement	36	25%	0.45	64						Joined 2006
Nacka Närsjukhus Proxima AB										Joined 2007
Ortopediska Huset										Not joined
Sophiahemmet										Not joined
Stockholms Specialistvård AB										Not joined
Nation	19,347	43%	0.39	62	12,518	0.75	15	18	0.36	

[1] Share of Charnley category C.
[2] Satisfaction (VAS).
[3] Difference in EQ-5D after 1 year and preoperatively.

The result is presented as number of patients, mean values of pain-VAS and EQ-5D-index preoperatively as well as the percentage of Charnley category C patients (i.e. patients with multiple joint disease and/or co-morbidity). Hospitals with a high percentage of C-patients generally report poorer outcome both preoperatively and after 1 year. However, the prospectively gained values are not as much affected.

Internet-based follow-up

Background

Once fully implemented, the Registry's follow-up using patient-related variables will include a large number of patient surveys per year (particularly when the 6- and 10-year follow-ups start). Since the start of the follow-up model for patient-related outcome in 2002, one Registry goal has been to make this routine 'paperless' with optimal use of modern technology. As one step in this endeavour, many departments are using touch-screens for the preoperative questionnaire. Using the touch-screen the patient communicates directly via the web with the Registry's database. This system is methodologically superior to paper processing, with reduced loss, fewer unanswered questions (the system 'forces' the patient to answer all questions) and immediate updating of the database. Unfortunately, some hospitals, mainly in the Skåne region, have created their own IT solutions, which involves loss of data and in some cases interrupted reporting to the Registry.

The standardised follow-up system for patient-related outcome has as one of many goals to reduce the number of routine visits (see Annual Report 2002). The follow-ups are handled via mailed self-administrated questionnaires which are then entered via local contact secretaries. Sweden is one of the countries with the highest use of internet, particularly among the older population groups. Against this background, we have run a pilot project in the use of the internet as a survey medium, for following-up patients who have undergone THR surgery. Technically, there are established, secure possibilities of running such surveys via the internet. If such a function can be made easy to use and at the same time give high response rate, this would solve a future problem of volume and resources and yet give material for adequate follow-up on activities.

The project

Between December 2006 and February 2007 a randomised methodological study was carried out for the purpose of investigating differences in response rate between traditional paper and internet forms.

From the Hip Arthroplasty Register 2,400 patients were chosen at random but stratified by age and diagnosis for inclusion in an extra four-year follow-up (110 patients had died). They were divided into groups of 600 patients each in the age groups below 50 years, 50-59 years, 60-75 years and over 75 years (age at operation), half women and half men. Thirty percent lived in metropolitan regions, 35% in fairly large cities, 7% in densely-populated areas, 21% in areas of intermediate population and 8% in sparsely-populated areas. The distribution between the 'paper' and 'internet' groups after randomisation was largely identical. The patients were chosen by lot to answer the follow-up model protocol either via a password-protected internet questionnaire or via a mailed paper questionnaire. Reminders were sent to non-responders in both groups after two months. New reminders were sent after a further month and then the answer procedure was switched so that the paper questionnaire group were enabled to answer via the internet and vice versa.

Age	Count	Response rate after first reminder	Share of patients that chose second option after second reminder	Total response rate
Paper form				
Younger than 50 years	293	88%	2%	90%
50 to 59 years	296	92%	1%	93%
60 to 75 years	287	97%	0%	97%
Older than 75 years	275	91%	0%	91%
Total	1151	92%	1%	93%
Web form				
Younger than 50 years	294	71%	15%	86%
50 to 59 years	289	62%	27%	89%
60 to 75 years	288	37%	40%	77%
Older than 75 years	268	23%	48%	71%
Total	1,139	49%	32%	81%

Table 1. Response rates from paper form versus web form in different age intervals.

Results

The response rate in the paper questionnaire group was 92% (exactly the response frequency the Hip Arthroplasty Register has had in earlier measurements) and in the internet response group 49%. The frequency rose in this group to 81% when the participants were offered the possibility to answer via the paper questionnaire. The difference in response frequency between the four age groups was marginal in the paper questionnaire group, but significant in the internet response group. Fifty-two percent of the men answered in the internet group and 93% in the paper questionnaire group. The corresponding response frequency among the women was 46% and 92%, respectively. Thus the men were somewhat more inclined to answer via the web. In the age group below 50 years, the response rates were 71%, 50-59 years 62%, 60-75 years 37% and over 75 years 23%. The internet group response frequency was best in the metropolitan regions and in sparsely-populated areas and poorest in intermediate regions. For the results see Tables 1 and 2.

Sixty-four percent of those who answered via the internet used their own computers to complete the questionnaire and 72% used a broadband connection. The majority (67%) stated that they felt secure in answering the questionnaire via the internet, 12% felt insecure and 21% had no view on this matter.

Discussion

The results indicate that patient-administered internet questionnaires can be used in quality register work, particularly with groups under 60 years. However, the system needs to be automated and supplemented with traditional paper questionnaires for non-responders. A system development of this kind has already been started. Within the near future it is expected that this answer procedure will also predominate among older population groups in view of the general development of internet functions throughout society. Register work may then become less resource-consuming and the results may be analysed in real time.

Area	Paper form	Web form
Metropolitan areas	89%	52%
Fairly large cities	92%	50%
Densely-populated areas	92%	47%
Areas of intermediate population	94%	42%
Sparsely-populated areas	91%	53%

Table 2. Response frequencies from paper form versus web form in different geographic areas.


Patientadministrerad enkät för
Uppföljning av Höftledsoperation
från Svenska Höftprotesregistret

Välkommen

Frågor om Din datoranvändning

1. Använder Du egen dator för att svara på dessa frågor?
Ja
Nej

2. Vad använder Du för typ av internetanslutning?
Bredband
Telefonmodem
Vet ej

7. Operationsresultat

8. Rörlighet

9. Hygien

10. Huvudsakliga aktiviteter

11. Smärtor/besvär

12. Oro/nedstämdhet

13. Jämfört med mitt allmänna hälsotillstånd de senaste tolv månaderna är mitt hälsotillstånd idag...
Bättre
Oförändrat
Sämre

14. Nuvarande hälsotillstånd

Skicka svar

Figure 1. Patient administrated, internet based questionnaire for follow-up after hip arthroplasty.

Notes

Follow-up of activities after total hip replacement surgery

Last year's Report gave details of a collaborative project with the Western Region and the Swedish Hip Arthroplasty Register on complete follow-up of activities after hip replacement surgery.

The report used the four cardinal points of what is termed the clinical value compass. Using this follow-up model we present this year a value compass for all the 41 departments that have been connected to the follow-up model for more than one year. This further-developed value compass contains the eight openly-reported variables now reported by hospital.

The limits are set to each variable's largest and smallest values, respectively, plus/minus a standard deviation. The poorest value for the variables is assigned origo and the best value in the periphery. This enlarged value compass may be seen as a Balanced Scorecard: the larger the surface the better the total result for that department. The national mean value is given in each figure, and each department can thus compare itself with the national result. Note that the observation periods for the variables differ. Result variables:

- **Patient satisfaction.** Measured with VAS. Can only, like variables 2 and 3, be stated if the department has been actively involved in the follow-up model routine for more than one year
- **Pain relief.** Measured by subtracting the preoperative VAS value from the follow-up value, i.e. the value gained after one year
- **Gain in health-related quality of life (EQ-5D index gain).** The prospective benefit of the EQ-5D index, i.e. the health gain after one year, is given. This variable is essential for cost-utility calculations
- **90-day mortality.** A new openly-reported department variable. In international literature this variable is used to illustrate mortality after discharge and may be a measure of increased mortality from thromboembolic and cardiovascular diseases following discharge
- **Cost per patient (operation).** Since the CPP system is not yet fully implemented in all Swedish hospitals, the distribution of this variable is not shown but is stated this year only with the national mean value which is approximately SEK 75,000 (about €7,900) based on 27 hospitals
- **Reoperation within two years.** Last year's 'new' variable stating all kinds of further surgery within two years during the past four-year period. This parameter reflects chiefly the frequency of reoperation per department for reasons of deep infection and recurring dislocations
- **Five-year implant survival.** Implant survival after five years using Kaplan-Meier statistics. The definition of failure is revision of one or both components or extraction of the prosthesis
- **Ten-year implant survival.** Same variable as for 5 years, but with longer follow-up which above all captures a unit's result regarding implant loosening.

Linked to the clinical value compass of each hospital is also a graphic presentation of the hospital's 'case-mix' (see separate section on page 8). This component is designed in the same way as the value compass and includes the variables that when the Registry's database is examined prove decisive demographic parameters for both patient-related outcome and long-term results regarding need for revision. The greater the surface in this figure, the more favourable a department's patient profile (in terms of outcome) is.

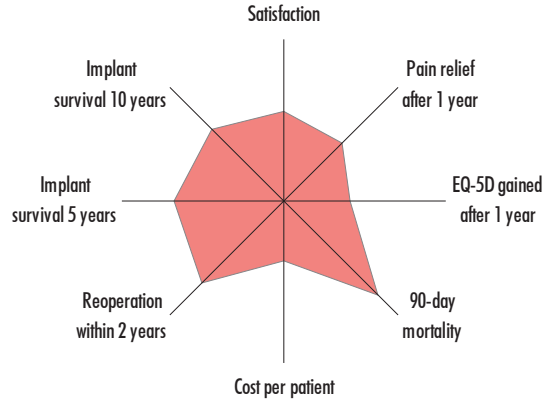
- **Charnley classification.** The figure shows the department's proportion of patients classed as Charnley category A or B, i.e. patients without multiple joint disease and/or intercurrent diseases that affect the patient's walking ability. We know from many studies that C-patients have significantly poorer outcome in satisfaction, pain relief and health gain.
- **Proportion of primary osteoarthritis.** The more patients the department processes with the diagnosis primary osteoarthritis, the better the long-term results according to the Registry's regression analysis of the database.
- **Proportion of patients 60 years or older.** Departments that operate on many patients over 60 years obtain a better result, in the same way as for the variable 'proportion of primary osteoarthritis'
- **Proportion of women.** Women have generally better long-term results than men in terms of need for revision, particularly for aseptic loosening.

Even though we do not yet have patient-related outcome and costs for all departments, we have chosen to present this graphic manner of showing the department's results in many dimensions since we believe in this model as a pedagogical instrument. All entry variables are presented in different tables in the Report but the tables are of necessity extensive and it is hard to obtain an overall picture of a department's combined and multidimensional results from them.

The aim of the modified clinical value compass is for each department to be able rapidly to form an impression of that department's result vis-à-vis the national result and to identify areas of poorer outcome. If this is the case, one should particularly scrutinise each table and start an analysis preceding work locally to improve and develop activities. As with all other register interpretation, it is imperative to assess, at the same time, the department's demographic profile since this may explain an expected or divergent result.

Quality Indicators

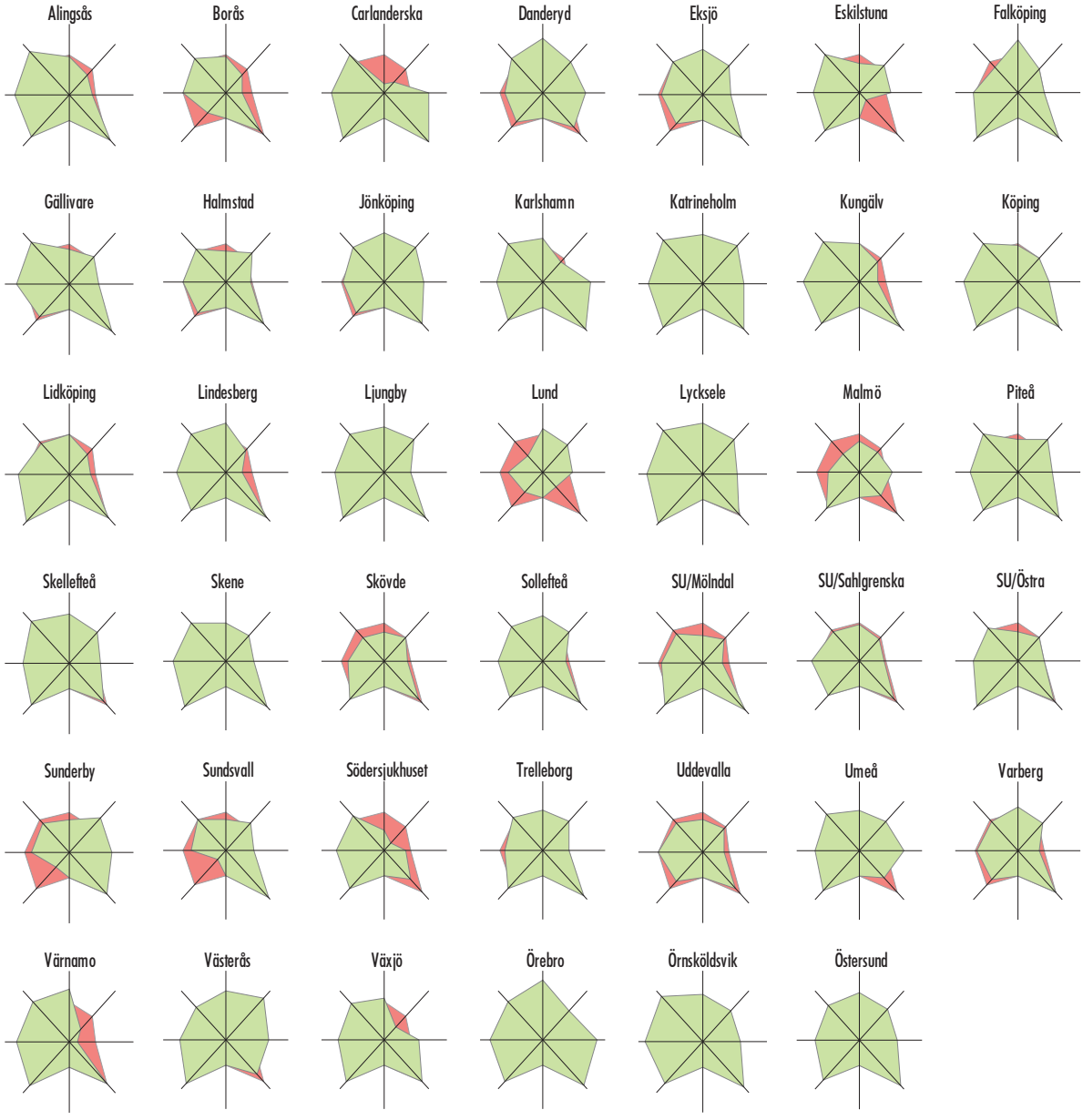
clinical value compass - national averages 2006



The clinical value compasses show the national results for the eight entry variables in red. The corresponding values for each department are shown in green. The limit values are set to the greatest or least value of each variable ± 1 SD. The poorest value for each variable is assigned origo and the best is at the periphery.

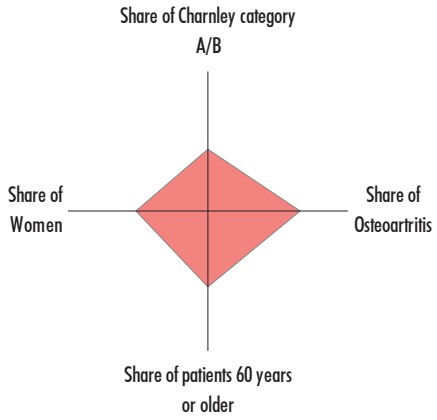
Those departments where red fields are shown have a poorer value than the national average for that variable. The outcome can be studied in detail in each table. Departments with 'much' red are recommended to carry out a local in-depth analysis.

Note that 'cost per patient' in this Annual Report cannot be stated per department and that all values are set against SEK 75,000 (national average, about €7,900).



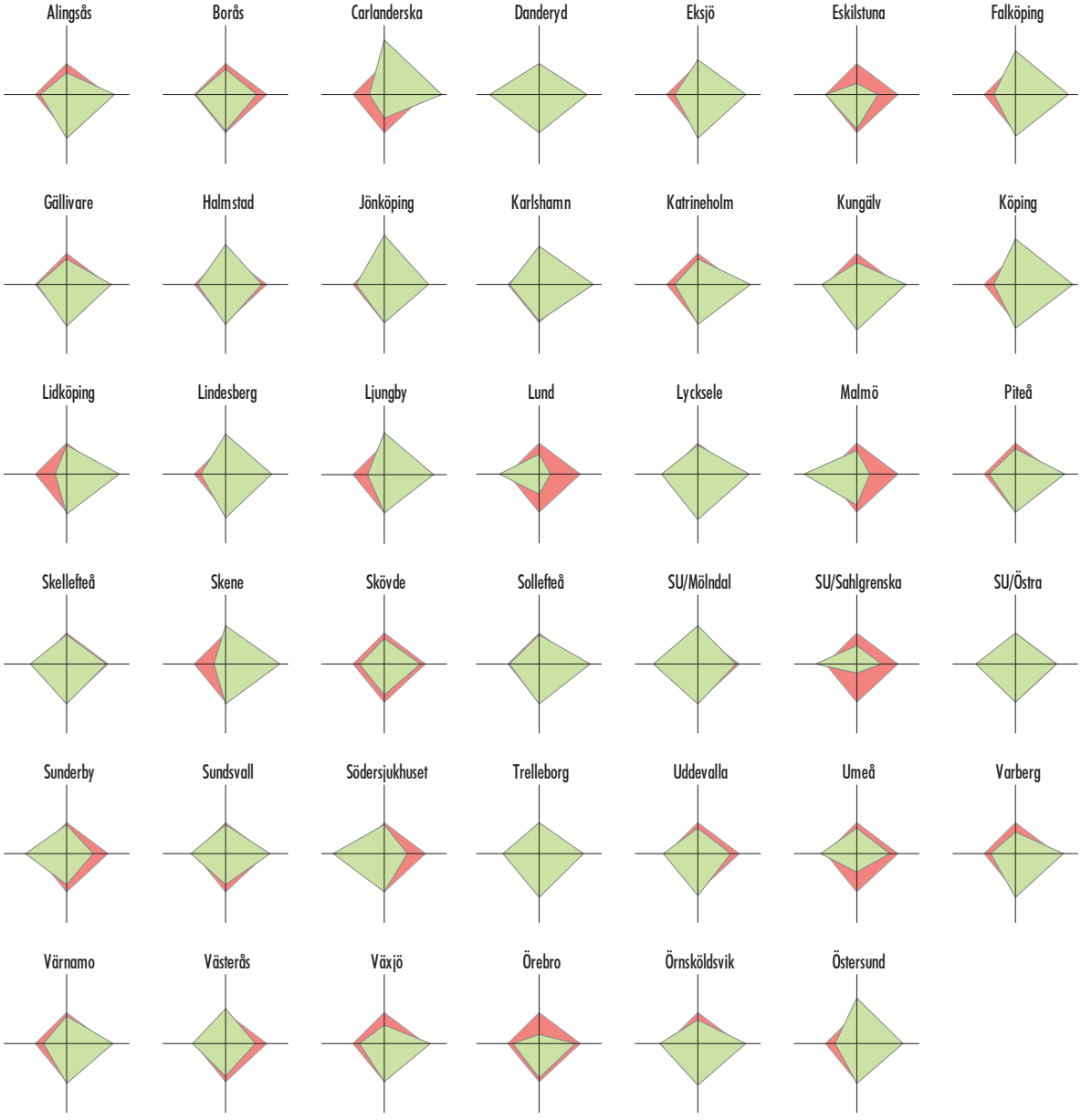
Case-mix Factors

national averages 2006



In the graphic presentation of patient demography ('case-mix') the national results are shown regarding the four entry variables in red. The corresponding values for each department are shown in green. The limit values are set to the greatest and the smallest value of each variable ± 1 SD. The worst value for the variables is assigned origo and the best value is at the periphery.

When interpreting the department's clinical value compass and above all in comparisons, always observe the 'case-mix' picture.



Implant survival as a quality indicator

Implant survival as a quality indicator has been presented in the last few Annual Reports. As ten-year survival per county council/region is now being used as a national quality indicator (see separate section), we last year changed the graphic presentation to agree with the presentation the National Board of Health and Welfare and SALAR uses in the report 'Quality and Efficiency in Swedish Health Care ...'. Publication of report number two is planned for the late Autumn of 2007.

The following table shows ten-year survival for all patients undergoing primary total hip replacement surgery. The definition of failure is revision of one or both implant components and extraction of the prosthesis. All causes of revision are included. As the histogram and the table clearly show, ten-year survival of total hip arthroplasty has improved successively in Sweden ever since the introduction of the Register.

The diagram on the next page shows ten-year survival by hospital (the 68 departments that were active and had ten-year results at 31/12/2006). The histogram is a graphic presentation of the ten-year results from the tables on pages 66-68. The observation period is 1992-2006. The national average was 93.0% ± 0.2%. Red bars represent departments whose upper confidence interval is below the lower national confidence interval, i.e. departments which with 95% probability have poorer implant survival than the national average after ten years. Thus 13 departments had a result that was poorer than the national average, so that 55 of the departments had a ten-year prosthesis survival that was equal to or better than the national average.

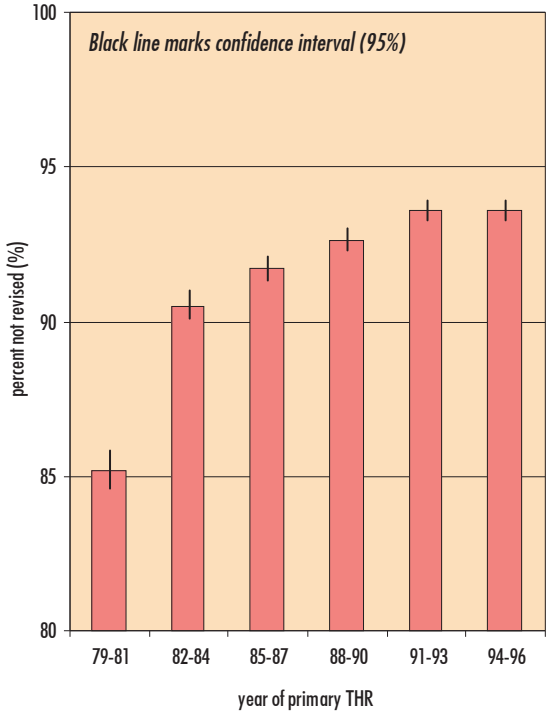
Kaplan-Meier statistics

Prosthesis survival statistics according to Kaplan-Meier are the commonest outcome variable in implant research both nationally and internationally. It is most common to publish ten-year results with the following definition of failure: revision of one or both components or removal of the prosthesis.

This measurement method is exact since it starts from the date the patient underwent revision surgery. It is however a blunt and rough measurement method since it does not take account of patient-related outcome, medical contraindications for further surgery, whether the patient him- or herself wishes to refrain from revision surgery, and whether the patient is on the waiting list. The variable should also be seen as a slow quality indicator describing historical material.

These factors should always be taken into account when interpreting survival statistics. However the method should always be reported since it reflects long-term results following total hip arthroplasty, above all regarding aseptic loosening.

Implant Survival after 10 Years in Different Time Periods

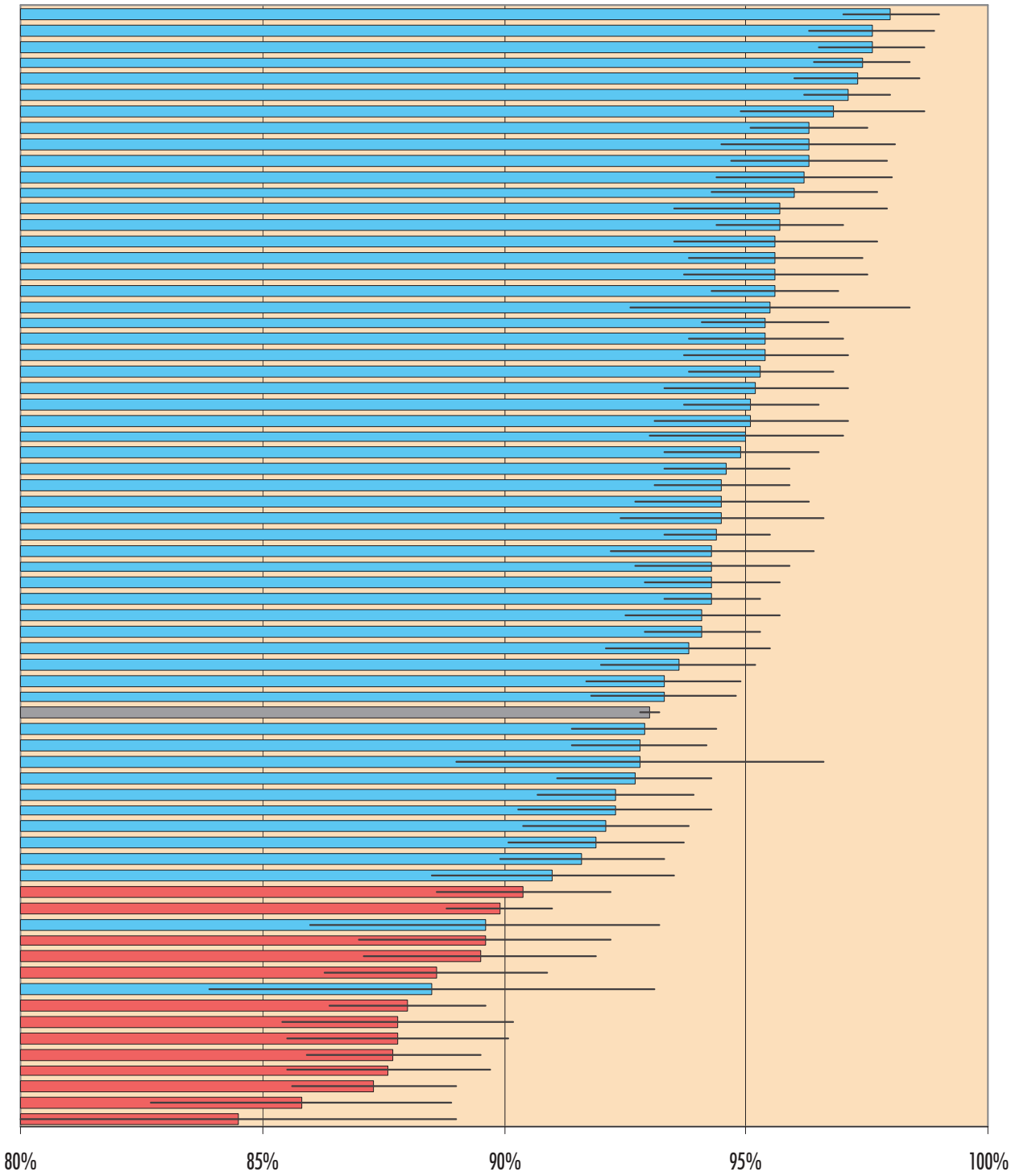


Time period	10 years	95% CI
1979-1981	84.6%	±0.6
1982-1984	90.1%	±0.4
1985-1987	91.3%	±0.4
1988-1990	92.3%	±0.3
1991-1993	93.3%	±0.3
1994-1996	93.3%	±0.3

Average 10-year implant survival for all hospitals active in each time period. Each time period comprises all primary THRs performed during the 3-year-period. All types of revisions are included. The analysis includes all observations up to and including 31-12-2006. The table shows the values presented in the bar chart to the left.

Implant Survival after 10 Years

each bar represents one hospital, primary THRs 1992-2006



10-year implant survival per hospital. The grey bar represents national average. Red bars are clinics whose upper confidence interval lies lower than the nation's lower confidence interval, i.e. hospitals that with 95% probability have poorer implant survival after 10 years than the national average. The histogram is a graphical presentation of the 10-year results from the table on pages 66-68. Clinic names are not stated in the chart.

Reoperation

The term reoperation covers all types of new surgical measure following primary operation. These interventions have been registered since 1979. With effect from the second half of 2000 we stopped registering and reporting closed reduction after dislocation. It is important to be aware of this when comparing with earlier annual reports up to and including 2002. Reoperations are divided into three groups: revision with exchange or extraction of implant components and major or minor reoperations without the prosthesis or any of its components being removed or replaced.

Since 2003 the number of reoperations has been reduced by 201 procedures (12%). During 2006, 89 fewer reoperations were performed than during the preceding year. Compared with 2003, reoperations owing to aseptic loosening and two-session procedures (commonly caused by infection) are the measures that have become fewer. The increased number of reoperations for dislocation noted in 2004, with another decline the following year, have further declined marginally. In previous reports we have feared that the number of reoperations/revisions owing to fractures in the vicinity of the prosthesis would increase as an effect of a growing population with hip implants combined with shrinking resources for follow-up. The standard follow-up model was initiated partly to combat this development. During 2006 the number of reoperations owing to periprosthetic fracture decreased from 171 (2005) to 148. It is possible that the increased attention the problem has gained via the Register has had an effect. Improved surgical technique and choice of implant may also have been important.

As previously, aseptic loosening is the major reason for reoperation, but since a peak in 2002 the number of reoperations consequent on loosening has decreased to 171 (15%), a large reduction. The decline continued marginally during 2006. Reoperation for 'technical reasons', dislocation and infection are major early quality indicators and should remain at a constant low level. The median time between primary operation and reoperation for these reasons is 0.2, 0.7 and 1.4 years.

Hence half of these reoperations occur during the first three to seventeen months of the primary operation. The variation between different departments is, however, large – ***approximately 40 times!***

In most cases an increased number of reoperations is caused by recurrent dislocations. However the large spread between departments should not be evaluated without account being taken of 'case-mix'. Certain departments operate largely only on healthy patients with primary osteoarthritis, while others operate on a large proportion of high-risk patients. A high frequency of early reoperations should, however, always lead to closer analysis in the individual department and, where relevant, to a programme of measures of the type that the Sundsvall department has conducted with great success (see the section "*Example of local improvement programme*").

Number of Reoperations per Procedure and Year

Primary THRs 1979-2006

Procedure at reoperation	1979-2001	2002	2003	2004	2005	2006	Total	Share
Exchange of cup and/or stem or extraction	19,309	1,660	1,692	1,610	1,582	1,491	27,344	85.5%
Major surgical intervention	2,418	171	151	158	132	120	3,150	9.9%
Minor surgical intervention	851	97	104	163	118	124	1,457	4.6%
(missing)	8	2	2	6	0	2	20	0.1%
Total	22,586	1,930	1,949	1,937	1,832	1,737	31,971	100%

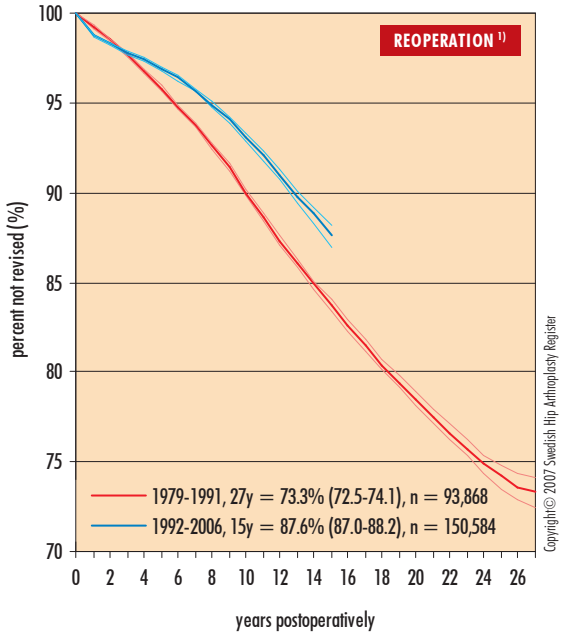
Number of Reoperations per Reason and Year

Primary THRs 1979-2006

Reason for reoperation	1979-2001	2002	2003	2004	2005	2006	Total	Share
Aseptic loosening	13,702	1,143	1,104	986	989	972	18,896	59.1%
Dislocation	2,338	242	255	314	258	244	3,651	11.4%
Deep infection	1,965	216	236	269	239	233	3,158	9.9%
Fracture	1,493	163	166	170	171	148	2,311	7.2%
2-stage procedure	907	84	107	98	98	75	1,369	4.3%
Technical error	807	24	17	17	18	13	896	2.8%
Miscellaneous	759	29	19	33	25	15	880	2.8%
Implant fracture	318	20	34	33	22	23	450	1.4%
Pain only	261	8	10	16	8	14	317	1.0%
Secundary infection	0	0	0	1	1	0	2	0.0%
(missing)	36	1	1	0	3	0	41	0.1%
Total	22,586	1,930	1,949	1,937	1,832	1,737	31,971	100%

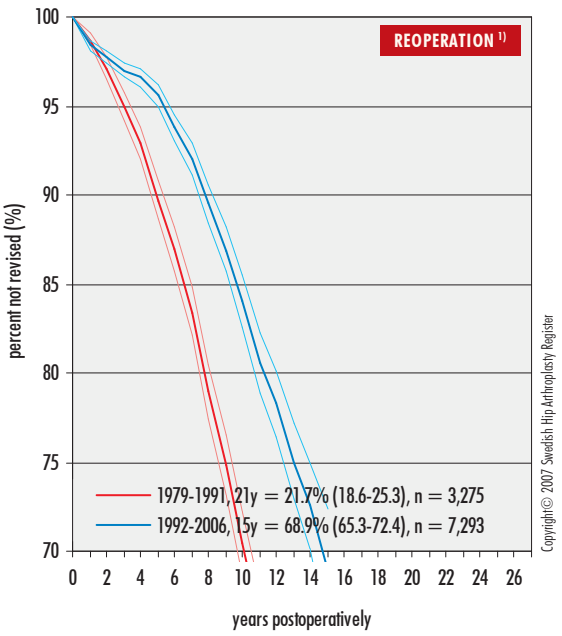
All Cemented Implants

all diagnoses and all reasons



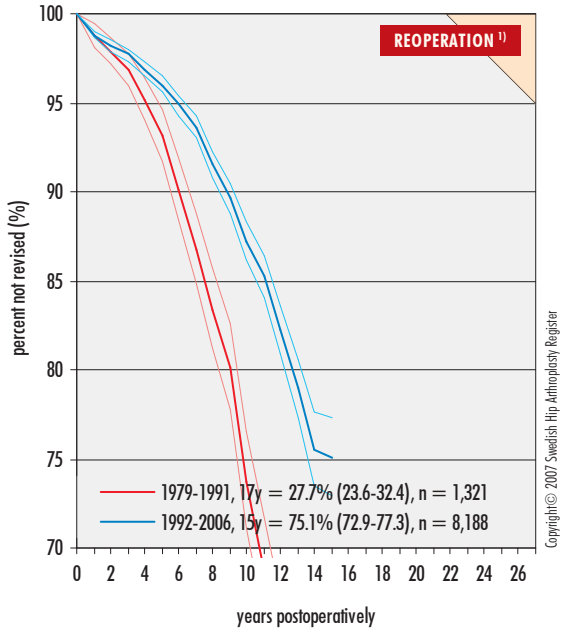
All Uncemented Implants

all diagnoses and all reasons



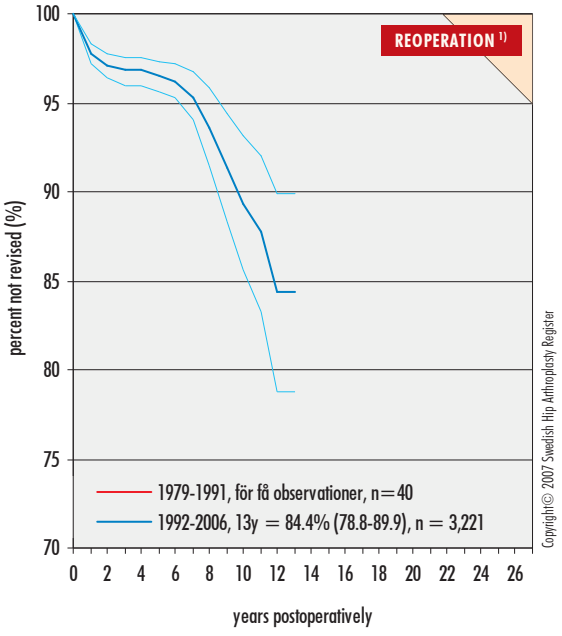
All Hybrid Implants

all diagnoses and all reasons



All Reversed Hybrid Implants

all diagnoses and all reasons



1) Survival statistics according to Kaplan-Meier with revision and removal (all form of surgery, including revision) as end-point for failure.

Notes

Short-term complications — reoperation within 2 years

Background

Last year's Report presented for the first time the variable 'reoperation within two years'. The definition of failure in traditional survival statistics is revision of one or more implant components or removal of the whole prosthesis. Reoperation within two years on the other hand refers to all forms of further surgery of the hip following insertion of total hip prosthesis. Survival statistics in the sense that the Registry and international literature use the method illustrate a mainly long-term result in terms of aseptic loosening. Reoperation in short-term follow-ups reflects mainly early and serious postoperative complications such as deep infection, and revision following repeated dislocations. This 'new' variable is a more rapid quality indicator and easier to use in departmental improvement programmes than ten-year survival, which is an important but slow and historical indicator.

Definition

By short-term complication is meant here all kinds of further surgery within two years of primary surgery. The most recent four-year period is studied – in this Report 2003-2006 inclusive. Note that the Report covers only complications that have been treated surgically. Infections treated with antibiotics, and conservatively-treated dislocations, are not captured in the Register. Patients undergoing repeated surgery for the same complication are included as one complication. However, a number of patients undergo reoperation for different reasons within a short time. Patients reoperated on at a different department than the primary one are assigned to the primary department.

Result

The result is given in the following tables. Hospital type, number of primary surgical interventions during the observation period, and number of patients undergoing reoperations, are given. The complication quotient varies from 0% to 4.4%. Ten departments had over 3% complications during the period. The national average was 1.5%. Departments reporting more than 3% complications were three of nine university/regional hospitals (33%), five of 27 central hospitals (19%), two of 33 rural hospitals (6%) and 0 of 8 private hospitals (0%). This demonstrates once again the varying patient compositions and problems of the different hospital types.

Discussion

This result variable aroused great reaction in the media following last year's Report. There a number of factors were given to be taken into account when interpreting the results which, however, the media did not do to any large extent. When interpreting the results, only departments of the same hospital type should be compared as regards varying competence and patient demography. Departments that operate on the most serious cases with larger risks of complications may naturally have a higher frequency. For reasons of space the table does not state 'case-mix' variables which are given in other tables and which are present graphically in the chapter on production follow-up. Apart from varying patient composition, the following considerations must also be included when interpreting these results:

- The complication rate is generally low and a random variability has a large affect on the results
- This variable can really only be evaluated over time, i.e. if there are clear trends
- Departments that adopt a wait-and-see approach (conservative – non surgical treatment of, for example, infection and dislocation) i.e. avoid operating for these complications, are not registered in the database.

If over time a department has a consistently high proportion of short-term complications, an analysis should be initiated with a review of routines, operation techniques and possibly choice of implants. Since the study concerns patients undergoing surgery during a four-year period, it may take one-to-two years before successful improvements are reflected in the result tables.

Since the Report was published, this 'new' variable has been criticised above all by those departments that had a high frequency. The reason for this criticism has throughout been that we did not report the department's patient demography – 'case-mix'. This somewhat surprised the Registry management since in the most recent reports we have attempted to focus more on this awkward problem of interpretation. As stated above we have for reasons of space been unable to publish the negative 'case-mix' factors identified in each table. These factors are available, however, in a number of tables and, starting with this year, also in graphic form (see the section on 'Follow-up of activities after total hip replacement surgery'). In addition, the Registry has for many years, in the confidential reports to the departments, given each department its specific patient composition. For this reason knowledge on 'case-mix' has been available for many years and each department has been able to present its arguments with this as background.

Irrespective of the hospital's category and result, the departments should analyse their complications and investigate whether there are systematic shortcomings. To simplify this process, starting with this Report, personal ID numbers and date of operation of the patients in question are being attached to the confidential appendix sent to each department.

Reoperation within 2 Years per Hospital

2003-2006

	Prim.THRs	Patients [1]		Infection		Dislocation		Loosening		Others	
Hospital	number	number	%	number	%	number	%	number	%	number	%
University/Regional Hospitals											
KS/Huddinge	923	15	1.6%	0	0.0%	7	0.8%	3	0.3%	5	0.5%
KS/Solna	1,038	44	4.2%	22	2.1%	15	1.4%	5	0.5%	14	1.3%
Linköping	447	6	1.3%	3	0.7%	3	0.7%	0	0.0%	1	0.2%
Lund	394	13	3.3%	1	0.3%	6	1.5%	1	0.3%	6	1.5%
Malmö	479	7	1.5%	2	0.4%	4	0.8%	0	0.0%	1	0.2%
SU/Sahlgrenska	781	12	1.5%	6	0.8%	1	0.1%	1	0.1%	6	0.8%
SU/Östra	458	2	0.4%	0	0.0%	2	0.4%	0	0.0%	0	0.0%
Umeå	287	3	1.0%	1	0.3%	1	0.3%	0	0.0%	1	0.3%
Uppsala	1,110	36	3.2%	11	1.0%	12	1.1%	4	0.4%	14	1.3%
Central Hospitals											
Borås	794	25	3.1%	5	0.6%	17	2.1%	1	0.1%	5	0.6%
Danderyd	1,320	28	2.1%	2	0.2%	13	1.0%	6	0.5%	11	0.8%
Eksjö	721	17	2.4%	8	1.1%	6	0.8%	0	0.0%	4	0.6%
Eskilstuna	312	4	1.3%	0	0.0%	1	0.3%	1	0.3%	3	1.0%
Falun	1,044	7	0.7%	1	0.1%	3	0.3%	2	0.2%	1	0.1%
Gävle	614	24	3.9%	6	1.0%	12	2.0%	1	0.2%	5	0.8%
Halmstad	779	16	2.1%	6	0.8%	5	0.6%	1	0.1%	7	0.9%
Helsingborg	360	2	0.6%	2	0.6%	0	0.0%	0	0.0%	1	0.3%
Hässleholm-Kristianstad	2,712	31	1.1%	15	0.6%	9	0.3%	4	0.1%	14	0.5%
Jönköping	774	15	1.9%	4	0.5%	8	1.0%	0	0.0%	5	0.6%
Kalmar	845	21	2.5%	13	1.5%	8	0.9%	0	0.0%	2	0.2%
Karlskrona	150	3	2.0%	0	0.0%	1	0.7%	2	1.3%	0	0.0%
Karlstad	952	23	2.4%	17	1.8%	3	0.3%	1	0.1%	4	0.4%
Norrköping	661	4	0.6%	0	0.0%	3	0.5%	0	0.0%	1	0.2%
S:t Göran	1,860	42	2.3%	18	1.0%	17	0.9%	7	0.4%	12	0.6%
Skövde	643	8	1.2%	3	0.5%	1	0.2%	0	0.0%	5	0.8%
SU/Mölndal	336	3	0.9%	1	0.3%	2	0.6%	0	0.0%	1	0.3%
Sunderby (inklusive Boden)	478	18	3.8%	7	1.5%	10	2.1%	1	0.2%	2	0.4%
Sundsvall	619	27	4.4%	11	1.8%	15	2.4%	0	0.0%	4	0.6%
Södersjukhuset	1,109	12	1.1%	3	0.3%	6	0.5%	1	0.1%	3	0.3%
Uddevalla	1,216	27	2.2%	10	0.8%	10	0.8%	4	0.3%	7	0.6%
Varberg	743	16	2.2%	14	1.9%	2	0.3%	0	0.0%	2	0.3%
Västerås	512	3	0.6%	0	0.0%	2	0.4%	0	0.0%	1	0.2%
Växjö	469	3	0.6%	0	0.0%	1	0.2%	0	0.0%	2	0.4%
Ystad	287	10	3.5%	1	0.3%	8	2.8%	0	0.0%	1	0.3%
Örebro	733	6	0.8%	4	0.5%	0	0.0%	0	0.0%	3	0.4%
Östersund	758	8	1.1%	1	0.1%	4	0.5%	0	0.0%	3	0.4%
Rural Hospitals											
Alingsås	655	6	0.9%	3	0.5%	2	0.3%	1	0.2%	0	0.0%
Arvika	403	5	1.2%	4	1.0%	0	0.0%	0	0.0%	3	0.7%
Bollnäs	1,008	11	1.1%	3	0.3%	4	0.4%	2	0.2%	3	0.3%
Enköping	648	10	1.5%	5	0.8%	2	0.3%	1	0.2%	3	0.5%
Falköping	937	4	0.4%	1	0.1%	2	0.2%	1	0.1%	0	0.0%
Frölunda Specialistsjukhus	195	2	1.0%	1	0.5%	1	0.5%	0	0.0%	1	0.5%

Reoperation within 2 Years per Hospital (cont.)

2003-2006

	Prim. THRs	Patients [1]		Infection		Dislocation		Loosening		Others	
Hospital	number	number	%	number	%	number	%	number	%	number	%
Gällivare	451	9	2.0%	3	0.7%	5	1.1%	1	0.2%	3	0.7%
Hudiksvall	599	20	3.3%	11	1.8%	8	1.3%	0	0.0%	1	0.2%
Karlshamn	697	9	1.3%	0	0.0%	7	1.0%	1	0.1%	1	0.1%
Karlskoga	457	5	1.1%	3	0.7%	3	0.7%	0	0.0%	2	0.4%
Katrineholm	808	6	0.7%	1	0.1%	0	0.0%	4	0.5%	4	0.5%
Kungälv	697	5	0.7%	3	0.4%	1	0.1%	0	0.0%	1	0.1%
Köping	835	4	0.5%	0	0.0%	3	0.4%	1	0.1%	0	0.0%
Lidköping	509	1	0.2%	0	0.0%	1	0.2%	0	0.0%	0	0.0%
Lindesberg	565	7	1.2%	2	0.4%	4	0.7%	0	0.0%	3	0.5%
Ljungby	420	2	0.5%	0	0.0%	0	0.0%	1	0.2%	1	0.2%
Lycksele	929	1	0.1%	0	0.0%	0	0.0%	1	0.1%	0	0.0%
Mora	573	7	1.2%	4	0.7%	2	0.3%	0	0.0%	1	0.2%
Motala	1,241	15	1.2%	1	0.1%	10	0.8%	1	0.1%	3	0.2%
Norrtälje	381	8	2.1%	3	0.8%	5	1.3%	1	0.3%	3	0.8%
Nyköping	534	9	1.7%	4	0.7%	4	0.7%	0	0.0%	5	0.9%
Oskarshamn	686	1	0.1%	1	0.1%	0	0.0%	0	0.0%	0	0.0%
Piteå	749	9	1.2%	5	0.7%	2	0.3%	1	0.1%	2	0.3%
Skellefteå	495	5	1.0%	3	0.6%	2	0.4%	1	0.2%	2	0.4%
Skene	312	1	0.3%	1	0.3%	0	0.0%	0	0.0%	0	0.0%
Sollefteå	563	8	1.4%	3	0.5%	3	0.5%	0	0.0%	4	0.7%
Södertälje	504	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Torsby	270	2	0.7%	1	0.4%	1	0.4%	0	0.0%	0	0.0%
Trelleborg	1,346	18	1.3%	8	0.6%	5	0.4%	2	0.1%	5	0.4%
Visby	356	12	3.4%	2	0.6%	3	0.8%	2	0.6%	5	1.4%
Värnamo	525	4	0.8%	0	0.0%	3	0.6%	1	0.2%	0	0.0%
Västervik	432	10	2.3%	6	1.4%	5	1.2%	0	0.0%	4	0.9%
Örnsköldsvik	573	5	0.9%	3	0.5%	1	0.2%	0	0.0%	2	0.3%
Private Hospitals											
Carlanderska	217	1	0.5%	0	0.0%	0	0.0%	0	0.0%	1	0.5%
Elisabethsjukhuset	467	3	0.6%	1	0.2%	0	0.0%	0	0.0%	2	0.4%
GMC	109	2	1.8%	1	0.9%	1	0.9%	1	0.9%	0	0.0%
Movement	216	3	1.4%	3	1.4%	0	0.0%	0	0.0%	1	0.5%
Nacka Närsjukhus Proxima	71	2	2.8%	0	0.0%	1	1.4%	1	1.4%	0	0.0%
Ortopediska Huset	1,099	6	0.5%	1	0.1%	2	0.2%	3	0.3%	1	0.1%
Sophiahemmet	977	9	0.9%	2	0.2%	4	0.4%	1	0.1%	4	0.4%
Stockhoms Specialistvård	641	11	1.7%	1	0.2%	7	1.1%	1	0.2%	2	0.3%
Sweden	53,962	819	1.5%	297	0.6%	326	0.6%	79	0.1%	242	0.4%

1) The number of patients with short-term complications can differ from the number of complications, as each patient can have more than one type of complication.

The following factors must be considered when interpreting the variable 'reoperation within 2 years':

- **Type of hospital.**
- **Patient demographics.**
- **The values of complication are generally low and a random variability has a great impact on the results.**
- **This variable can only be evaluated over time, i.e. if obvious trends are present.**
- **Observe that this report is only valid for complications that are surgically treated.**

Example of local improvement programme

In last year's Report the orthopaedic department at Sundsvall hospital had the highest reported frequency of complications (reoperation within two years) in the country (4.8%). Even before the report was published, the Registry management contacted the head of the department to inform him of the results since we knew from experience that we could expect a reaction from the media. We also contacted four more departments that 'topped' the current statistics.

As Table 1 shows, Sundsvall had during the observation period had problems with above all reoperation owing to dislocations and infections. The patient demography in Sundsvall during the period greatly resembled the national mean value.

On many occasions following publication of the Report, the department head in Sundsvall contacted the Registry management for discussion. This included help with interpretation of the results in preparation for a meeting with the local press and discussion with colleagues at the department. The reaction from the media was rapid and two newspapers reported on the high complication frequency at the department.

A list of personal ID numbers for the patients in question was requested from Sundsvall and at a department meeting two colleagues were given the job of analysing patient records and X-rays for the dislocation and infection cases, respectively.

Reoperation owing to dislocation

The material included 19 patients reoperated on for dislocation. The analysis gave the following results:

- The majority of these patients had poorly-positioned cups both in anteversion and retroversion.
- A number of patients had patient-related risk factors such as sequelae of hip fractures and neuromuscular disease
- The dislocations were distributed among experienced and less-experienced orthopaedic surgeons
- In only one case were no factors found that could explain the dislocation
- In many cases reoperation was carried out early:
  - In eight cases, revision after one dislocation (obviously incorrectly positioned cups)
  - In two cases after two dislocations.

Following this analysis a literature search was undertaken and at a new department meeting the following action programme was decided upon covering general routines, surgical technique and choice of implants:

- Improved information to patients preoperatively by physiotherapists
- Preoperative patient selection – identify contraindications such as dementia
- Preoperative planning obligatory in all cases
- Operator must approve the preoperative arrangements before the patient is cleansed and dressed
- Positioning guide must be used for cup placement
- Change from 28 to 32 mm caput diameter, especially for risk patients
- If posterior approach is used, obligatory to resuture capsule and muscle insertion
- Discussion on X-ray round regarding component placement to increase awareness
- Should a postoperative dislocation occur, patient must attend 'dislocation school' to analyse movement pattern and improve 'patient compliance'.

Over and above these measures contacts were made between Sundsvall and the Registry management who visited the department for further discussion. Following implementation of the action programme (November 2006) there has been no further reoperation at the department owing to dislocation.

Reoperation owing to infection

The infection material comprised ten patients. Seven of these had co-morbidities that could be 'immunosuppressive', such as arterial sclerosis, heart failure, cortisone treatment and ethylism. The agent was in seven cases staph. aureus and in two cases streptococci, i.e. a somewhat divergent infection panorama compared with the national one which contains about 50% CNS. However the material

	Number of patients	Number of reop.	Frequency	Infection	Dislocation	Loosening	Other
Sundsvall	638	33	4.8%	1.3%	2.8%	0.1%	1.0%
Nation	52,623	763	1.4%	0.5%	0.6%	0.1%	0.5%

Table 1. Sundsvall results versus the national averages. Reoperations within 2 years (2002–2005).

	Number of patients	Primary OA	Share patients < 60 years	Share women	Share reopererated
Sundsvall	638	85.3%	20.4%	60.9%	4.8%
Nation	52,623	81.8%	19.1%	59.4%	1.4%

Table 2. Patient demographics. The Sundsvall clinic versus the nation.

is so small that no conclusions may be drawn regarding this pattern.

The department has contacted infection colleagues, bacteriologists and hospital hygienists for further analysis and an action plan. This work is still going on and will be concluded in autumn 2007.

Discussion

It is with great pleasure that the Registry management notes that last year's Annual Report with its new open variable has in several departments led to a local analysis and rapid measures for improvement. As well as Sundsvall, four departments have requested personal-ID-number lists for the cases in question.

It is our hope that all departments irrespective of complication frequencies in the table will analyse their short-term complications.

When the Sundsvall department became aware of its high complication frequency, they were according to the department head 'caught with our trousers down'. In Registry terms, complication frequency is a rapid indicator but it is reported to a department with a certain delay and local registration of complications could prompt a faster reaction from the department. With local registration, moreover, cases with non-surgical treatment of for example dislocation and infection could be included, in this way more clearly reflecting the department's complications. The optimum would of course be that the department reports to the Registry but also starts up a local complication registry comprising events not registered at national level.

The Sundsvall action plan against dislocation is, in the Registry management's view, entirely adequate and also follows current international literature. One substantial factor is the department's 'aggressive' attitude leading to reoperation in 10 of 19 cases as early as after one or two dislocation episodes. Most treatment algorithms for hip prosthesis dislocation recommend reoperation after three dislocations. In the majority of the Sundsvall cases, however, there were clearly incorrectly positioned cups, for which reason in these cases it would hardly have been worth waiting for more dislocations before surgical intervention. This surgically active attitude is probably entirely adequate but may be understood to be to the department's 'disadvantage' in this type of analysis.

Following this Report the Registry's management was contacted by journalists from different parts of Sweden for discussion on departments' complication frequencies. In some cases we discussed with the same journalists after the articles were published and we then asked, above all, why they had not taken up the factors we consider obligatory in interpretation of register results. The journalists' comments on this may be summarised in a quotation from one of them '*. . . I read about that – but it's not journalistically interesting. . .*'. This quotation clearly illustrates an attitude that all the national quality registers must take into account when introducing openly-reported register results. There is consensus about increasing the Registry's openness, but this involves an onerous teaching job for the keepers of the registers.

Lennart Bengtsson är verksamhetschef vid ortopedkliniken i Sundsvall. Han tycker inte att patienterna behöver vara oroliga, trots att så många får komma tillbaka hans klinik efter att de opererat höfterna.
Foto: Sören Wallgin

Klicka på bilden för att beställa bilden

Flest höftoperationer får göras om i Sundsvall

SUNDSVALL (ST) 2006-10-24 03:00

Om en höftprotes går sönder gör det väldigt ont. I Sundsvall händer det oftare än på andra ställen i Sverige.
Det visar ny statistik från Höftprotesregistret.

Var tjugonde patient kommer tillbaka till Sundsvalls sjukhus redan kort tid efter att de opererat höften. Orsaken är oftast att protesen hoppat ur sitt läge. Resultatet är bland de sämsta om man jämför alla ortopedkliniker i Sverige.

Uppgifterna kommer från Höftprotesregistret, en landsomfattande sammanställning som görs av Sveriges främsta experter på ortopedi. Den senaste granskningen rör perioden från 2002 till och med 2005.

I Sundsvall fick 33 av 680 patienter göra om sina operationer inom två år under den aktuella perioden.

Press cutting from Sundsvalls Tidning's web edition 2006-10-24.

The press cutting above is quoted with permission from the Sundsvall clinic. It is an important example of the value of early, openly reported outcome variables as a incitement to clinical improvement programme.

Revision

As well as reoperation, which is a broader concept, the term revision is also used for replacement or extraction of one, several or all parts of the prosthesis. For the period 1979-1991, particulars of primary arthroplasty were recorded in aggregate by department, and not based on personal ID number. For this reason approximations are used for diagnosis, gender and age distribution and mortality risk in survival calculations that have showed good validity (Söderman et al 2000). Starting in 1992 registration has been based on personal ID number and more data is collected for each primary operation, which permits a more complete account.

This year we report an in-depth analysis of revision for reasons of dislocation in cases where a semi-circular wall addition has been screwed onto the cup. The method was launched in Sweden during the 1980s but has never been documented using sizeable patient material.

In this overall reporting we see that the number of revisions following primary operation, distributed by cause, is relatively constant except that the number of implant replacements owing to infection has decreased. On the other hand there is no corresponding decrease in reoperations for the same reason. This indicates that the incidence is relatively unchanged but that conservative surgical treatment with irrigation and soft-tissue revision is now being chosen to a larger extent, and this may be successful if performed early.

The small increase in revision owing to dislocation (5%) may be random. Patients undergoing repeated revision constitute a special problem. They are subjected to great strains partly owing to the problem related to the poorly functioning joint, partly owing to the burden that recurrent and often extensive operations involve. These operations generally involve a large burden on medical care. Patients undergoing revision for dislocation and infection are here in a special position since they run the greatest risk of being afflicted by repeated reoperations. For first-time revisions they together represent about 15% of the total number. In the group revised more than twice, this proportion has increased to almost half (48.2%). In the group with more revisions, there is an over-representation of patients with inflammatory joint disorders, sequelae of childhood diseases and secondary osteoarthritis following trauma. These results may indicate that technically difficult or unusual revisions should be centralised to special units.

Down to 2005 we saw a reduction in the number of revisions of, primarily, fully cemented and uncemented implants. During 2006 the number of revisions of entirely uncemented implants and reversed hybrids increased, relatively speaking. Regarding wholly uncemented prostheses, problems of wear and osteolysis may be one explanation since the majority (84%) were performed in consequence of mechanical complications. The increase in revision of reversed hybrids was caused largely by fractures and dislocations (approximately 50%) which are more probably related to surgical technique and to some extent prosthesis design.

As expected, the proportion of revisions for dislocation, deep infection and technical problems decreased with time following primary operation when whole periods (1979-2006) were studied. The risk of revision for mechanical loosening reaches a plateau when seven to ten years have passed following primary operation. The relative proportion of revisions due to fracture shows a different picture and remains fairly constant at 5% - 6% up to ten years, and then increases. This pattern may be because many patients with loose prostheses are not noticed in time.

Prosthesis survival related to type of fixation shows that cemented fixation gives the smallest number of revisions in a long-term perspective if all diagnoses are included. Analysing only those patients who underwent primary surgery for osteoarthritis does not change the result even though the material – and above all the follow-up time – for the reversed hybrids is short.

The diagrams on pages 52-53 offer a description of the current situation throughout the country. Based on almost 70,000 cemented prostheses, a 27-year survival of 77.3% constitutes important documentation of the procedure as such and a benchmark for ongoing and future studies. Note that these data are not sufficient for a more far-reaching comparison between the different ways of fixing a prosthesis since many factors, for example demographic differences between the groups, a shift in indications over time and changes in implant design, are not taken into account.

Overall results have improved successively. For certain indications however, for example dislocation and sometimes implant modification, there are several examples of the opposite, and this underlines the importance of continuous registration and re-reporting.

The implant-specific survival diagrams are based on revision irrespective of cause and independently of diagnosis. Four survival graphs showing the risk of stem and/or cup revision are reported only for the most frequently-used cemented implants. In the upper diagram, cup and stem are reported separately. The analysis is terminated when the number of observations is below 50. A more detailed report of different implants is given in table form starting on page 62. Continuous re-reporting from the register has led to an increasingly narrow selection of implants.

This is partly why we now stand on firmer ground regarding the documentation of certain cemented and uncemented prosthesis systems. Repeated analyses of

how prostheses fixation, method of operation and prosthesis design affect the outcome for different patient categories are urgently required so as to optimise the result.

The results separated into different gender and age groups are reported for 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 reported by gender. All causes of revision are included for the period reported (1992-2006).

In the age group below 50 years, women have a poorer result than men in absolute numbers. If one adjusts for diagnosis and other contributory factors in a regression analysis, the gender difference disappears, probably owing partly to the predominance of women in the diagnosis group with sequelae of childhood diseases, a diagnosis with increased risk of revision (see separate section).

For both genders the results improve if one uses cemented fixation instead of uncemented or hybrid. In the age group 50-59 years cemented fixation still involves a lower risk of revision among women. Among men, 15-year implant survival is about the same for cemented and wholly uncemented fixation and in absolute numbers 4.5% worse when hybrid fixation is chosen. In the interval 60-75 years cemented fixation gives the highest implant survival and hybrid fixation the lowest. Based on the choice of implant and surgical technique used in Sweden during the observation period, cemented fixation is probably preferable in this, as in the oldest, group. A deeper analysis with adjustment for contributory factors is necessary, however, to give more secure guidelines.

In the review of implant survival by type, the 'case-mix' for each design should be included. Prostheses largely used in women with primary osteoarthritis, 60 years or older, should have a more favourable outcome. The possibility of generalising results of prostheses with registered good outcome increases with the number of observations. For prostheses with poorer outcome, the assessment can generally be of great interest even with fairly few observations. Note that the variation is fairly small up to five years of observation, even though it is even then possible in some cases to suspect important differences that emerge clearly at ten years of follow-up.

The departmental consequences of aseptic loosening or osteolysis which are so important for the patient and medical care thus do not manifest themselves in most cases until after the 5- to 10-year follow-up and during the ensuing 10- to 20-year period, which is important to stress not least for those who are to supply resources for these often complicated interventions.

The implants that show low survival after ten years have often but not always been used on younger patients. On the other hand there are certain combinations of prostheses which even though used to a fairly large extent on high-risk patients, demonstrate a ten-year survival of up to 96-97%. So far the follow-up time for certain relatively newly introduced implants is too short to present in table form. One example is cups of highly cross-linked polythene, which in controlled studies have shown a large reduction of wear up to 5 years. The use of these new types of plastic is increasing and we hope to be able to present data from at least some designs during the next few years. Note, however, that plastic quality varies between manufacturers; consequently the departmental results can vary.

Prosthesis survival based on implant survival per department exhibits fairly large variations. This can partly be explained by patient selection, even though other aspects such as responsibility for training and for development and evaluation of new methodology and other factors, too, may be added. The difference in 'case-mix' is large between groups of departments. At university /regional hospitals the proportion of patients with the most favourable prognosis (women, 60 years or older with primary osteoarthritis) is 28% of the total number. The corresponding proportions for county hospitals, sub-county hospitals and private hospitals are 36%, 41% and 46%, respectively. This is reflected well in the tables.

Where the department's results diverge appreciably from what is expected for the group as a whole, an analysis of cause is of value. Note, however, that these data reflect the circumstances prevailing at the time of operation and therefore do not necessarily represent what is now current. In prosthetic surgery, the long-term result is of the greatest importance since the majority of serious complications appear late.

By *reoperation* is meant all forms of further surgery following total hip arthroplasty.

By *revision*, which is a form of reoperation, is meant an intervention where one or more components of the prosthesis are replaced or the whole prosthesis is removed.

Operation with 'socket wall addition' following dislocation

Surgery using a semicircular socket wall addition is documented but sparsely in the literature. The majority of reports are based on few cases and the risk of renewed dislocation varies greatly (between 0% and 24%). The advantage of this intervention is that it is relatively small with a lower risk of general complications. Indications are considered to be present if the components are correctly placed and/or if the patient represents a great operational risk owing to co-morbidity. Since this operation is used at a relatively constant frequency in Sweden we have run a more detailed analysis. The database until 2005 contains 3,384 operations for dislocation.

In 979 of these cases, socket wall additions were used. The procedure is combined with exchange of the joint head in the majority of cases (91%). In 9% the cup and/or the stem were also replaced. In about half the operations (51%) this was performed as a first revision. In nearly all cases, the socket wall addition was fixed on to a cemented cup (98.5%). Compared with those patients for whom other operational methods were used to reduce the risk of dislocation, the group in question were three years older (median: 77 *33-99* versus 74 *21-99* years; $p < 0.001$), 65% were women and 28 had a primary diagnosis of hip fracture. The mean follow-up time was 5 years and 8 months.

A Cox regression analysis was used to evaluate how far the factors age, gender, primary diagnosis, number of earlier revisions, component replacement or not, and type of incision, affected the risk that the patient would undergo a further revision. Only one factor was statistically significant. Increasing age at the first revision reduced the risk that further revisions would be performed for the same reason. The risk reduction per year was 0.97% *0.96-0.99*. The probability that the patient would not be afflicted by a further revision irrespective of cause was 69±2.0% after 11 years where more than 138 observations remained (see Figure 1). Patients reoperated on for dislocation have practically always been afflicted by repeated dislocations and undergone a large number of closed reductions. If following reoperation the patient continues to dislocate, it is common first to attempt a closed reduction and this may occur several times.

Failure in the form of repeated dislocations following reoperation thus does not always automatically involve further surgery. This may be because the conservative treatment was successful but also because of many other factors related to the patient and the treatment situation. High age, which proves to be significant in the regression analysis, may be one such factor. It may therefore be assumed that failure defined as renewed revision is an underestimation of the true problem.

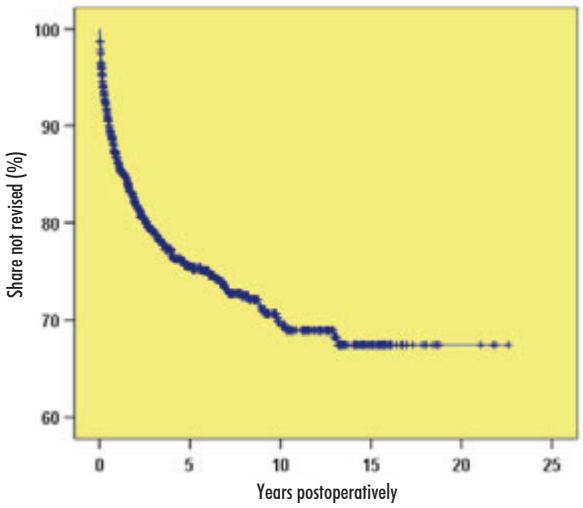


Figure 1. Survival with respect to revision, regardless of reason. 11-year survival = 69±2.0 (138 remaining observations).

Figure 2. Prefabricated "socket wall addition" for a Lubinus cup (frontal).

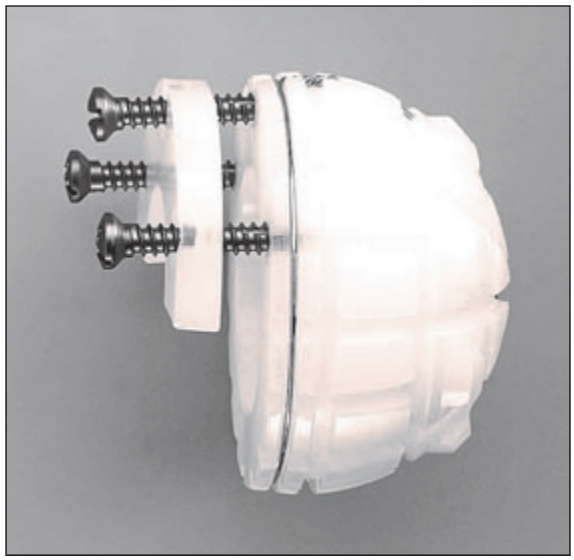


Figure 3. Prefabricated "socket wall addition" for a Lubinus cup (side).

Number of Revisions per Reason and Year of Revision

only the first revision, primary THRs 1979-2006

Reason for revision	1979-2001	2002	2003	2004	2005	2006	Total	Share
Aseptic loosening	11,820	952	908	804	822	822	16,128	74.9%
Dislocation	944	123	125	168	133	140	1,633	7.6%
Deep infection	1,165	86	90	79	83	68	1,571	7.3%
Fracture	811	74	95	94	94	97	1,265	5.9%
Technical error	432	8	6	10	8	6	470	2.2%
Implant fracture	244	12	21	16	16	15	324	1.5%
Pain only	49	5	5	5	3	7	74	0.3%
Miscellaneous	38	0	1	7	5	3	54	0.3%
Total	15,503	1,260	1,251	1,183	1,164	1,158	21,519	100%

Number of Revisions per Reason and Number of Previous Revisions

primary THRs 1979-2006

Reason for revision	0		1		2		> 2		Total	Share
Aseptic loosening	16,128	74.9%	2,240	62.5%	390	56.5%	83	43.0%	18,841	72.5%
Dislocation	1,633	7.6%	477	13.3%	113	16.4%	51	26.4%	2,274	8.8%
Deep infection	1,571	7.3%	410	11.4%	98	14.2%	42	21.8%	2,121	8.2%
Fracture	1,265	5.9%	288	8.0%	55	8.0%	6	3.1%	1,614	6.2%
Technical error	470	2.2%	76	2.1%	18	2.6%	2	1.0%	566	2.2%
Implant fracture	324	1.5%	65	1.8%	11	1.6%	7	3.6%	407	1.6%
Pain only	74	0.3%	13	0.4%	3	0.4%	2	1.0%	92	0.4%
Miscellaneous	54	0.3%	12	0.3%	2	0.3%	0	0.0%	68	0.3%
Secondary infection	0	0.0%	1	0.0%	0	0.0%	0	0.0%	1	0.0%
Totalt	21,519	100%	3,582	100%	690	100%	193	100%	25,984	100%

Number of Revisions per Diagnosis and Number of Previous Revisions

primary THRs 1979-2006

Diagnosis at primary THR	0		1		2		> 2		Total	Share
Primary osteoarthritis	15,875	73.8%	2,518	70.3%	465	67.4%	123	63.7%	18,981	73.0%
Fracture	1,993	9.3%	309	8.6%	47	6.8%	8	4.1%	2,357	9.1%
Inflammatory arthritis	1,731	8.0%	355	9.9%	85	12.3%	27	14.0%	2,198	8.5%
Childhood disease	1,067	5.0%	247	6.9%	55	8.0%	22	11.4%	1,391	5.4%
Idiopathic femoral head necrosis	383	1.8%	64	1.8%	15	2.2%	4	2.1%	466	1.8%
Secondary arthritis after trauma	188	0.9%	52	1.5%	14	2.0%	9	4.7%	263	1.0%
Secondary osteoarthritis	69	0.3%	8	0.2%	1	0.1%	0	0.0%	78	0.3%
Tumor	33	0.2%	7	0.2%	4	0.6%	0	0.0%	44	0.2%
(missing)	180	0.8%	22	0.6%	4	0.6%	0	0.0%	206	0.8%
Total	21,519	100%	3,582	100%	690	100%	193	100%	25,984	100%

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

primary THRs 1979-2006

Year of revision	0		1		2		> 2		Total	Share
1979-2001	15,503	72.0%	2,384	66.6%	414	60.0%	93	48.2%	18,394	70.8%
2002	1,260	5.9%	236	6.6%	60	8.7%	20	10.4%	1,576	6.1%
2003	1,251	5.8%	259	7.2%	57	8.3%	20	10.4%	1,587	6.1%
2004	1,183	5.5%	265	7.4%	51	7.4%	18	9.3%	1,517	5.8%
2005	1,164	5.4%	246	6.9%	59	8.6%	23	11.9%	1,492	5.7%
2006	1,158	5.4%	192	5.4%	49	7.1%	19	9.8%	1,418	5.5%
Total	21,519	100%	3,582	100%	690	100%	193	100%	25,984	100%

Number of Revisions per type of Fixation at Primary THRs and Year of Revision

only the first revision, primary THRs 1979-2006

Type of fixation at primary THR	1979-2001	2002	2003	2004	2005	2006	Total	Share
Cemented	13,215	987	959	933	917	863	17,874	83.1%
Uncemented	1,274	136	143	109	89	128	1,879	8.7%
Hybrid	475	104	124	111	123	124	1,061	4.9%
Reversed hybrid	75	8	9	18	19	30	159	0.7%
(missing)	464	25	16	12	16	13	546	2.5%
Total	15,503	1,260	1,251	1,183	1,164	1,158	21,519	100%

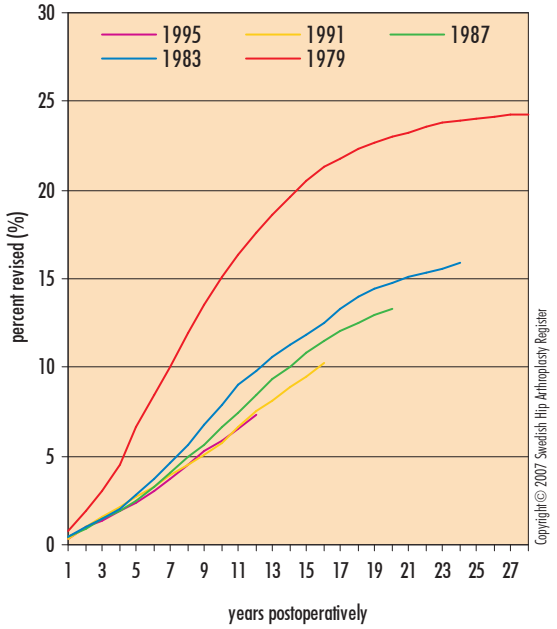
Number of Revisions per Reason and Time to Revision

only the first revision, primary THRs 1979-2006

Reason for revision	0 – 3 years		4 – 6 years		7 – 10 years		> 10 years		Total	Share
Aseptic loosening	2,706	46.3%	3,454	83.3%	4,777	86.7%	5,191	86.3%	16,128	74.9%
Dislocation	1,101	18.8%	174	4.2%	166	3.0%	192	3.2%	1,633	7.6%
Deep infection	1,154	19.7%	198	4.8%	135	2.4%	84	1.4%	1,571	7.3%
Fracture	321	5.5%	216	5.2%	308	5.6%	420	7.0%	1,265	5.9%
Technical error	423	7.2%	25	0.6%	16	0.3%	6	0.1%	470	2.2%
Implant fracture	51	0.9%	63	1.5%	103	1.9%	107	1.8%	324	1.5%
Pain only	57	1.0%	9	0.2%	3	0.1%	5	0.1%	74	0.3%
Miscellaneous	34	0.6%	7	0.2%	4	0.1%	9	0.1%	54	0.3%
Total	5,847	100%	4,146	100%	5,512	100%	6,014	100%	21,519	100%

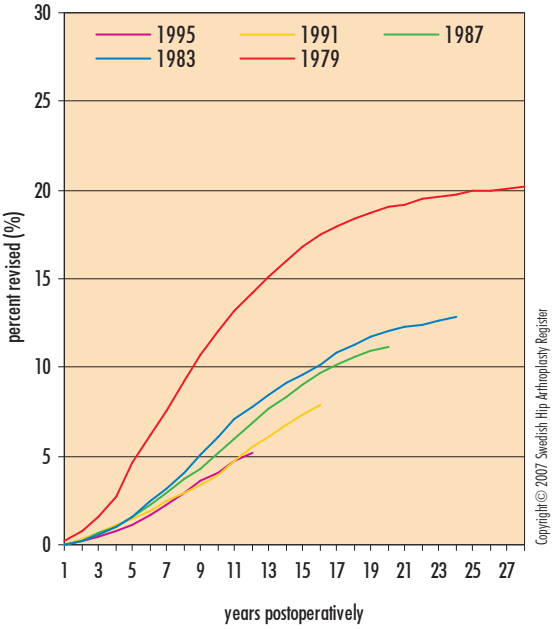
All Diagnoses and All Reasons

cumulative frequency of revision



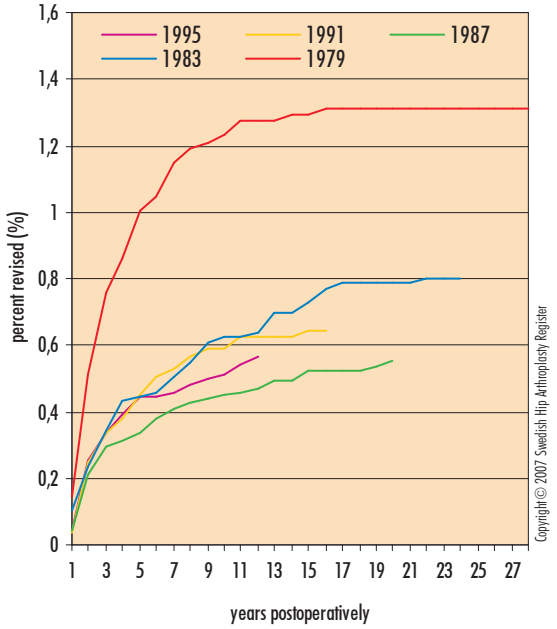
Aseptic Loosening

cumulative frequency of revision



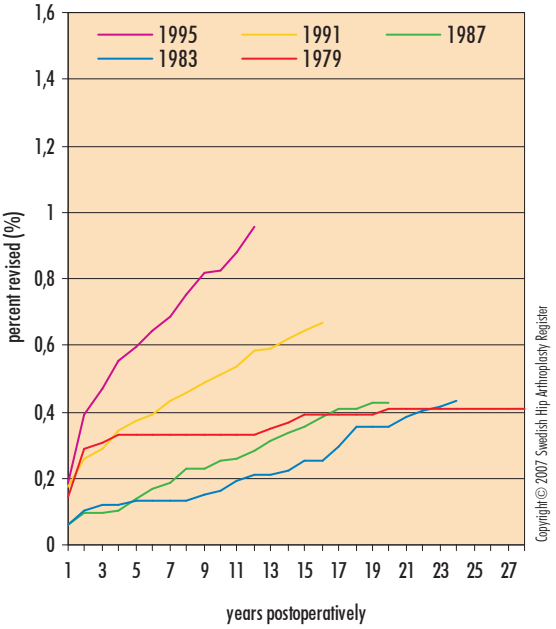
Deep infection

cumulative frequency of revision



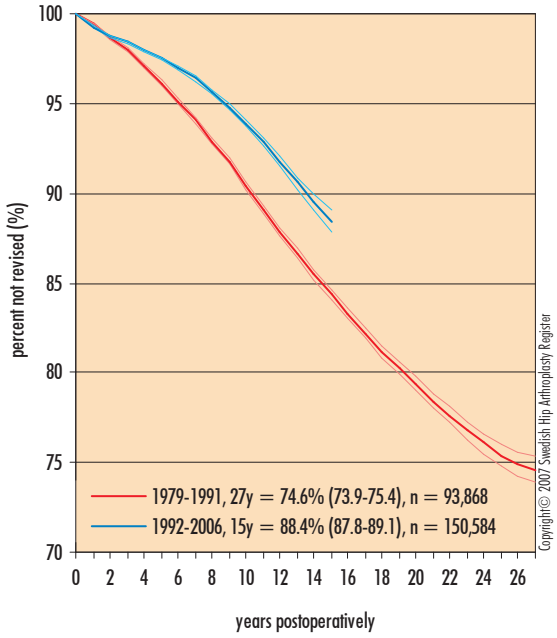
Dislocation

cumulative frequency of revision



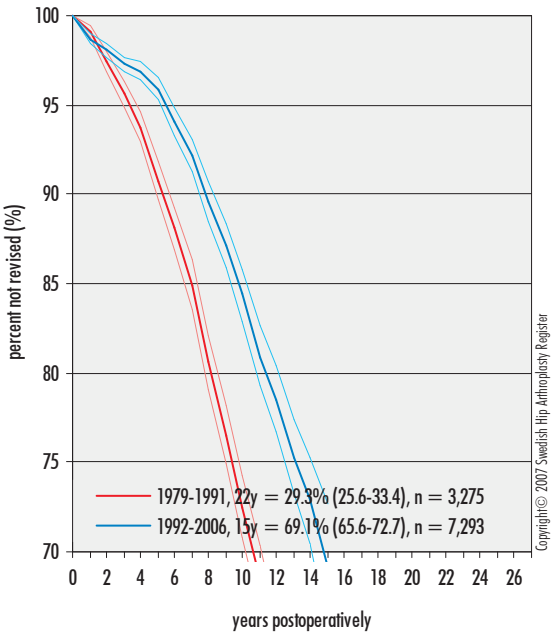
All Cemented Implants

all diagnoses and all reasons for revision



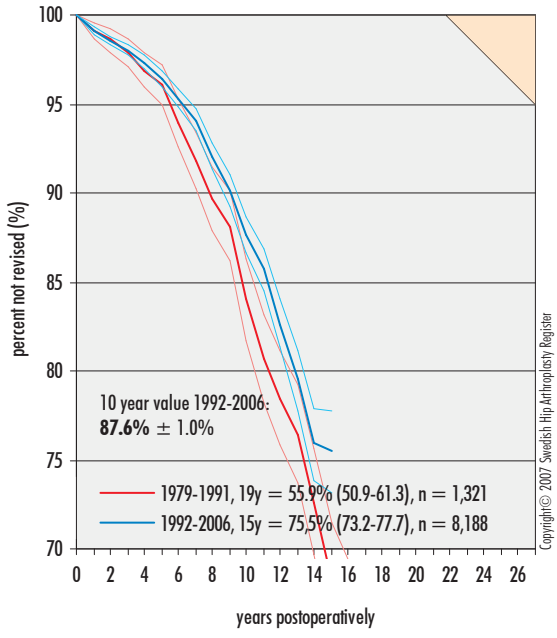
All Uncemented Implants

all diagnoses and all reasons for revision



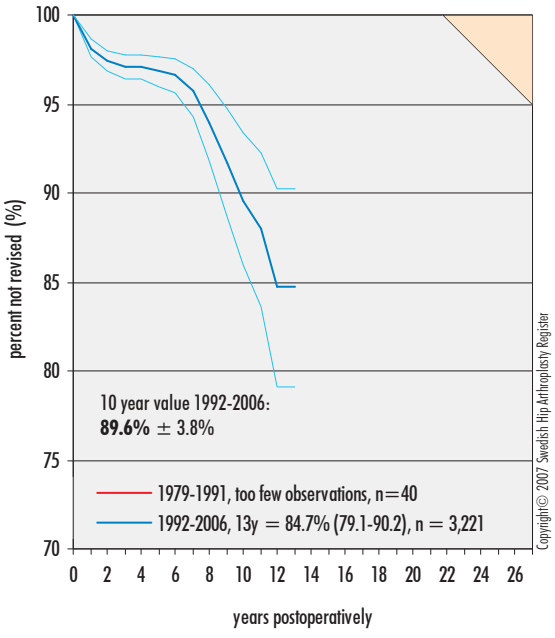
All Hybrid Implants

all diagnoses and all reasons of revision



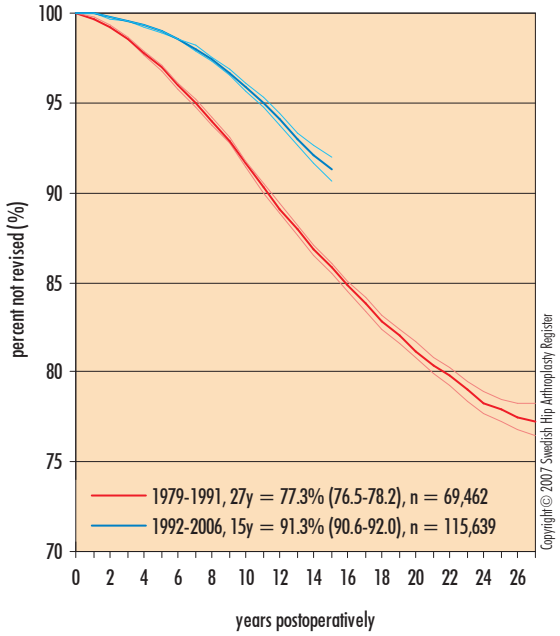
All Reversed Hybrid Implants

all diagnoses and all reasons for revision



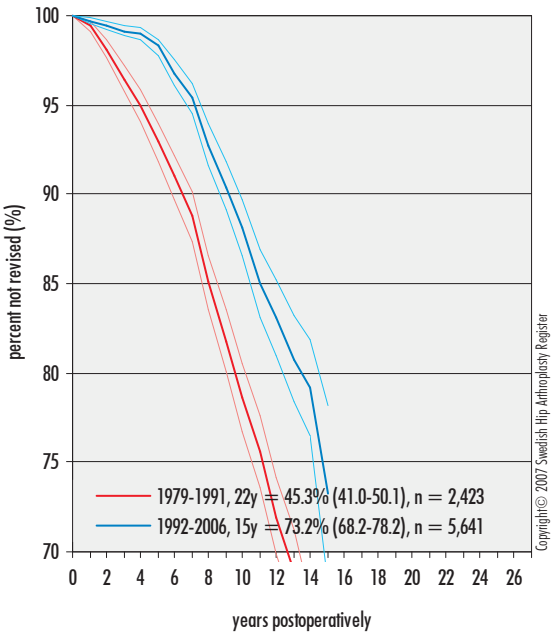
All Cemented Implants

osteoarthritis and aseptic loosening



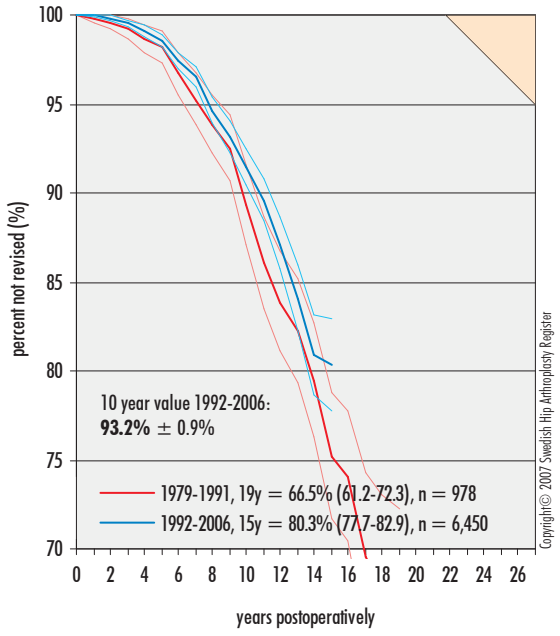
All Uncemented Implants

osteoarthritis and aseptic loosening



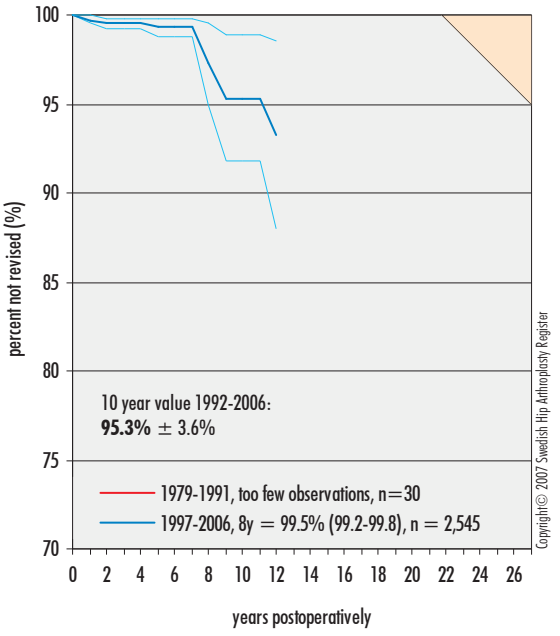
All Hybrid Implants

osteoarthritis and aseptic loosening



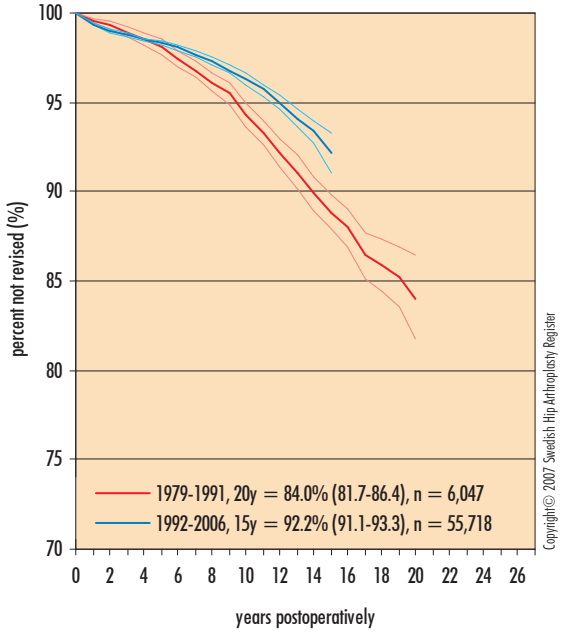
All Reversed Hybrid Implants

osteoarthritis and aseptic loosening



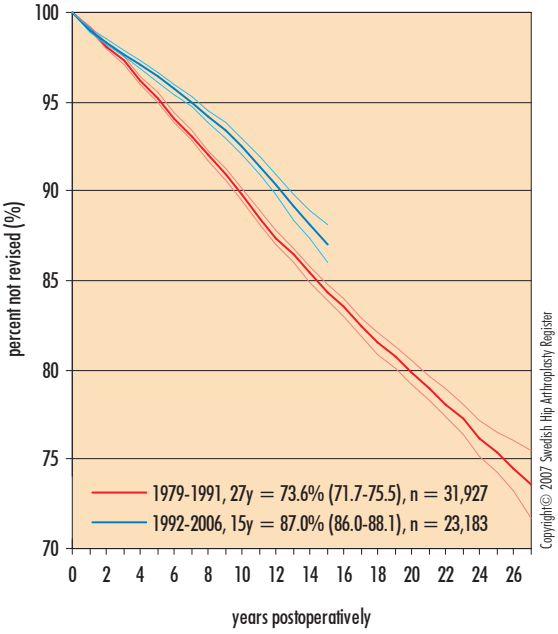
Lubinus SP II

all diagnoses and all reasons for revision



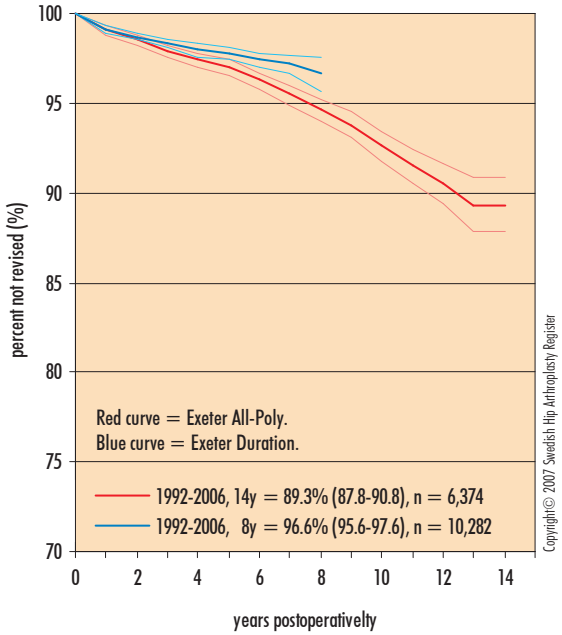
Charnley

all diagnoses and all reasons for revision



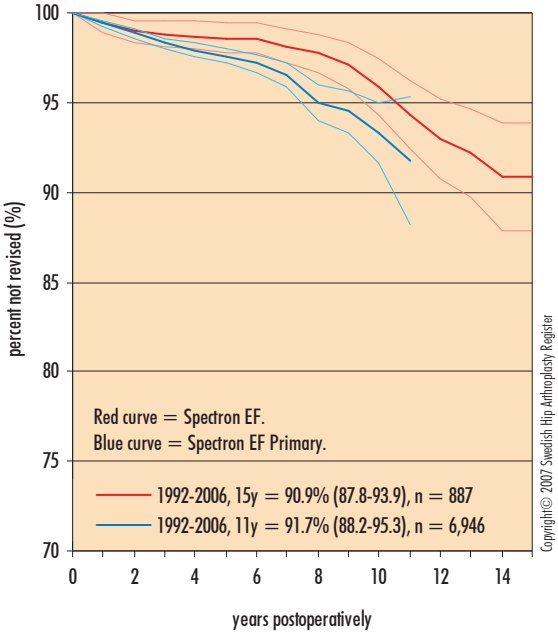
Exeter (Exeter Polished)

all diagnoses and all reasons for revision



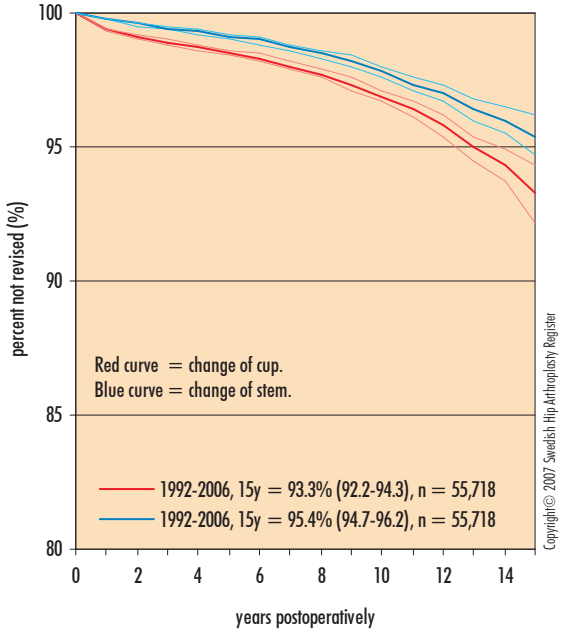
Reflection All-Poly (Spectron)

all diagnoses and all reasons for revision



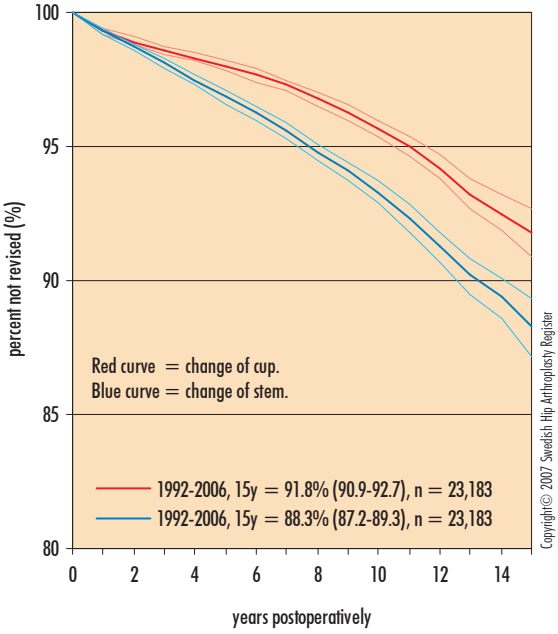
Lubinus SP II

all diagnoses and all reasons for revision



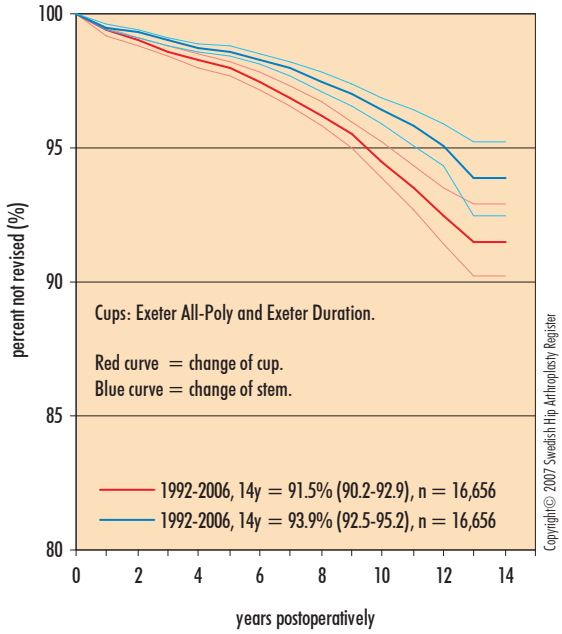
Charnley

all diagnoses and all reasons for revision



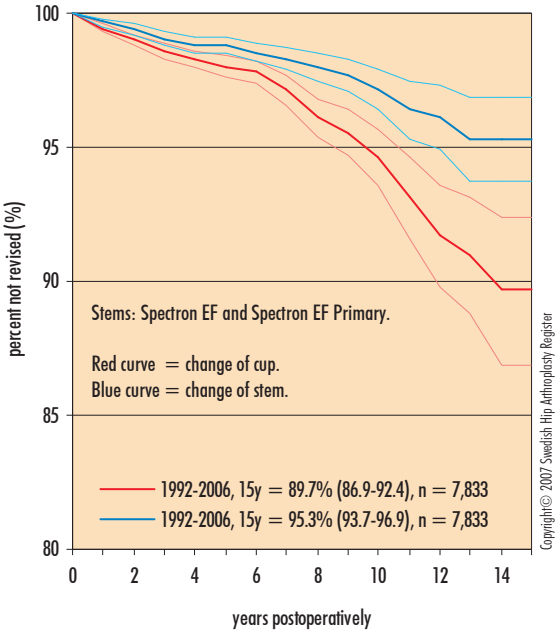
Exeter (Exeter Polished)

all diagnoses and all reasons for revision



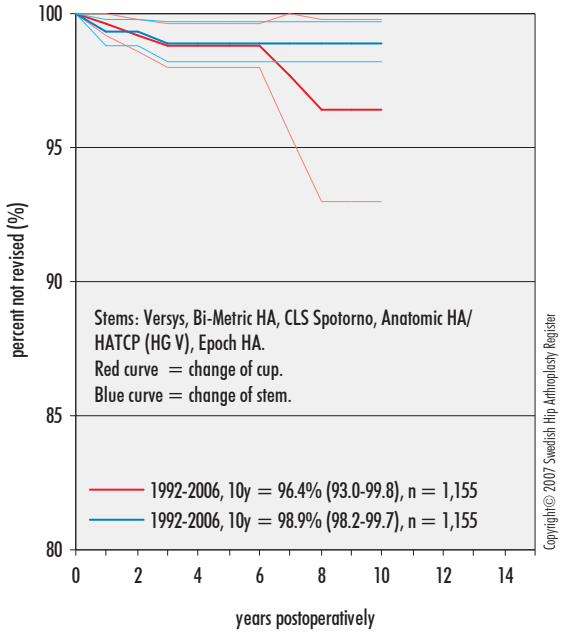
Reflection Plast (Spectron)

all diagnoses and all reasons for revision



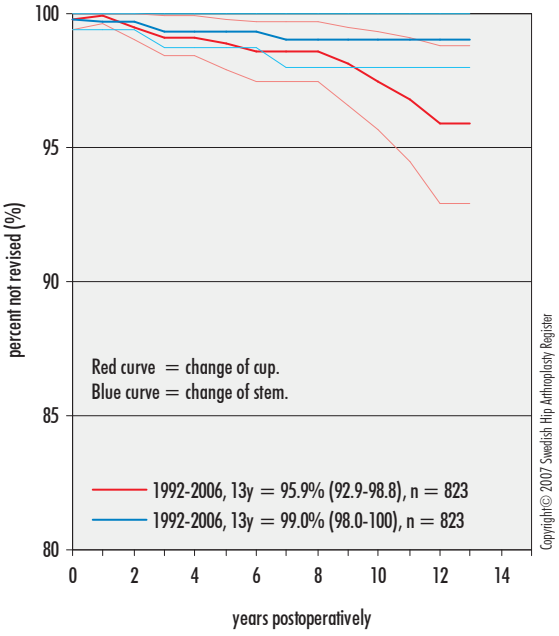
Trilogy HA

all diagnoses and all reasons for revision



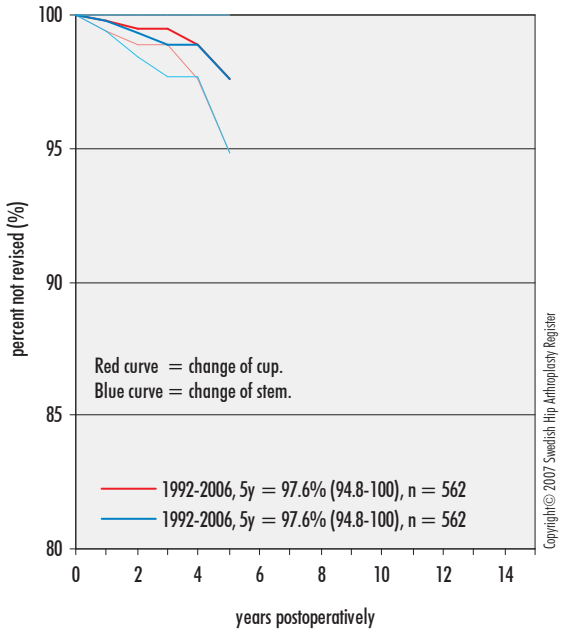
CLS Spotorno

all diagnoses and all reasons for revisions



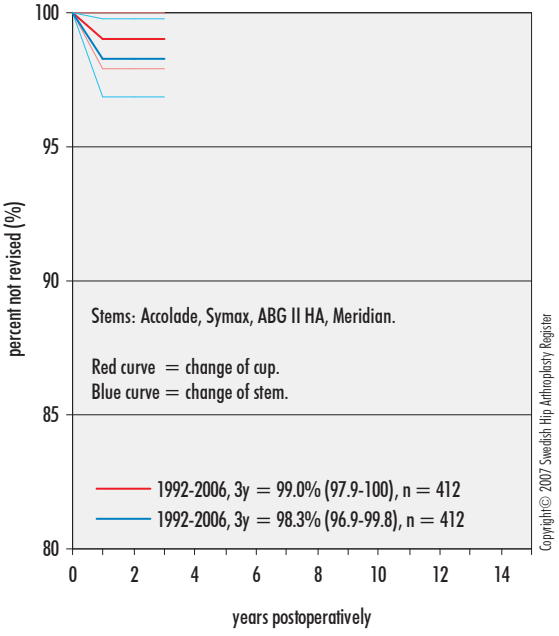
Allofit (CLS Spotorno)

all diagnoses and all reasons for revision



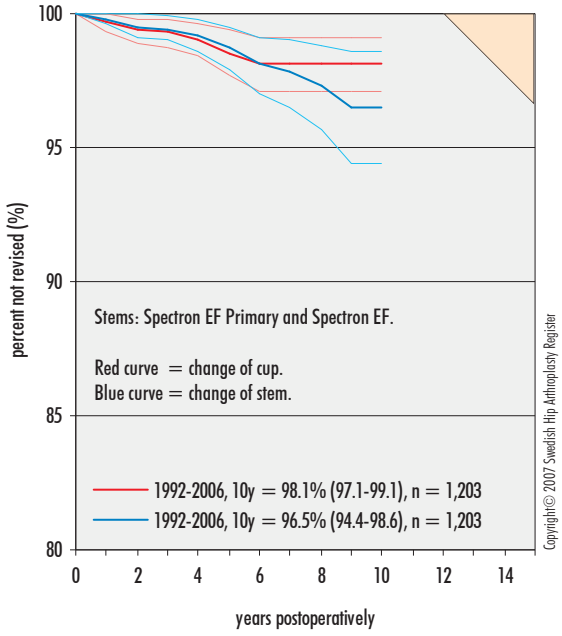
Trident HA

all diagnoses and all reasons for revision



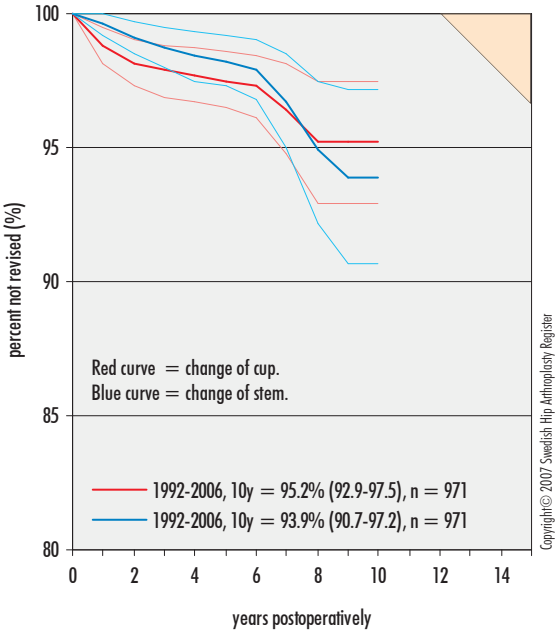
Trilogy HA (Spectron)

all diagnoses and all reasons for revision



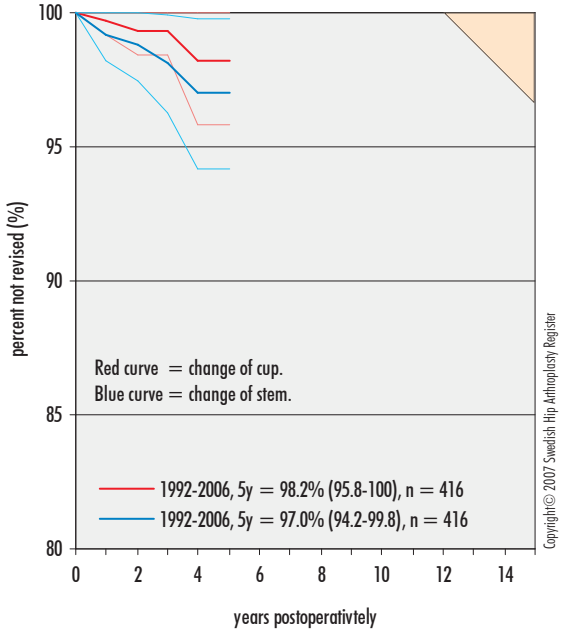
Trilogy HA (Lubinus SP II)

all diagnoses and all reasons for revision



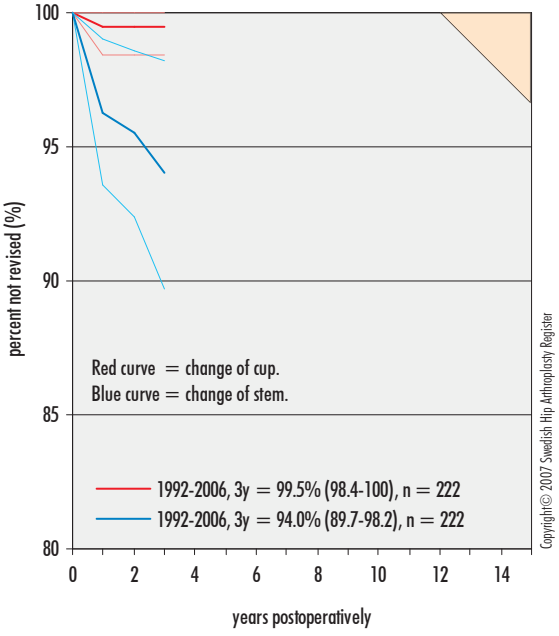
BHR

all diagnoses and all reasons for revision

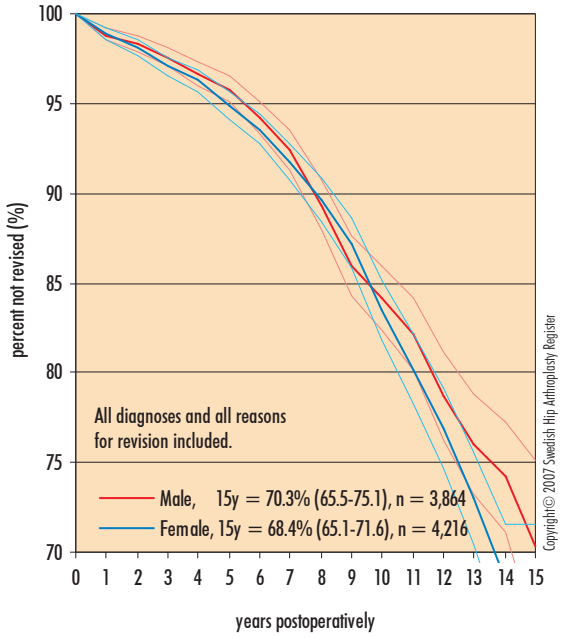


Durom

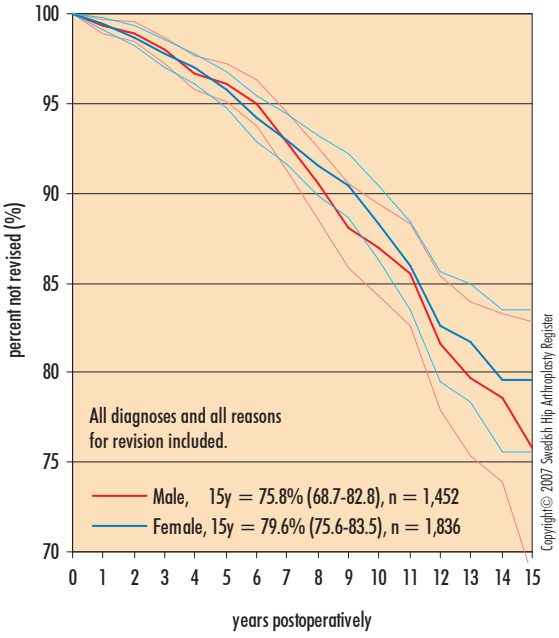
all diagnoses and all reasons for revsion



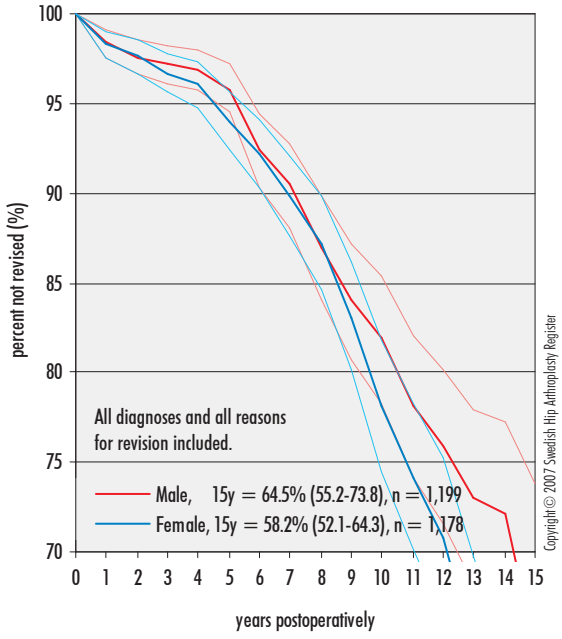
Younger than 50 years
all observations, 1992-2006



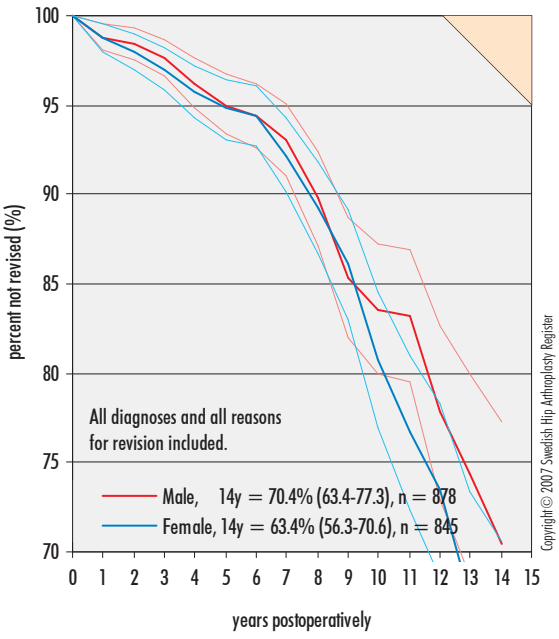
Younger than 50 years
cemented implants, 1992-2006



Younger than 50 years
uncemented implants, 1992-2006

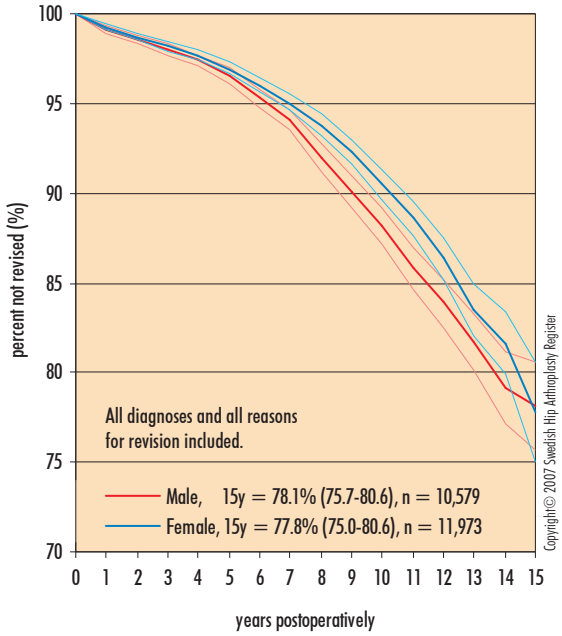


Younger than 50 years
hybrid implants, 1992-2006



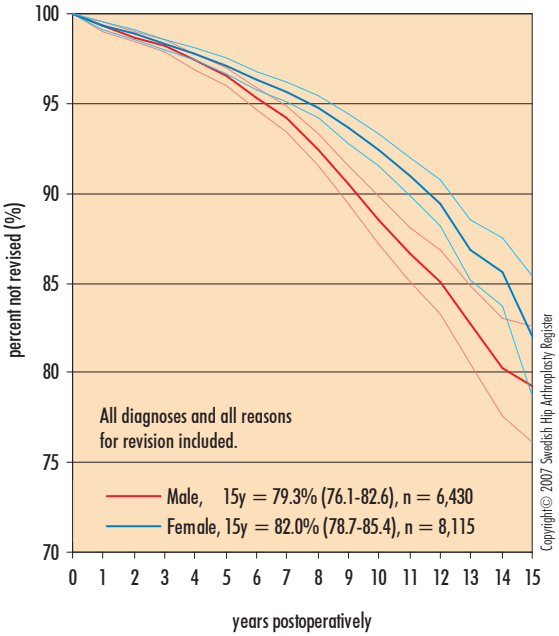
Between 50 and 59 years

all observations, 1992-2006



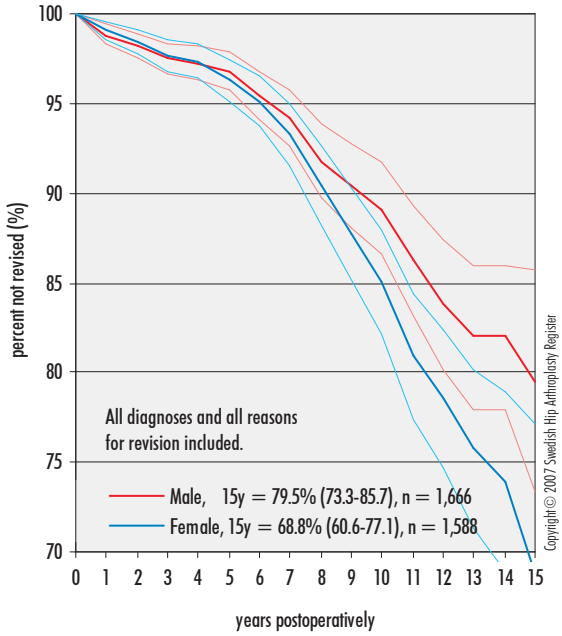
Between 50 and 59 years

cemented implants, 1992-2006



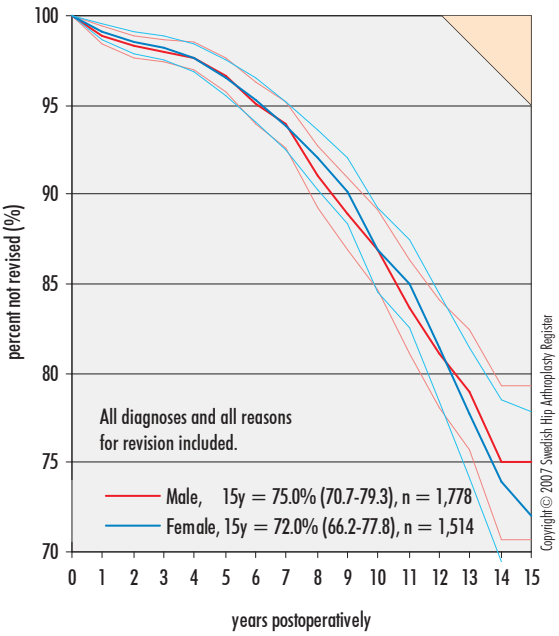
Between 50 and 59 years

uncemented implants, 1992-2006



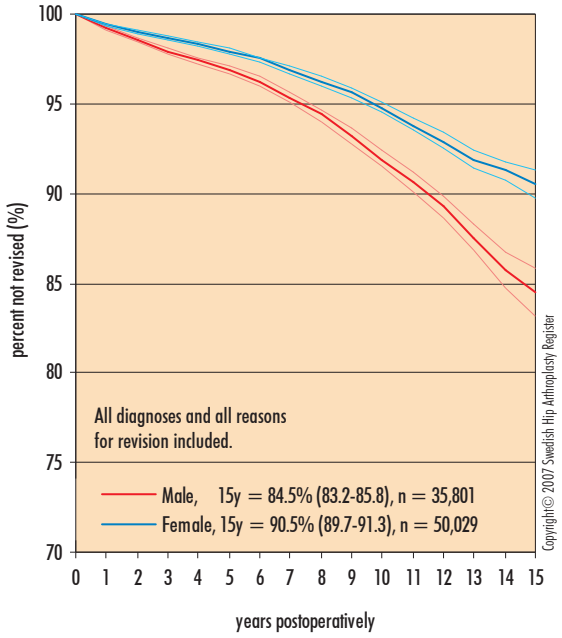
Between 50 and 59 years

hybrid implants, 1992-2006



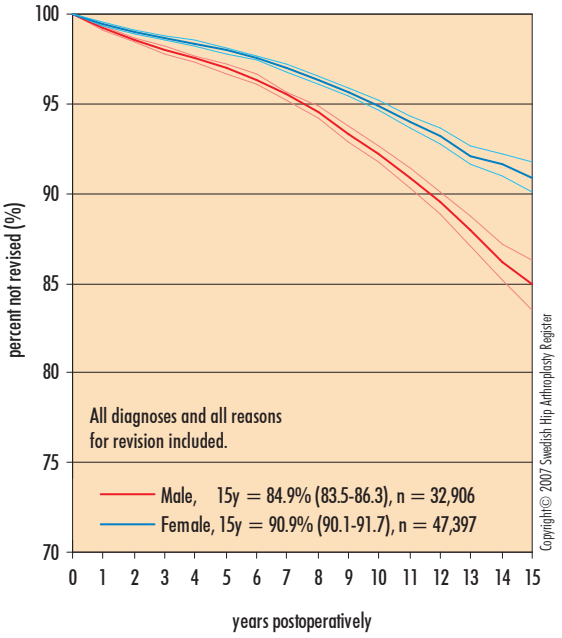
Between 60 and 75 years

all observations, 1992-2006



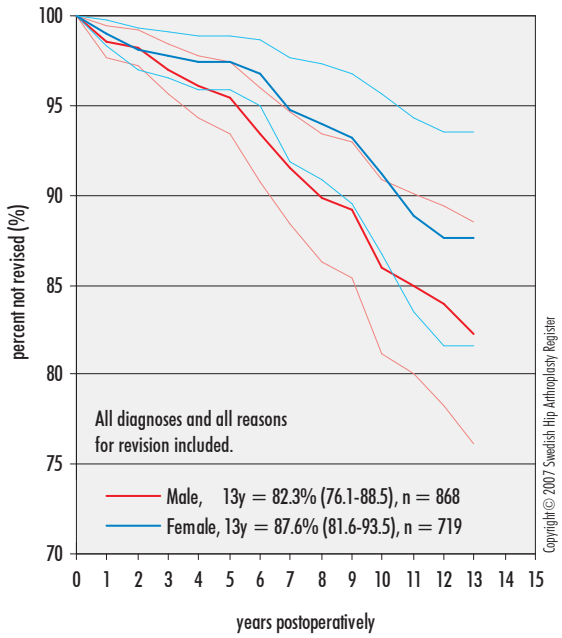
Between 60 and 75 years

cemented implants, 1992-2006



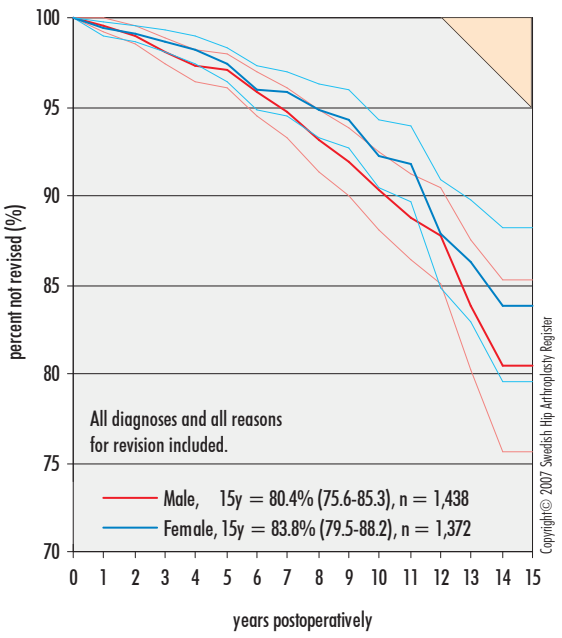
Between 60 and 75 years

uncemented implants, 1992-2006

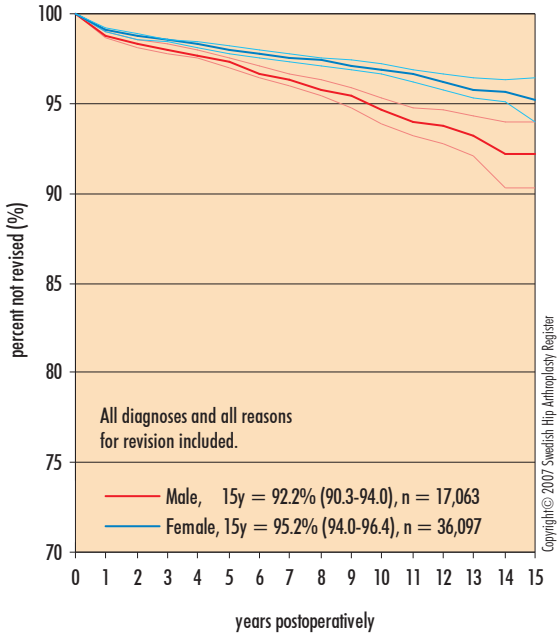


Between 60 and 75 years

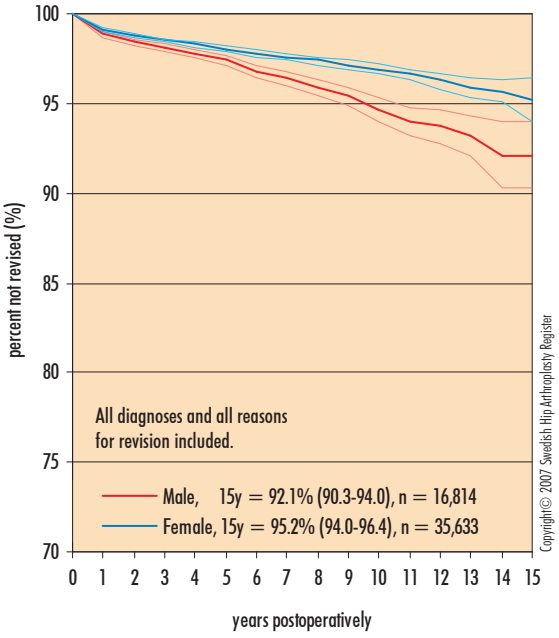
hybrid implants, 1992-2006



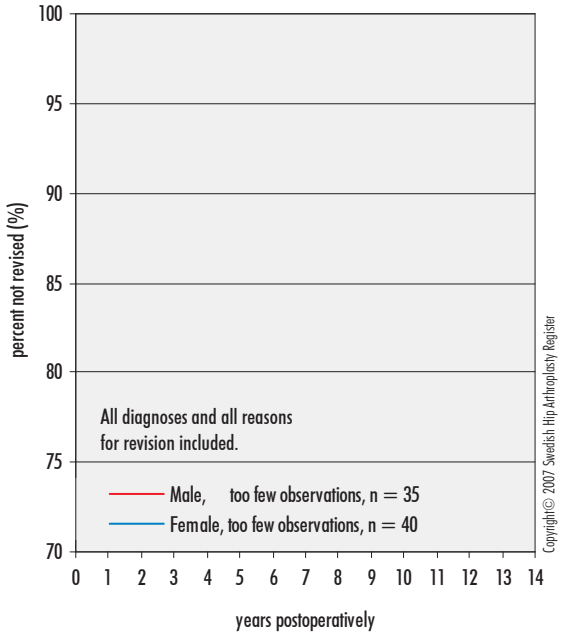
Older than 75 years
all observations, 1992-2006



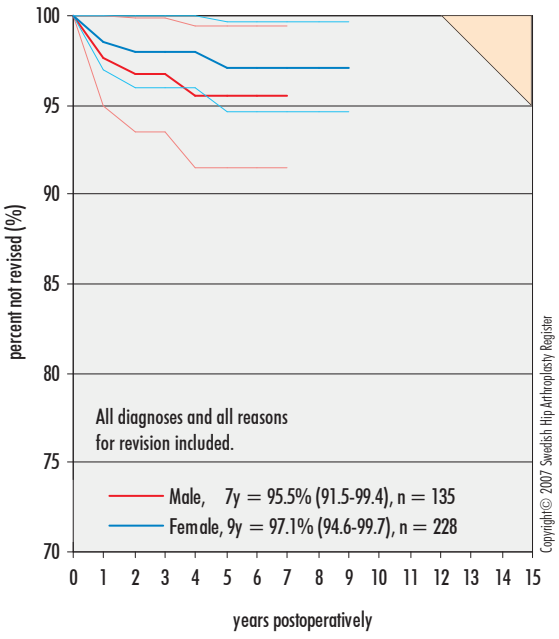
Older than 75 years
cemented implants, 1992-2006



Older than 75 years
uncemented implants, 1992-2006



Older than 75 years
hybrid implants, 1992-2006



Implant Survival per Type

all diagnoses and all reasons for revision, 1992-2006

Cup (Stem)	Period [1]	Number [2]	OA [3]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
ABG HA (ABG cem.)	1992–1998	241	65.1%	87.1%	63.1%	98.2%	±1.8%	92.7%	±4.0%
ABG HA (ABG uncem.)	1992–1998	281	83.8%	5.7%	53.0%	97.1%	±1.9%	81.8%	±4.6%
ABG HA (Lubinus SP II)	1992–1998	335	80.3%	40.6%	49.0%	96.9%	±1.9%	85.3%	±4.1%
ABG II HA (ABG uncem.)	1993–2006	197	80.7%	7.6%	42.1%	97.0%	±2.7%		
ABG II HA (Exeter Polished)	1997–2005	67	82.1%	16.4%	43.3%	96.9%	±3.6%		
ABG II HA (Lubinus SP II)	1997–2006	209	81.3%	31.6%	48.8%	97.4%	±2.3%		
ABG II HA (Meridian)	1998–2004	114	66.7%	27.2%	47.4%	97.3%	±2.8%		
Allofit (CLS Spotorno)	2001–2006	562	88.1%	34.9%	48.9%	96.5%	±3.0%		
Allofit (MS30 Polished)	1998–2006	79	48.1%	13.9%	50.6%	92.1%	±6.6%		
BHR Acetabular Cup (BHR Femoral Head)	1999–2006	416	95.4%	7.9%	31.0%	96.7%	±2.8%		
Biomet Müller (Bi-Metric cem.)	1992–1996	1,099	81.0%	90.0%	59.1%	96.3%	±1.1%	90.7%	±1.9%
Biomet Müller (Bi-Metric HA uncem.)	1995–2006	195	95.4%	34.9%	60.5%	99.5%	±0.8%		
Biomet Müller (CPT (steel))	1997–2004	949	94.6%	94.3%	67.9%	96.2%	±1.3%		
Biomet Müller (RX90-S)	1994–2001	1,450	76.9%	88.1%	61.5%	97.8%	±0.8%	94.0%	±1.6%
Biomet Müller (Stanmore mod)	1997–2002	94	95.7%	90.4%	62.8%	98.9%	±1.6%		
Biomex HA (Lubinus SP II)	2000–2004	105	81.9%	8.6%	60.0%	100.0%	±0.0%		
Cenator (Bi-Metric cem.)	1993–1999	293	70.9%	46.8%	48.8%	97.1%	±2.0%	90.4%	±3.8%
Cenator (Cenator)	1993–2000	1,221	60.2%	95.2%	66.5%	92.7%	±1.5%	85.1%	±2.5%
Cenator (Charnley Elite Plus)	1996–2000	320	84.0%	78.8%	60.3%	96.7%	±2.0%		
Cenator (Cone uncem.)	1994–2000	56	61.8%	10.7%	71.4%	96.4%	±4.3%		
Cenator (Exeter Polished)	1998–2003	660	84.5%	78.2%	53.3%	99.5%	±0.5%		
Cenator (Lubinus SP II)	1997–2000	63	50.8%	77.8%	58.7%	94.2%	±6.0%		
Charnley (Bi-Metric cem.)	1992–1998	58	48.3%	43.1%	51.7%	96.1%	±4.6%		
Charnley (CAD)	1992–1996	225	79.8%	89.8%	72.4%	97.2%	±2.2%	95.4%	±3.0%
Charnley (Charnley Elite Plus)	1994–2003	1,406	69.6%	77.3%	65.8%	96.5%	±1.0%	89.1%	±2.8%
Charnley (Charnley)	1992–2006	23,183	79.1%	89.2%	65.3%	96.4%	±0.3%	92.5%	±0.4%
Charnley (CPT (steel))	1996–2004	193	72.5%	80.3%	65.8%	98.3%	±1.8%		
Charnley (C-stem)	2001–2003	70	85.7%	70.0%	65.7%	97.1%	±3.5%		
Charnley (Exeter Polished)	1992–2006	2,202	79.7%	86.2%	66.7%	98.3%	±0.6%	97.3%	±1.3%
Charnley (Lubinus SP II)	1992–2006	339	83.4%	85.8%	60.5%	97.5%	±1.7%	93.8%	±3.0%
Charnley (Müller Straight)	1992–1998	104	87.5%	96.2%	47.1%	96.9%	±3.3%	95.7%	±4.1%
Charnley (PCA E-series Textured)	1992–1996	129	82.8%	72.9%	56.6%	96.8%	±3.1%	83.7%	±6.9%
Charnley Elite (ABG uncem.)	1994–2005	370	90.5%	22.2%	45.4%	97.8%	±1.5%		
Charnley Elite (Charnley Elite Plus)	1992–2002	946	67.7%	89.0%	62.9%	94.8%	±1.5%	85.2%	±5.7%
Charnley Elite (Charnley)	1992–2001	337	60.5%	86.6%	63.2%	95.6%	±2.3%	88.5%	±4.1%
Charnley Elite (CPT (steel))	1997–2003	115	73.0%	85.2%	68.7%	93.7%	±4.6%		
Charnley Elite (Exeter Polished)	1996–2006	6,549	71.5%	88.9%	65.2%	98.8%	±0.3%		
Charnley Elite (Lubinus SP II)	1992–2006	1,133	82.6%	82.8%	61.9%	97.5%	±1.3%	91.5%	±4.9%
Charnley Elite (Müller Straight)	1999–2006	271	80.4%	97.4%	59.8%	99.0%	±1.3%		
Charnley Elite (PCA E-series Textured)	1992–1997	214	81.4%	80.8%	58.4%	96.9%	±2.4%	89.1%	±4.7%
Charnley Elite (Spectron EF Primary)	1998–2006	302	90.4%	87.1%	52.3%	97.4%	±2.0%		
CLS Spotorno (CLS Spotorno)	1992–2006	823	89.4%	30.5%	45.0%	98.7%	±1.0%	97.0%	±2.0%
Contemporary (Exeter Polished)	1994–2005	331	87.9%	88.2%	50.8%	96.2%	±2.1%	89.6%	±5.1%
Contemporary (Lubinus SP II)	1994–2001	102	66.7%	75.5%	79.4%	95.9%	±3.9%	89.5%	±6.6%
Contemporary Hooded Duration (Exeter Polished)	2000–2006	2,545	86.8%	86.7%	58.4%	97.8%	±1.4%		
Duralock (uncem.) (Spectron EF Primary)	1995–2000	114	87.7%	52.6%	61.4%	97.4%	±2.8%		
Exeter Duration (Exeter Polished)	1999–2006	10,282	84.1%	84.8%	58.8%	97.8%	±0.3%		
Exeter Duration (Lubinus SP II)	1999–2006	694	78.0%	81.7%	61.0%	99.8%	±0.3%		
Exeter Metal-backed (Exeter Polished)	1992–1994	588	76.7%	94.6%	55.8%	98.7%	±1.0%	95.2%	±2.0%

(continued on next page)

Implant Survival per Type (cont.)

all diagnoses and all reasons for revision, 1992-2006

Cup (Stem)	Period [1]	Number [2]	OA [3]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
Exeter All-Poly (Exeter Polished)	1992–2006	6,374	73.8%	86.7%	60.7%	97.0%	±0.5%	92.6%	±0.8%
Exeter All-Poly (Lubinus SP II)	1992–2002	202	80.0%	76.2%	65.3%	96.7%	±2.6%	88.7%	±6.0%
Exeter Polished (Exeter Polished)	1992–1995	668	73.2%	88.9%	57.6%	95.9%	±1.5%	92.5%	±2.3%
FAL (Lubinus SP II)	1999–2006	4,059	79.7%	86.9%	63.4%	98.7%	±0.4%		
Harris-Galante I (Lubinus SP II)	1992–1997	73	78.9%	19.2%	37.0%	97.2%	±3.3%	91.1%	±6.9%
Harris-Galante II (Charnley)	1992–1996	144	86.0%	27.8%	50.7%	93.0%	±4.2%	85.6%	±5.9%
Harris-Galante II (Lubinus SP II)	1992–1997	241	77.0%	28.2%	46.9%	95.0%	±2.8%	84.4%	±4.7%
Harris-Galante II (Spectron EF)	1992–1996	161	86.1%	57.1%	51.6%	96.2%	±3.0%	87.9%	±5.3%
HGPII/HATCP (HG III) (Spectron EF)	1992–1995	93	58.3%	48.4%	60.2%	100.0%	±0.0%	96.6%	±3.6%
Inter-op cup (CLS Spotorno)	1999–2001	58	86.2%	22.4%	37.9%	96.6%	±4.0%		
ITH (ITH)	1992–1997	313	62.3%	95.5%	71.9%	98.5%	±1.5%	96.4%	±2.6%
LINK Pressfit (Lubinus SP II)	1996–2000	61	65.5%	8.2%	34.4%	100.0%	±0.0%		
Lubinus All-Poly (Lubinus IP)	1992–1998	826	55.9%	96.5%	66.0%	99.3%	±0.6%	98.4%	±1.0%
Lubinus All-Poly (Lubinus SP II)	1992–2006	55,718	79.4%	88.7%	59.3%	98.3%	±0.1%	96.3%	±0.3%
Mallory-Head uncem. (Lubinus SP II)	1993–2006	100	81.0%	10.0%	52.0%	96.8%	±3.4%		
Müller All-Poly (Bi-Metric cem.)	1992–1994	64	94.6%	89.1%	67.2%	98.4%	±2.3%		
Müller All-Poly (MS30 Unpolished)	1992–2001	113	59.5%	74.3%	52.2%	93.0%	±5.0%		
Müller All-Poly (Müller Straight)	1992–2006	1,683	74.2%	92.6%	61.9%	97.5%	±0.8%	96.6%	±1.0%
Müller All-Poly (Straight-stem standard)	1996–2006	225	94.2%	87.1%	74.2%	95.9%	±3.6%		
Omnifit (Lubinus SP II)	1992–1995	171	80,6%	28.7%	52.6%	95.9%	±3.0%	77.4%	±6.4%
Omnifit (Omnifit)	1992–1996	320	66.4%	12.2%	54.1%	91.8%	±3.0%	65.6%	±5.3%
OPTICUP (Lubinus SP II)	1995–2006	679	56.1%	85.1%	64.4%	98.3%	±1.0%	91.0%	±5.0%
OPTICUP (NOVA Scan Hip)	1993–2000	156	66.5%	75.6%	54.5%	91.0%	±4.7%	72.4%	±8.3%
OPTICUP (Optima)	1993–2000	758	74.1%	87.3%	59.9%	96.6%	±1.4%	88.6%	±2.8%
OPTICUP (Scan Hip II Collar)	1996–2006	1,981	76.7%	82.7%	60.9%	96.9%	±0.8%	90.5%	±2.6%
OPTICUP (Scan Hip Collar)	1995–1996	82	80,.2%	84.1%	58.5%	97.0%	±3.5%		
PCA (PCA)	1992–1994	69	72.7%	23.2%	42.0%	95.6%	±4.6%	84.7%	±8.8%
Reflection (Spectron EF Primary)	1996–2006	6,946	75.0%	92.1%	65.7%	97.6%	±0.4%	93.3%	±1.7%
Reflection (Spectron EF)	1992–1996	887	69.5%	97.9%	66.3%	98.6%	±0.8%	95.9%	±1.6%
Reflection HA (Lubinus SP II)	1995–2006	187	87.1%	16.0%	43.3%	94.4%	±3.8%		
Reflection HA (Spectron EF Primary)	1996–2000	99	81.6%	24.2%	43.4%	93.7%	±4.9%		
Romanus (Bi-Metric cem.)	1992–1998	365	82.5%	31.2%	47.7%	95.8%	±2.1%	85.7%	±3.8%
Romanus (Bi-Metric HA uncem.)	1992–1999	139	83.5%	16.5%	53.2%	99.3%	±1.0%	92.4%	±4.5%
Romanus (Bi-Metric uncem.)	1992–1997	256	73.4%	11.3%	50.8%	96.4%	±2.3%	86.0%	±4.4%
Romanus (Lubinus SP II)	1992–1996	91	72.2%	20.9%	33.0%	98.9%	±1.6%	90.6%	±6.2%
Romanus (RX90-S)	1994–2000	180	90.6%	39.4%	52.2%	96.1%	±2.9%	85.6%	±5.4%
Romanus HA (Bi-Metric HA uncem.)	1992–2005	261	74.2%	10.3%	60.5%	96.1%	±2.4%	90.9%	±4.2%
Romanus HA (Bi-Metric uncem.)	1992–1999	63	76.2%	11.1%	50.8%	93.7%	±6.1%	79.9%	±10.1%
Scan Hip Cup (Lubinus SP II)	1992–2002	91	62.2%	84.6%	75.8%	95.3%	±4.5%		
Scan Hip Cup (Optima)	1993–2001	505	71.2%	89.9%	67.3%	98.5%	±1.1%	93.3%	±2.9%
Scan Hip Cup (Scan Hip II Collar)	1996–2001	207	77.0%	89.9%	62.8%	96.8%	±2.5%	88.4%	±6.1%
Scan Hip Cup (Scan Hip Collar)	1992–2000	2,871	72.7%	89.0%	61.9%	97.8%	±0.5%	91.9%	±1.2%
Scan Hip Cup (Scan Hip Collarless)	1992–1999	138	77.7%	92.8%	65.2%	98.5%	±1.8%	90.8%	±5.9%
Secur-Fit (Omnifit)	1996–1999	104	72.1%	2.9%	52.9%	89.1%	±6.1%	73.1%	±8.9%
SHP (Lubinus SP II)	1994–2006	614	80.6%	87.9%	55.0%	99.4%	±0.6%	96.8%	±2.0%
SLS (CLS Spotorno)	1992–1998	66	83.1%	33.3%	33.3%	96.9%	±3.6%		
Stanmore (Stanmore mod)	1994–2006	632	49.8%	91.9%	70.6%	98.3%	±1.0%		
Stanmore (Stanmore)	1992–1998	105	89.3%	96.2%	70.5%	96.8%	±3.4%	89.8%	±6.8%

(continued on next page)

Implant Survival per Type (cont.)

all diagnoses and all reasons for revision, 1992-2006

Cup (Stem)	Period [1]	Number [2]	OA [3]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
TOP Pressfit HA (Lubinus SP II)	2000–2006	141	83.7%	31.2%	39.7%	98.0%	±2.5%		
Trilogy (CLS Spotorno)	1998–2006	386	78.2%	35.2%	42.7%	95.9%	±3.6%		
Trilogy (Cone uncem.)	1998–2006	182	45.1%	22.5%	69.2%	93.8%	±4.2%		
Trilogy (Lubinus SP II)	1996–2006	68	88.2%	32.4%	36.8%	98.5%	±2.2%		
Trilogy (SL plus stem uncem.)	1997–2006	135	70.4%	11.1%	35.6%	100.0%	±0.0%		
Trilogy HA (Anatomic HA/HATCP (HG V))	1994–1999	57	80.7%	22.8%	43.9%	94.7%	±5.6%		
Trilogy HA (Bi-Metric HA uncem.)	1998–2006	188	85.6%	10.6%	49.5%	98.3%	±1.8%		
Trilogy HA (Lubinus SP II)	1995–2006	971	84.1%	48.8%	48.7%	96.8%	±1.3%	91.9%	±3.4%
Trilogy HA (Optima)	1995–1999	96	94.8%	46.9%	37.5%	96.8%	±3.4%	92.6%	±6.0%
Trilogy HA (Spectron EF Primary)	1996–2006	1,189	75.3%	57.1%	56.5%	98.4%	±0.9%	95.9%	±2.3%
Trilogy HA (Versys stem)	1999–2006	257	75.1%	13.6%	45.9%	99.2%	±1.0%		
Weber All-Poly cup (MS30 Polished)	1999–2006	370	90.5%	87.0%	60.0%	99.4%	±0.7%		
Weber All-Poly cup (Straight-stem standard)	1999–2006	958	99.5%	90.3%	65.9%	98.2%	±1.1%		
Weber Poly Metasul cup (MS30 Polished)	1999–2006	100	73.0%	16.0%	52.0%	94.7%	±5.3%		
ZCA (CPT (steel))	1993–2005	114	80.0%	85.1%	62.3%	94.5%	±4.3%		
ZCA (Stanmore mod)	2000–2006	243	74.9%	97.1%	64.2%	99.6%	±0.6%		

Implant Survival per Type

osteoarthritis and aseptic loosening, 1992-2006

Cup (Stem)	Period [1]	Number [2]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
ABG HA (ABG cem.)	1992–1998	142	82.4%	55.6%	100.0%	±0.0%	93.5%	±5.0%
ABG HA (ABG uncem.)	1992–1998	223	5.8%	50.2%	98.6%	±1.5%	82.3%	±5.2%
ABG HA (Lubinus SP II)	1992–1998	269	48.3%	45.7%	99.6%	±0.6%	91.1%	±3.9%
ABG II HA (ABG uncem.)	1997–2006	159	8.2%	37.1%	98.9%	±1.6%		
ABG II HA (Lubinus SP II)	1997–2006	170	33.5%	44.1%	99.3%	±1.0%		
Allofit (CLS Spotorno)	2001–2006	495	38.2%	49.5%	98.6%	±1.4%		
BHR Acetabular Cup (BHR Femoral Head)	1999–2006	397	7.8%	30.5%	99.4%	±0.7%		
Biomet Müller (Bi-Metric cem.)	1992–1995	731	90.7%	54.9%	97.2%	±1.2%	91.6%	±2.3%
Biomet Müller (Bi-Metric HA uncem.)	1995–2006	186	34.9%	58.6%	100.0%	±0.0%		
Biomet Müller (CPT (steel))	1997–2003	898	94.4%	66.9%	99.4%	±0.6%		
Biomet Müller (RX90-S)	1994–2001	1,113	88.2%	56.2%	99.1%	±0.6%	95.3%	±1.6%
Biomet Müller (Stanmore mod)	1997–2002	90	91.1%	64.4%	98.9%	±1.6%		
Biomex HA (Lubinus SP II)	2000–2004	86	10.5%	58.1%	100.0%	±0.0%		
Cenator (Bi-Metric cem.)	1993–1999	207	50.2%	43.0%	98.5%	±1.6%	91.7%	±4.3%
Cenator (Cenator)	1993–2000	731	96.0%	57.9%	94.5%	±1.8%	87.4%	±2.9%
Cenator (Charnley Elite Plus)	1997–2000	268	82.8%	57.1%	98.4%	±1.6%		
Cenator (Exeter Polished)	1998–2003	558	80.5%	51.6%	99.8%	±0.3%		
Charnley (CAD)	1992–1996	142	92.3%	68.3%	98.5%	±1.8%	95.8%	±3.7%
Charnley (Charnley Elite Plus)	1994–2002	977	78.5%	61.1%	98.5%	±0.8%	90.4%	±3.3%
Charnley (Charnley)	1992–2005	17,507	90.3%	61.8%	98.0%	±0.2%	94.8%	±0.5%
Charnley (CPT (steel))	1996–2004	140	80.0%	60.7%	100.0%	±0.0%		
Charnley (C-stem)	2001–2003	60	71.7%	63.3%	96.7%	±4.0%		
Charnley (Exeter Polished)	1992–2006	1,753	88.3%	64.1%	100.0%	±0.0%	99.2%	±1.0%
Charnley (Lubinus SP II)	1992–2006	282	85.8%	56.4%	99.2%	±1.0%	96.1%	±2.7%
Charnley (Müller Straight)	1992–1998	91	97.8%	45.1%	98.8%	±1.8%	97.3%	±3.1%
Charnley (PCA E-series Textured)	1992–1996	106	75.5%	53.8%	97.1%	±3.1%	83.8%	±7.5%
Charnley Elite (ABG uncem.)	1994–2005	335	24.2%	44.2%	99.7%	±0.5%		
Charnley Elite (Charnley Elite Plus)	1992–2002	640	89.7%	58.9%	96.2%	±1.5%	85.9%	±6.3%

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Implant Survival per Type (cont.)

osteoarthritis and aseptic loosening, 1992-2006

Cup (Stem)	Period [1]	Number [2]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
Charnley Elite (Charnley)	1992–2001	204	86.8%	58.8%	94.7%	±3.2%	90.7%	±4.4%
Charnley Elite (CPT (steel))	1997–2003	84	90.5%	66.7%	97.5%	±3.0%		
Charnley Elite (Exeter Polished)	1996–2006	4,676	89.0%	62.6%	99.8%	±0.1%		
Charnley Elite (Lubinus SP II)	1992–2006	933	82.7%	60.3%	98.9%	±1.0%	94.4%	±4.4%
Charnley Elite (Müller Straight)	1999–2006	218	98.6%	57.3%	100.0%	±0.0%		
Charnley Elite (PCA E-series Textured)	1992–1997	171	80.7%	57.3%	98.2%	±2.0%	90.1%	±5.0%
Charnley Elite (Spectron EF Primary)	1998–2006	273	90.5%	50.9%	98.5%	±1.6%		
CLS Spotorno (CLS Spotorno)	1992–2006	732	33.2%	42.8%	100.0%	±0.0%	98.9%	±1.3%
Contemporary (Exeter Polished)	1994–2004	290	88.3%	47.6%	98.1%	±1.6%	93.3%	±4.4%
Contemporary (Lubinus SP II)	1994–2001	68	80.9%	77.9%	98.4%	±2.4%		
Contemporary Hooded Duration (Exeter Polished)	2000–2006	2,210	88.1%	57.0%	99.7%	±0.3%		
Duralock (ocem.) (Spectron EF Primary)	1995–2000	100	55.0%	62.0%	98.0%	±2.4%		
Exeter Duration (Exeter Polished)	1999–2006	8,647	85.3%	56.5%	99.5%	±0.2%		
Exeter Duration (Lubinus SP II)	1999–2006	541	84.5%	56.9%	100.0%	±0.0%		
Exeter Metal-backed (Exeter Polished)	1992–1994	402	95.3%	51.0%	99.2%	±0.9%	95.6%	±2.3%
Exeter All-Poly (Exeter Polished)	1992–2006	4,655	87.6%	55.9%	98.7%	±0.3%	95.6%	±0.8%
Exeter All-Poly (Lubinus SP II)	1992–2002	160	78.8%	65.6%	97.2%	±2.7%	91.5%	±5.8%
Exeter Polished (Exeter Polished)	1992–1995	460	91.5%	51.3%	97.7%	±1.4%	94.8%	±2.3%
FAL (Lubinus SP II)	1999–2006	3,234	87.3%	60.5%	99.7%	±0.3%		
Harris-Galante I (Lubinus SP II)	1992–1997	56	25.0%	35.7%	100.0%	±0.0%		
Harris-Galante II (Charnley)	1992–1996	123	30.1%	44.7%	98.3%	±2.0%	94.7%	±4.1%
Harris-Galante II (Lubinus SP II)	1992–1997	151	22.5%	43.7%	98.6%	±1.6%	87.8%	±5.4%
Harris-Galante II (Spectron EF)	1992–1996	118	61.0%	50.8%	100.0%	±0.0%	95.1%	±4.2%
ITH (ITH)	1992–1996	182	95.1%	65.9%	98.8%	±1.5%	97.3%	±2.6%
Lubinus All-Poly (Lubinus IP)	1992–1998	459	97.2%	58.6%	99.3%	±0.8%	98.4%	±1.3%
Lubinus All-Poly (Lubinus SP II)	1992–2006	43,741	89.1%	55.8%	99.6%	±0.1%	98.0%	±0.3%
Mallory-Head uncem. (Lubinus SP II)	1995–2005	81	9.9%	50.6%	100.0%	±0.0%		
Müller All-Poly (MS30 Unpolished)	1992–2001	66	81.8%	48.5%	98.4%	±2.4%		
Müller All-Poly (Müller Straight)	1992–2006	1,248	94.3%	55.8%	99.6%	±0.4%	98.6%	±0.9%
Müller All-Poly (Straight-stem standard)	1996–2006	212	87.7%	75.0%	98.0%	±2.4%		
Omnifit (Lubinus SP II)	1992–1995	137	28.5%	48.9%	97.8%	±2.4%	77.4%	±7.3%
Omnifit (Omnifit)	1992–1996	184	17.9%	48.4%	92.8%	±3.8%	66.1%	±7.0%
OPTICUP (Lubinus SP II)	1995–2006	379	85.5%	60.2%	99.4%	±0.8%	94.7%	±4.6%
OPTICUP (NOVA Scan Hip)	1993–2000	103	72.8%	48.5%	90.7%	±5.8%	75.4%	±9.9%
OPTICUP (Optima)	1994–2000	559	90.2%	54.7%	97.6%	±1.3%	90.0%	±3.0%
OPTICUP (Scan Hip II Collar)	1996–2004	1,502	83.8%	56.7%	98.4%	±0.6%	93.4%	±2.6%
OPTICUP (Scan Hip Collar)	1995–1996	65	86.2%	52.3%	98.2%	±2.6%		
Reflection (Spectron EF Primary)	1996–2006	5,203	92.9%	62.7%	99.0%	±0.4%	94.4%	±2.1%
Reflection (Spectron EF)	1992–1996	587	98.6%	59.6%	99.6%	±0.5%	97.8%	±1.5%
Reflection HA (Lubinus SP II)	1995–2006	162	16.0%	38.9%	95.5%	±3.9%		
Reflection HA (Spectron EF Primary)	1996–2000	80	28.8%	45.0%	96.1%	±4.1%		
Romanus (Bi-Metric cem.)	1992–1998	279	34.1%	45.2%	97.0%	±2.0%	89.4%	±3.8%
Romanus (Bi-Metric HA uncem.)	1992–1999	116	19.8%	53.4%	100.0%	±0.0%	92.6%	±5.0%
Romanus (Bi-Metric uncem.)	1992–1997	182	13.7%	50.0%	98.9%	±1.4%	91.7%	±4.2%
Romanus (Lubinus SP II)	1992–1996	65	26.2%	27.7%	100.0%	±0.0%	93.3%	±6.4%
Romanus (RX90-S)	1994–2000	163	41.7%	51.5%	96.9%	±2.7%	87.8%	±5.3%
Romanus HA (Bi-Metric HA uncem.)	1992–2005	193	12.4%	60.1%	100.0%	±0.0%	95.7%	±4.1%
Scan Hip Cup (Optima)	1993–2001	356	90.4%	60.7%	99.7%	±0.5%	98.0%	±1.8%
Scan Hip Cup (Scan Hip II Collar)	1996–2001	157	89.2%	60.5%	99.3%	±1.0%	91.5%	±6.1%
Scan Hip Cup (Scan Hip Collar)	1992–2000	2,038	89.2%	57.3%	98.8%	±0.5%	93.2%	±1.3%
Scan Hip Cup (Scan Hip Collarless)	1992–1995	94	94.7%	55.3%	100.0%	±0.0%	91.4%	±6.6%

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Implant Survival per Type (cont.)

osteoarthritis and aseptic loosening, 1992-2006

Cup (Stem)	Period [1]	Number [2]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
Secur-Fit (Omnifit)	1996–1999	75	2.7%	44.0%	95.8%	±4.5%		
SHP (Lubinus SP II)	1994–2006	495	87.9%	51.1%	100.0%	±0.0%	97.9%	±2.0%
Stanmore (Stanmore mod)	1994–2006	315	91.1%	64.4%	99.6%	±0.5%		
Stanmore (Stanmore)	1992–1998	92	97.8%	68.5%	97.6%	±2.8%	91.4%	±6.7%
TOP Pressfit HA (Lubinus SP II)	2000–2006	118	35.6%	39.8%	100.0%	±0.0%		
Trilogy (CLS Spotorno)	1998–2006	302	36.1%	42.1%	97.4%	±3.4%		
Trilogy HA (Bi-Metric HA uncem.)	1999–2006	161	11.8%	48.4%	100.0%	±0.0%		
Trilogy HA (Lubinus SP II)	1995–2006	817	50.8%	44.9%	99.2%	±0.8%	96.1%	±2.6%
Trilogy HA (Optima)	1995–1999	91	45.1%	35.2%	97.8%	±2.6%	94.5%	±5.5%
Trilogy HA (Spectron EF Primary)	1996–2006	895	65.6%	54.2%	99.4%	±0.6%	97.0%	±2.8%
Trilogy HA (Versys stem)	1999–2006	193	17.6%	38.3%	99.5%	±0.8%		
Weber All-Poly cup (MS30 Polished)	1999–2006	335	89.0%	60.0%	99.4%	±0.8%		
Weber All-Poly cup (Straight-stem standard)	1999–2006	953	90.5%	65.9%	99.2%	±0.9%		
ZCA (CPT (steel))	1993–2004	88	86.4%	56.8%	96.4%	±3.9%		

[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] Share of primary THRs performed due to primary osteoarthritis.
[4] Share of primary THRs in the age group 60 years or older (age at primary operation).
[5] Share of women.

Certain types of implant did not occur to a sufficient extent during the period to give a 10-year value for implant survival. In order to calculate the 10-year survival value, the longest observed time between primary operation and revision must be at least 10 years. A condition that consistently has been used in survival statistics from the register is that only values where 50 patients remain 'at-risk' are shown. Implants used to a smaller extent can therefore also be excluded for this reason. Only implants where a 5-year value can be calculated are included.

Implant Survival per Hospital

all diagnoses, all reasons for revision and all types of implants, 1992-2006

Hospital	Period [1]	Number [2]	OA [3]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
University/Regional Hospitals									
KS/Huddinge	1992–2006	3,136	65.2%	75.3%	63.7%	95.6%	±0.9%	87.7%	±1.8%
KS/Solna	1992–2006	2,772	60.9%	73.1%	61.8%	95.1%	±0.9%	88.6%	±2.3%
Linköping	1992–2006	2,597	66.9%	80.4%	61.4%	99.0%	±0.4%	96.3%	±1.2%
Lund	1992–2006	2,147	49.8%	72.7%	63.0%	96.5%	±0.9%	87.6%	±2.1%
Malmö	1992–2006	3,075	50.5%	78.4%	68.6%	95.9%	±0.8%	88.0%	±1.6%
SU/Sahlgrenska	1992–2006	2,949	62.0%	66.4%	64.0%	98.0%	±0.5%	92.3%	±1.6%
SU/Östra	1992–2006	2,357	79.7%	82.6%	63.0%	97.6%	±0.7%	93.3%	±1.5%
Umeå	1992–2006	1,695	71.0%	71.2%	62.1%	97.6%	±0.8%	95.1%	±1.4%
Uppsala	1992–2006	3,915	54.8%	74.5%	61.9%	94.8%	±0.8%	87.3%	±1.7%
Central Hospitals									
Borås	1992–2006	2,754	68.7%	81.2%	59.2%	97.4%	±0.7%	94.6%	±1.3%
Danderyd	1992–2006	4,359	85.1%	83.0%	67.6%	96.9%	±0.6%	94.3%	±1.0%
Eksjö	1992–2006	2,613	84.6%	86.0%	56.6%	97.0%	±0.8%	92.9%	±1.5%
Eskilstuna	1992–2006	1,996	59.9%	80.7%	60.3%	97.9%	±0.7%	95.6%	±1.3%
Falun	1992–2006	2,311	83.3%	79.7%	56.2%	96.9%	±0.9%		
Gävle	1992–2006	2,197	70.0%	78.7%	60.4%	96.7%	±0.8%	89.6%	±2.6%
Halmstad	1992–2006	2,566	74.1%	83.4%	58.4%	97.4%	±0.7%	93.6%	±1.6%
Helsingborg	1992–2006	2,065	73.5%	83.1%	61.9%	96.6%	±0.9%	87.8%	±2.3%
Hässleholm-Kristianstad	1992–2006	5,632	87.1%	83.5%	56.5%	97.8%	±0.5%	94.1%	±1.2%

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Implant Survival per Hospital (cont.)

all diagnoses, all reasons for revision and all types of implants, 1992-2006

Hospital	Period [1]	Number [2]	OA [3]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
Jönköping	1992–2006	2,490	81.5%	82.7%	58.9%	97.3%	±0.8%	94.3%	±1.4%
Kalmar	1992–2006	2,703	66.2%	85.0%	58.7%	98.2%	±0.6%	95.7%	±1.3%
Karlskrona	1992–2006	1,135	69.7%	81.1%	61.6%	95.5%	±1.3%	89.5%	±2.4%
Karlstad	1992–2006	2,312	69.5%	79.1%	62.9%	97.3%	±0.8%	93.8%	±1.7%
Norrköping	1992–2006	2,917	67.2%	83.3%	60.9%	98.3%	±0.5%	92.7%	±1.6%
S:t Göran	1992–2006	6,403	83.3%	80.7%	66.8%	95.1%	±0.6%	89.9%	±1.1%
Skövde	1992–2006	2,444	74.6%	79.1%	57.1%	96.7%	±0.8%	90.4%	±1.8%
SU/Mölndal	1992–2006	1,700	74.9%	83.4%	65.3%	97.0%	±0.9%	92.3%	±2.0%
Sunderby (including Boden)	1992–2006	2,183	63.3%	78.4%	64.1%	96.8%	±0.8%	91.6%	±1.7%
Sundsvall	1992–2006	2,683	82.8%	78.4%	61.1%	96.3%	±0.8%	92.8%	±1.4%
Södersjukhuset	1992–2006	4,173	60.0%	82.6%	68.3%	98.1%	±0.4%	94.4%	±1.1%
Uddevalla	1992–2006	3,272	70.6%	84.5%	61.4%	97.6%	±0.6%	92.1%	±1.7%
Varberg	1992–2006	2,543	85.7%	85.2%	57.0%	97.2%	±0.8%	91.9%	±1.8%
Västerås	1992–2006	1,850	67.0%	79.4%	60.5%	97.9%	±0.8%	94.1%	±1.6%
Växjö	1992–2006	1,604	83.3%	82.6%	57.2%	97.8%	±0.8%	94.9%	±1.6%
Ystad	1992–2006	1,474	79.5%	88.0%	56.9%	97.2%	±0.8%	95.3%	±1.5%
Örebro	1992–2006	2,687	73.0%	80.4%	58.2%	98.6%	±0.5%	95.4%	±1.3%
Östersund	1992–2006	2,303	83.5%	83.3%	55.7%	97.6%	±0.7%	94.5%	±1.4%
Rural Hospitals									
Alingsås	1992–2006	1,590	85.7%	85.8%	58.2%	98.8%	±0.6%	97.3%	±1.3%
Arvika	1992–2006	812	84.7%	85.8%	62.4%	93.1%	±2.4%	84.5%	±4.5%
Bollnäs	1992–2006	1,919	86.2%	85.1%	59.8%	98.0%	±0.8%	95.0%	±2.0%
Enköping	1992–2006	1,261	94.8%	94.8%	60.9%	97.5%	±1.1%	88.5%	±4.6%
Falköping	1992–2006	2,102	89.8%	84.3%	55.7%	97.6%	±0.9%	91.0%	±2.5%
Frölunda Specialistsjukhus	2002–2006	196	99.5%	84.2%	69.4%				
Gällivare	1992–2006	1,380	81.2%	84.9%	59.2%	98.5%	±0.8%	96.3%	±1.6%
Hudiksvall	1992–2006	1,792	76.0%	87.9%	59.8%	98.0%	±0.8%	95.4%	±1.7%
Karlshamn	1992–2006	1,542	91.1%	81.3%	59.1%	97.8%	±0.9%	95.2%	±1.9%
Karlskoga	1992–2006	1,465	87.8%	86.5%	61.8%	98.2%	±0.8%	94.5%	±2.1%
Katrineholm	1992–2006	1,844	89.4%	83.2%	56.8%	98.8%	±0.6%	97.6%	±1.1%
Kungälv	1992–2006	2,094	87.7%	86.8%	61.0%	99.2%	±0.4%	96.3%	±1.8%
Köping	1992–2006	2,121	95.1%	85.2%	55.9%	98.9%	±0.5%	95.7%	±2.2%
Lidköping	1992–2006	1,324	89.3%	83.5%	52.0%	98.4%	±0.8%	92.8%	±3.8%
Lindesberg	1992–2006	1,505	83.2%	85.6%	57.0%	98.2%	±0.8%	95.6%	±1.9%
Ljungby	1992–2006	1,547	87.4%	82.2%	53.6%	98.3%	±0.8%	95.4%	±1.6%
Lycksele	1992–2006	2,080	88.8%	86.7%	61.7%	99.0%	±0.5%	97.6%	±1.3%
Mora	1992–2006	1,953	86.4%	84.5%	57.4%	97.5%	±0.9%	94.3%	±1.6%
Motala	1992–2006	2,453	81.0%	85.0%	58.6%	98.7%	±0.6%	95.6%	±1.8%
Norrtälje	1992–2006	1,213	77.5%	87.9%	58.3%	96.6%	±1.2%	95.1%	±2.0%
Nyköping	1992–2006	1,683	81.6%	84.7%	57.8%	98.2%	±0.7%	97.4%	±1.0%
Oskarshamn	1992–2006	1,506	85.4%	85.1%	58.6%	99.3%	±0.5%	96.8%	±1.9%
Piteå	1992–2006	1,468	87.7%	83.0%	58.2%	98.1%	±0.9%	96.2%	±1.8%
Skellefteå	1992–2006	1,741	76.7%	83.7%	61.9%	97.8%	±0.8%	97.1%	±0.9%
Skene	1992–2006	1,013	92.1%	84.0%	51.7%	98.6%	±0.9%	95.6%	±2.1%
Sollefteå	1992–2006	1,402	88.1%	83.9%	59.3%	97.6%	±1.0%	94.3%	±2.1%

(continued on next page)

Implant Survival per Hospital (cont.)

all diagnoses, all reasons for revision and all types of implants, 1992-2006

Hospitals	Period [1]	Number [2]	OA [3]	≥60 yrs [4]	Female [5]	5 yrs	95% CI	10 yrs	95% CI
Södertälje	1995–2006	1,129	84.5%	83.4%	60.2%	99.0%	±0.8%		
Torsby	1992–2006	952	82.4%	86.8%	52.7%	97.2%	±1.2%	89.6%	±3.6%
Trelleborg	1992–2006	2,872	81.8%	85.1%	62.1%	96.8%	±0.8%	93.3%	±1.6%
Visby	1992–2006	1,239	83.2%	82.4%	55.2%	94.1%	±1.5%	85.8%	±3.1%
Värnamo	1992–2006	1,502	84.0%	84.1%	56.7%	98.6%	±0.7%	96.0%	±1.7%
Västervik	1992–2006	1,482	82.1%	84.3%	56.1%	97.7%	±0.9%	94.5%	±1.8%
Örnsköldsvik	1992–2006	1,703	85.2%	84.7%	62.8%	99.2%	±0.4%	98.0%	±1.0%
Private Hospitals									
Carlanderska	1992–2006	658	94.5%	74.8%	52.9%	98.7%	±1.1%	95.5%	±2.9%
Elisabethsjukhuset	1999–2006	598	86.8%	76.3%	58.0%	97.7%	±2.3%		
Gothenburg Medical Center	2004–2006	109	100.0%	70.6%	53.2%				
Movement	2003–2006	216	98.1%	79.2%	54.2%				
Nacka Närsjukhus Proxima AB	2005–2006	71	98.6%	66.2%	50.7%				
Ortopediska Huset	1996–2006	1,576	98.8%	79.3%	63.8%	97.6%	±1.2%		
Sophiahemmet	1992–2006	2,486	98.0%	75.8%	57.9%	95.6%	±1.0%	87.8%	±2.4%
Stockholms Specialistvård AB	2000–2006	816	96.8%	77.1%	54.9%	98.3%	±1.0%		

[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] Share of primary THRs performed due to primary osteoarthritis.
[4] Share of primary THRs in the age group 60 years or older (age at primary operation).
[5] Share of women.

Certain units do not have a sufficient number of primary THRs during the period to give a 10-year value for implant survival. In order to calculate the 10-year survival value, the longest observed time between primary operation and revision must be at least 10 years. We have therefore chosen to also include 5-year survival. A condition that consistently has been used in survival statistics from the register is that only values where 50 patients remain 'at-risk' are shown. Units with a smaller production may therefore be missing a value for this reason. All units reporting to the register during the year in question are included in the table, even if values are missing.

Environmental and technological profile

Under environmental and technical profile, the departments report annually on their surgical technique and operational environment. It is important that the departments update their profiles via our website. If there is no change, the Registry management assume that the profile is unchanged compared with the previous year. Since the profile gives aggregate data per department and year this gives an uncertainty in the statistical analyses of the databases. The primary and re-operation databases are based on the individual operation, with personal ID number and side as unique variables.

Two variables that have existed during the history of the environmental profile are type of cement and type of incision. These two became individually-based in 1999 and 2000, respectively (via the Hipfact internet input) and will therefore, starting with next year's Report, be presented in the 'Primary total hip arthroplasty' section. In the present Report we have adapted the histograms with these variables to comprise the time they have been reported on an individual basis. For historical results, the reader is referred to earlier annual reports.

Cement type

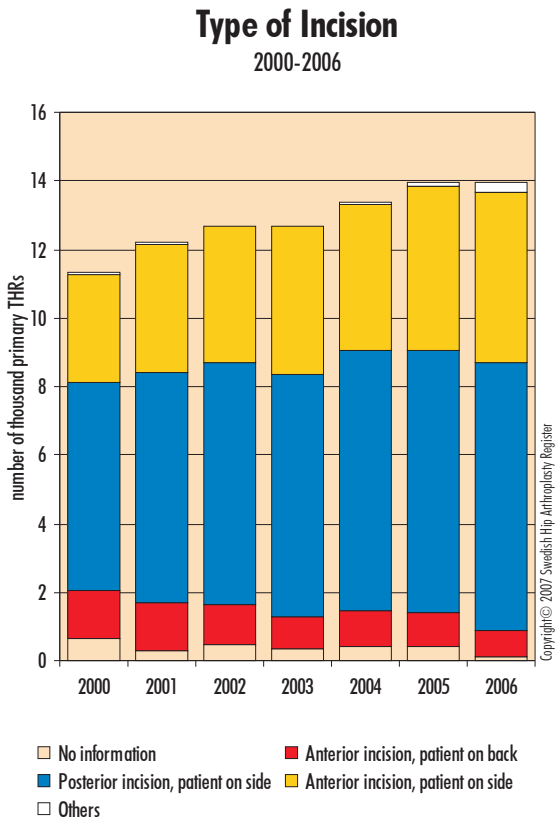
In 2005 the brand names of the predominant cement types used in Sweden were changed.

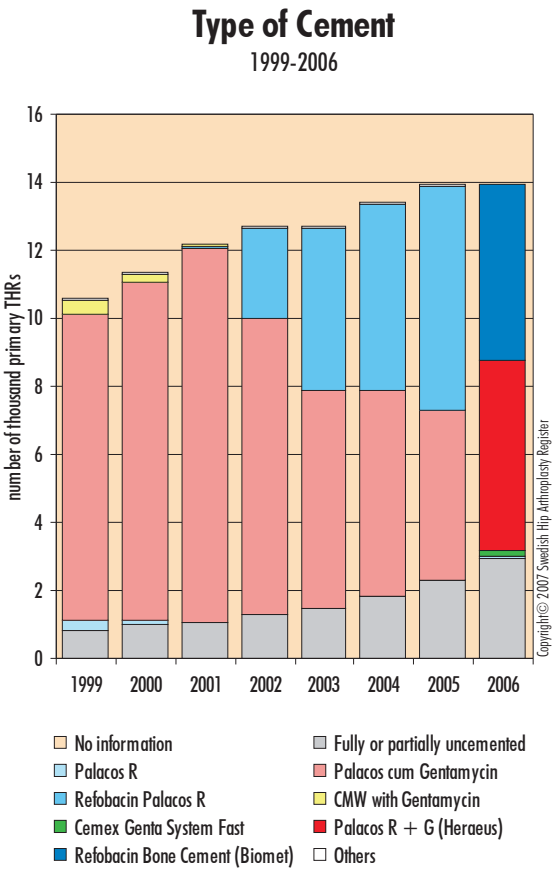
- **Palacos cum Gentamycin was changed to Palacos R + G**
- **Refobacin Palacos R was changed to Refobacin Bone Cement R.**

Whether the 'new' cements are commensurate with the 'older' ones has been investigated with polymer-chemical and durability studies. For the results of these studies, reference is made to the companies in question.

The 'new' cements were introduced stepwise and with some variability among the various departments during autumn 2005. As from the new year (1/1/2006) the changes have been completed at all units, for which reason all cement packages will be registered with the new designations. The historical material will keep the older designations. In Norway the Norwegian Hip Arthroplasty Registry has handled this issue in exactly the same way. The majority of patients undergo surgery using one or other of the cements mentioned.

The year 2006 saw an intensive discussion on possible differences between the 'old' cements and the 'new' cements. It is not part of the Hip Arthroplasty Registry's brief to participate in this type of debate – the Registry's job is to report via a prospective national observational study whether there are any outcome differences between differ-





ent cement types. Since the follow-up is short, it is not yet possible to carry out such an analysis.

Surgical approach

The connection between surgical approach and outcome in terms of reoperation and patient-related outcome on an individual basis may thus now be investigated for primary operations from 2000 onwards. The follow-up time is short but we plan such an in-depth report for next year's Report.

As previously, the posterior incision in the lateral position dominates over the anteriolateral approach in the same patient position (see Table below). Since we started registering what are termed mini-invasive approaches (2003), 315 operations have been performed in Sweden with various types of mini-approach, of which the MIS/1 anterior has increased most. The low number and the short observation time for patients operated on with MIS renders adequate register analysis impossible – however the relatively high revision numbers for MIS/2 are disquieting.

Surgical Approach	N pri.	N rev.	Share rev.
MIS/2	41	3	7.3%
MIS/1, posterior	59	2	3.4%
Anterior, patient on back (Hardinge)	4,917	76	1.5%
MIS/1, anterior	213	3	1.4%
Posterior, patient on side (Moore)	37,191	505	1.4%
Posterior with trochanteric osteotomy	77	1	1.3%
Anterior, patient on side (Gammer)	22,292	238	1.1%
Lateral with trochanteric osteotomy	76	0	0.0%
OCM	2	0	0.0%

Share of revisions by type of incision, 2000-2006.

Cementing technique

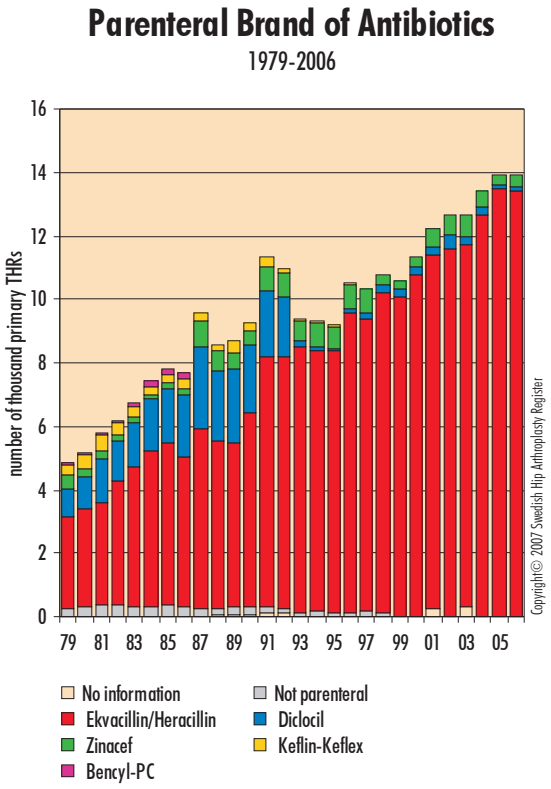
The analysis here is based on annually-aggregated results. Most departments state that they use a very similar technique, with the results that risk analyses are hard to perform on modern material. The standardised cement technique has probably contributed to the good Swedish results with, internationally speaking, a low revision burden. As regards cementing techniques, there have for some years been two trends.

The use of brushes has declined for the sixth year in succession. In earlier multivariate analyses we have found no positive effect of the use of brushes. Their use can, however, be an advantage in revisions procedures. For cleansing of cement beds, careful and repeated high-pulsatile lavage has a better effect.

The use of proximal femoral seals continues to increase. However, in 2004 just over 15% of the departments still stated that they did not use this technique. During 2006 this proportion sank to just under 8%. If one does not employ proximal seals one does not exploit the possibilities of good cement penetration, which is an important part of contemporary cementing technique. Earlier, Poisson analyses have shown that the use of proximal plugs lowers the risk of aseptic loosening. The reason why there is doubt in some departments about using this technique probably stems from anxiety regarding thromboembolic complications. This risk can, however, be reduced by careful cleansing of the bone bed (high-pulsatile lavage) prior to cementing. This has been scientifically tested in a number of studies.

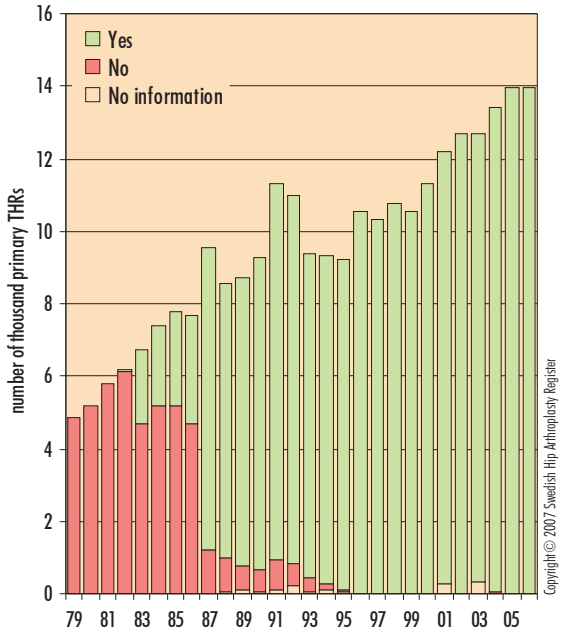
The recommendation is unambiguous: proximal sealing with high-pulsatile lavage both before and after application of the distal femur plug is essential for both cement penetration and lower risk of embolism.

A Kaplan-Meier analysis of 169,000 patients undergoing operation in 1992-2006 gave a 15-year survival for the patients operated on using the high-pressure technique of 86.6% ± 0.9%, while those who were operated on without this technique had a corresponding prosthesis survival of 85.1% ± 1.0%. The difference is statistically significant ($p < 0.001$, LogRank test). In view of the above it is surprising that not all departments are using a proximal seal in the cementing of standard cases. This technique should, however, be avoided in operations using hemi-arthroplasty.



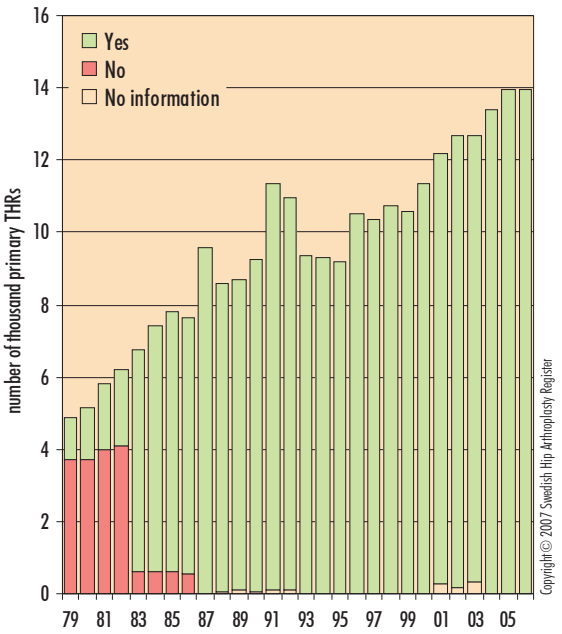
Cleansing by Lavage

1979-2006



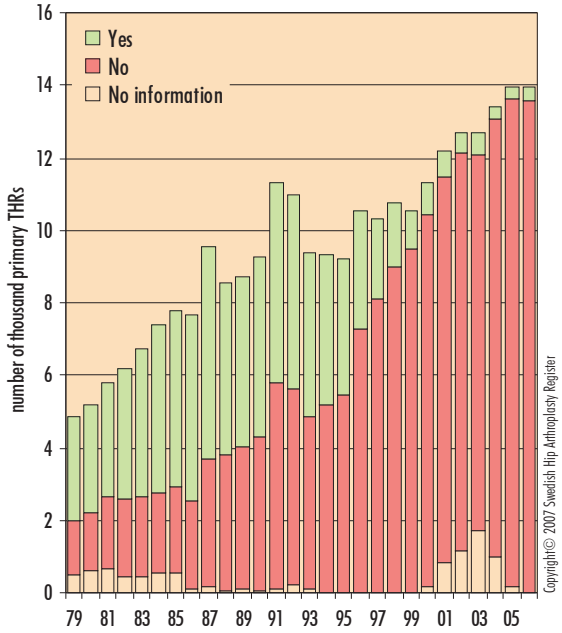
Distal Femoral Plug

1979-2006



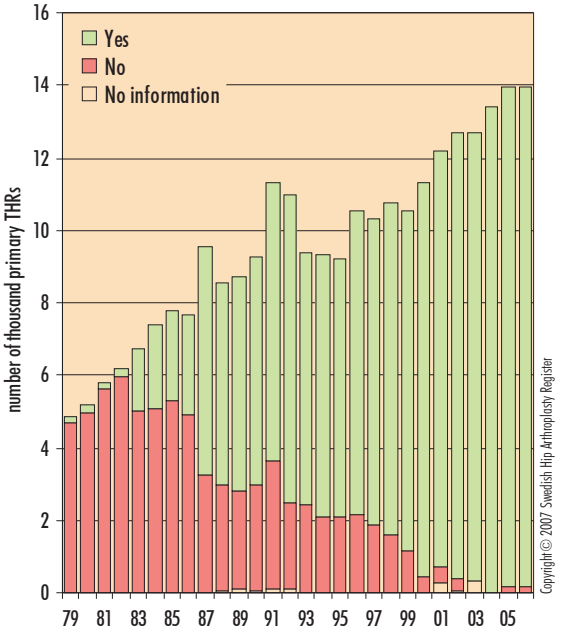
Peroral Antibiotics

1979-2006



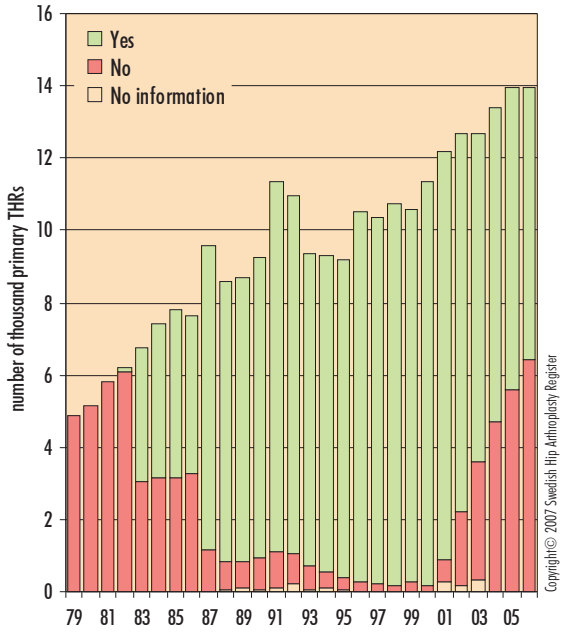
Acetabular Compression

1979-2006



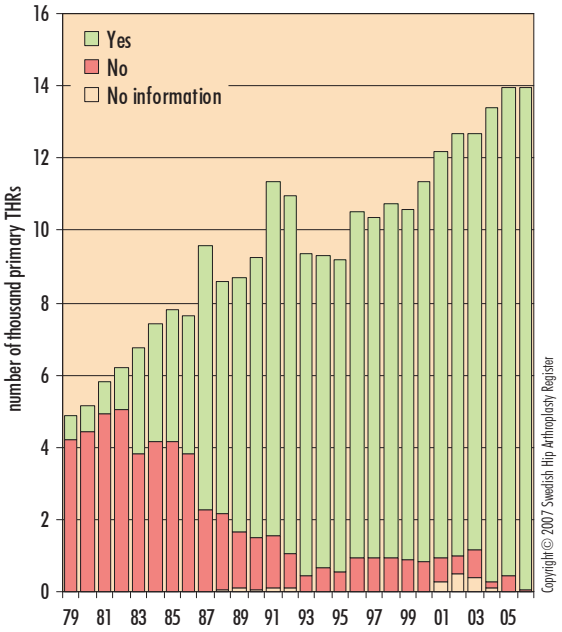
Cleansing by Brush

1979-2006



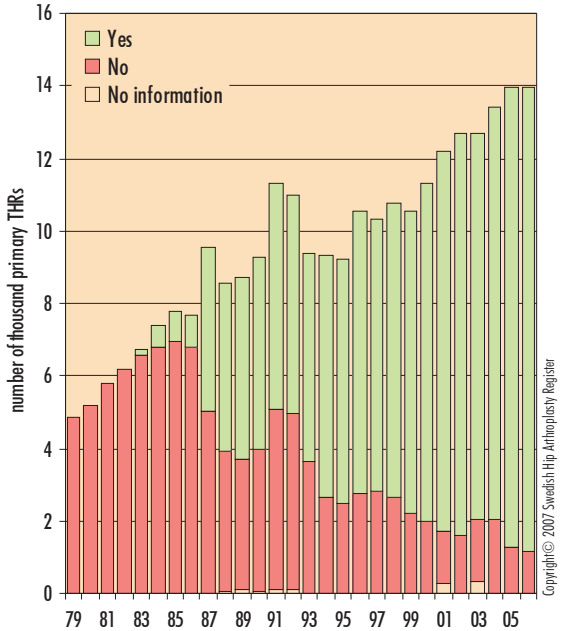
Retrograde Cement-filling of Femur

1979-2006



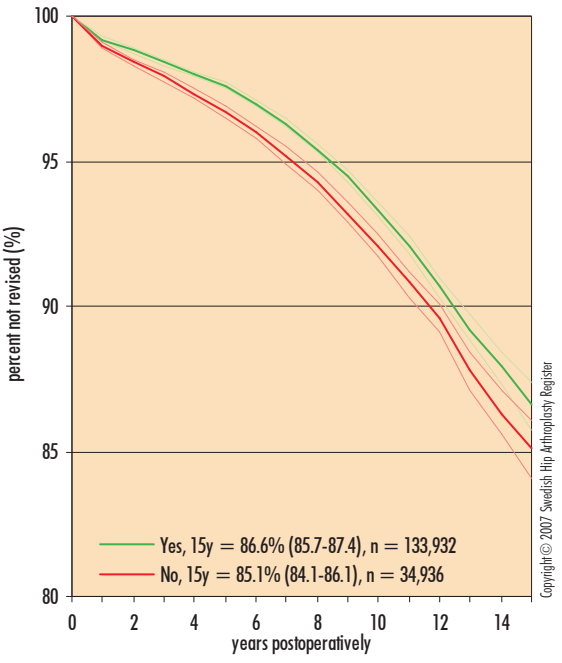
Proximal Femoral Sealing

1979-2006



Proximal Femoral Sealing

all diagnoses and all reasons, 1992-2006



Follow-up of free choice of care

The new Swedish care guarantee (maximum 3 months waiting time) seeks to improve the individual patient's opportunities of obtaining adequate care within a reasonable time. Since many county councils have not been able to achieve the goals of the care guarantee, they have been obliged to adopt short-term solutions with separate agreements with both public and private hip arthroplasty 'entrepreneurs'. In this way, accessibility has been improved for those patients who have accepted surgery at a different hospital from their own. The Registry management claim, as in earlier years, that improved accessibility must be 'quality-tested' in both the short-term and the long-term before it can be adduced as an improved indicator. Against this background the Registry, for the 2004 Annual Report, initiated an outcome analysis of patients undergoing total hip arthroplasty outside 'their' home region between 2002 and 2003.

What follows is a brief summary of the investigation, as material for this year's follow-up (for details see Annual Reports 2004 and 2005).

Materials:

- The analysis covered only 'standard patients', i.e. those with primary osteoarthritis as diagnosis and operated on with cemented THR outside university hospital departments
- Operated on within the county: 14,785 hips; outside the county 1,964 hips
- Those who took advantage of the 'free flow' were somewhat younger with fewer women than the national average
- Those who took advantage of the 'free choice of care' had lower co-morbidity and short-term mortality.

Results of the 2005 and 2006 analyses:

- Following mean follow-up at 24 and 36 months, respectively, we found no significant differences regarding reoperation frequency between patients operated on in their county and those operated on elsewhere
- About 80% of patients operated on outside their home region and who needed reoperation underwent this at their home departments
- Patient-related outcome measured with pain VAS, satisfaction VAS and the EQ-5D index did not differ significantly between the two groups (analysis 2005), but with the reservation that the 'free flow' patients had a different demographic profile.

This year's comparison

This year's continued analysis of the two groups shows a somewhat increased reoperation frequency above all in the 'free-flow' group. The difference between the groups regarding all causes of reoperation, however, is not statistically significant. On the other hand there was a significant difference regarding reoperation for deep infection, with an increased number of operations in the 'free-flow' group ($p=0.03$, Fischer's exact test). Mean follow-up time on analysis was 48 months. The follow-up time is still short and reflects chiefly complications such as deep infection and revision owing to recurrent dislocations. The frequency of this type of short-term complication should now, with a longer follow-up time, level out; and the next few years will be more interesting for a possible difference regarding reoperation due to aseptic loosening.

Discussion

Just as last year, we in the Registry management must regret that some of the major actors among those operating outside the counties are still not included in the Registry's standardised follow-up routine (this applies primarily to private actors in the Stockholm region). Those hospitals that are still not connected are shown in the table on pages 28 and 29. Orderers of care for 'care-guarantee patients' should be aware that these departments cannot deliver the national quality indicator regarding health gain after hip arthroplasty to the new version of the report 'Quality and Efficiency in Swedish Health Care ...' (published October 2007).

The management may be criticised for not initiating a new analysis in the wake of the new care guarantee. The analysis of production in 2002 and 2003 was fully financed by the Registry as regards questionnaires to patients included in the 'free-flow'. This extra work and increased cost could have been entirely avoided if all the hospitals had joined the follow-up routine, and in that case analyses from current time intervals could have been performed via the Registry's databases.

Such a function could be used for continual quality assurance of patients who had used the care guarantee to undergo surgery at a different hospital from their own home department.

Reason	Operated in home county (n = 14,785)		Free choice (n = 1,964)	
	Number	Share (%)	Number	Share (%)
Aseptic loosening	47	0.3	10	0.5
Deep infection	76	0.5	18	0.9 [2)]
Fracture	23	0.2	1	0.1
Implant Fracture	3	0.0	1	0.1
Dislocation	77	0.5	11	0.6
Technical Error	10	0.1	2	0.1
Pain only	5	0.0	0	0.0
Miscellaneous	18	0.1	2	0.1
Total	259	1.8	45	2.3 [1)]

Table 1. Frequency of reoperation by reason, divided into operated in home county and 'free choice'.
[1)] There is no significant difference between the two groups when statistically analysing all reasons for reoperation.
[2)] But there was a statistical significant difference with respect to deep infection (p=0.03).

Notes

Mortality after total hip replacement

Background

Hip arthroplasty is in most cases an elective intervention. This is especially so if the indication for operation is osteoarthritis. Even if the intervention today should be considered routine surgery, it is in fact a major surgical intervention not without risk for the patient. Modern anaesthesiology, careful preoperative medical preparation and prophylactic measures against infection and thrombosis have brought about low complication and mortality frequencies. The indications for prosthesis surgery have for the past few years, however, been extended – both nationally and internationally. More patients, both younger and older, are being operated on now than during the 1970s and 1980s. Today, particularly at larger units, more high-risk patients than previously are undergoing surgery.

The Hip Arthroplasty Registry is now updating its database several times a year regarding entered individuals' possible date of death (via the Swedish Tax Agency). The new Patient Data Act and the approval of various boards of ethics have now also made individual-based co-processing together with the Causes of Death Register at the Epidemiological Centre (EpC, National Board of Health & Welfare) more easy. Hence the Registry has better opportunities than previously for carrying out adequate analyses of mortality.

Short-term mortality (90-day mortality)

Ninety-day mortality is an indicator frequently used in the literature and applied in many different medical contexts. This variable is now captured automatically in the Registry's database in connection with updating of date of death via the Swedish Tax Agency. The causes of a patient dying in connection with, or within 90 days of, a hip arthroplasty (and related to the intervention) may be many; but the dominating causes are probably cardiovascular or thromboembolic diseases. The variable could in the future be used as a quality indicator to reflect the preoperative medical assessment and the unit's prophylactic measures. To achieve this, co-processing with the Causes of Death Register is required, and this has been done with this year's material. However the problem is that the EpC has a delay of approximately two years in the database. For this reason, the table on the next page shows only mortality frequency.

Ninety-day mortality varied relatively widely among the Swedish hospitals during the observation period 2003/2006: from 0‰ to 38.5‰. When assessing mortality, the department's patient demography is naturally also an important factor. For this reason we have included in this table the 'case-mix' variables discussed earlier. The mortality figure is generally low and should be judged with the same caution as the 'reoperation within two years' variable, i.e. as a possible trend over time. We plan to introduce a further variable in future annual reports – one that describes causes of death (for example the proportion of deaths from cardiovascular and/or thromboembolic diseases).

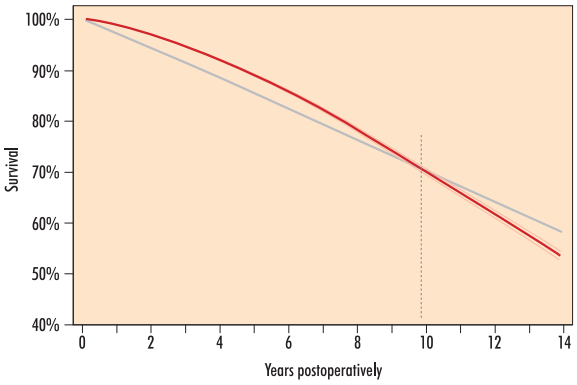
The Registry management recommends that departments check their 90-day mortality in the table. If their results deviate, they should initiate a local analysis. The variable is included in the modified value compass (see section 'Follow-up of activities after total hip replacement surgery').

Long-term mortality

Many studies in many countries have shown that patients with osteoarthritis undergoing hip arthroplasty have a higher 10-year survival than a normal population. The cause of this improved life expectation has in most cases been explained by the medical selection preceding operation. Despite the development described above, there are clear and relative medical contraindications for hip arthroplasty surgery.

The Swedish knee and hip arthroplasty registers have been in existence for long enough to enable us to analyse mortality in a much longer follow-up time than ten years. The Knee Arthroplasty Registry recently published a noted study (J Bone Joint Surg [Br] 2007; 89-B:599-603), showing that patients under 55 years of age undergoing knee prosthesis operations for osteoarthritis have significantly higher long-term mortality than a comparable Swedish normal population. The group studied had, as in other studies, better survival until about 12-years' follow-up. After this period the curves crossed and patients operated on before the age of 55 showed a significant excess mortality from cardiovascular diseases. The finding was so striking that the authors concluded that there is reason to consider the young osteoarthritis patient as a risk patient.

A corresponding analysis has been carried out on the Swedish hip arthroplasty material. The Hip Arthroplasty Register started four years later than the Knee Arthroplasty Register and was also later in starting to individually-base primary operations. For this reason the follow-up period is not so long for hip arthroplasty. The long-term mortality following hip arthroplasty shows exactly the same pattern as for the knee prosthesis analysis: increased long-term mortality for the young osteoarthritis patient especially from cardiovascular diseases.



Long-term mortality after total hip replacement surgery in Sweden. The red curve shows operated patients. The grey curve shows the mortality for the Swedish population. After approximately 10 years, the curves crosses, i.e. somewhat sooner than for patients with knee prosthesis (12 years).

90-day Mortality

proportion deceased within three months after primary THR, 2003-2006

Hospital	Number [1]	OA [2]	≥60 yrs [3]	Female [4]	Mortality [5]
University/Regional Hospitals					
KS/Huddinge	923	64.2%	71.3%	61.2%	15.2‰
KS/Solna	1,038	62.6%	73.1%	64.1%	9.6‰
Linköping	447	58.2%	72.3%	60.2%	20.1‰
Lund	394	34.0%	68.3%	64.7%	33.0‰
Malmö	479	27.1%	80.6%	71.0%	23.0‰
SU/Sahlgrenska	781	66.3%	59.2%	59.3%	10.2‰
SU/Östra	458	79.7%	81.9%	64.2%	8.7‰
Umeå	287	71.4%	69.7%	58.9%	20.9‰
Uppsala	1,110	49.4%	70.5%	60.8%	24.3‰
Central Hospitals					
Borås	794	66.4%	80.1%	59.4%	11.3‰
Danderyd	1,320	81.6%	85.1%	65.2%	13.6‰
Eksjö	721	93.2%	86.4%	57.8%	5.5‰
Eskilstuna	312	47.8%	87.2%	56.7%	38.5‰
Falun	1,044	84.6%	81.5%	56.8%	1.9‰
Gävle	614	63.5%	81.9%	60.7%	16.3‰
Halmstad	779	76.0%	80.9%	59.3%	7.7‰
Helsingborg	360	66.7%	85.3%	61.4%	16.7‰
Hässleholm-Kristianstad	2,712	93.1%	83.7%	55.1%	4.1‰
Jönköping	774	85.7%	83.9%	62.3%	7.8‰
Kalmar	845	69.8%	84.3%	60.5%	13.0‰
Karlskrona	150	40.7%	86.7%	68.0%	26.7‰
Karlstad	952	70.9%	81.9%	63.6%	20.0‰
Norrköping	661	64.8%	80.9%	61.7%	13.6‰
S:t Göran	1,860	85.8%	79.1%	63.2%	8.1‰
Skövde	643	70.9%	76.5%	55.8%	10.9‰
SU/Mölndal	336	67.3%	83.0%	67.9%	3.0‰
Sunderby (inklusive Boden)	478	63.2%	81.2%	63.6%	8.4‰
Sundsvall	619	85.3%	79.6%	60.9%	1.6‰
Södersjukhuset	1,109	60.7%	81.6%	65.1%	18.0‰
Uddevalla	1,216	69.7%	83.8%	61.9%	12.3‰
Varberg	743	87.9%	82.9%	56.9%	5.4‰
Västerås	512	62.9%	78.3%	58.6%	13.7‰
Växjö	469	84.9%	85.9%	57.8%	6.4‰
Ystad	287	82.2%	85.4%	56.8%	10.5‰
Örebro	733	79.8%	80.2%	59.2%	2.7‰
Östersund	758	85.8%	80.5%	54.4%	2.6‰
Rural Hospitals					
Alingsås	655	94.4%	85.3%	60.5%	3.1‰
Arvika	403	89.6%	85.9%	57.6%	5.0‰
Bollnäs	1,008	94.8%	84.6%	57.5%	2.0‰
Enköping	648	95.4%	94.6%	60.6%	4.6‰
Falköping	937	89.5%	85.6%	57.1%	2.1‰
Frölunda Specialistsjukhus	195	99.5%	84.1%	69.2%	5.1‰
Gällivare	451	82.0%	84.0%	59.0%	2.2‰
Hudiksvall	599	73.0%	89.0%	59.4%	10.0‰

(continued on next page)

90-day Mortality (cont.)

proportion deceased within three months after primary THR, 2003-2006

Hospital	Number[1)]	OA[2)]	≥60 yrs[3)]	Female[4)]	Mortality[5)]
Karlshamn	697	95.3%	79.9%	57.8%	1.4‰
Karlskoga	457	89.7%	83.8%	58.6%	8.8‰
Katrineholm	808	93.8%	77.5%	57.2%	3.7‰
Kungälv	697	87.2%	86.8%	62.6%	4.3‰
Köping	835	95.2%	84.4%	55.1%	2.4‰
Lidköping	509	89.8%	83.5%	49.7%	5.9‰
Lindesberg	565	87.6%	87.3%	58.2%	3.5‰
Ljungby	420	83.1%	81.0%	56.7%	2.4‰
Lycksele	929	91.3%	84.1%	63.5%	9.7‰
Mora	573	88.8%	85.5%	58.1%	5.2‰
Motala	1,241	88.0%	83.8%	60.8%	8.9‰
Norrtälje	381	81.6%	85.3%	54.9%	13.1‰
Nyköping	534	84.1%	85.2%	57.9%	3.7‰
Oskarshamn	686	93.3%	85.3%	55.5%	0.0‰
Piteå	749	92.0%	78.4%	54.3%	4.0‰
Skellefteå	495	79.0%	81.6%	64.6%	12.1‰
Skene	312	97.4%	83.0%	49.0%	3.2‰
Sollefteå	563	91.5%	83.5%	61.1%	5.3‰
Södertälje	504	84.1%	85.5%	61.7%	6.0‰
Torsby	270	83.3%	86.3%	53.7%	7.4‰
Trelleborg	1,346	88.7%	79.9%	60.8%	2.2‰
Visby	356	86.0%	80.6%	55.6%	11.2‰
Värnamo	525	87.8%	79.8%	56.6%	7.6‰
Västervik	432	87.0%	84.0%	55.8%	6.9‰
Örnsköldsvik	573	92.8%	78.7%	60.9%	5.2‰
Private Hospitals					
Sophiahemmet	977	99.9%	72.6%	55.8%	3.1‰
Carlanderska	217	96.3%	67.3%	48.4%	0.0‰
GMC	109	100.0%	70.6%	53.2%	0.0‰
Ortopediska Huset	1,099	99.7%	77.2%	61.5%	1.8‰
Elisabethsjukhuset	467	85.4%	75.8%	57.6%	0.0‰
Movement	216	98.1%	79.2%	54.2%	0.0‰
Nacka Närsjukhus Proxima	71	98.6%	66.2%	50.7%	0.0‰
Stockholms Specialistvård	641	97.2%	76.9%	53.5%	3.1‰
Sweden	53,962	81.8%	80.9%	59.4%	8.0‰

1) Number of primary THRs during the period with the conditions specified in the table heading.
2) Share of primary THRs performed due to primary osteoarthritis.
3) Share of primary THRs in the age group 60 years or older (age at primary operation).
4) Share of women.
5) 90-day mortality (number of patients deceased within three months of primary operation / number of primary operations during the period).

The mortality values are generally low and should be interpreted with the same caution as the variable 'reoperation within 2 years', i.e. as a possibility of a trend over time.

Hemi-arthroplasty registration 2005-2006

The treatment of dislocated cervical hip fractures has radically changed during the past eight years. Primary hip prosthesis is now the alternative of choice. Above all, operations with hemi-arthroplasties have increased, from about 300 annually in 1999 to 4,000 in 2006. This means that the absolute number of intervention-related complications has also increased. Quality registration of hemi-arthroplasties by analogy with registration of total prostheses has therefore been in demand, not least by Sweden's orthopaedic surgeons. In January 2005 this registration started in the same web-based environment as that for total prostheses. Registration achieved national coverage already in the first year (2005) thanks to the established contact secretaries and contact physicians, together with well-known entry routines.

In 2005, 3,801 hemi-arthroplasty operations were registered. They increased to 4,137 in 2006. Patients receiving hemi-arthroplasties are considerably older than those undergoing total hip replacement. The mean age is 83 years at operation with hemi-arthroplasty, compared with just under 70 for total hip replacement. This is explained by the fact that the majority (98%) of hemi-arthroplasties are used in hip fracture, which occurs at high ages. Only 11% of total hip replacements are related to fractures. The gender distribution also differs – 73% of hemi-arthroplasty patients are women, compared with 59% of total-prosthesis patients – reflecting osteoporosis as a risk factor for fracture.

Normally the patient in the acute situation gets a hemi-arthroplasty. Five percent of hemi-arthroplasty operations are carried out after a failed insertion of nails or screws (osteosynthesis) for an earlier fracture (secondary plasty). The proportion of primary hemi-arthroplasties increased somewhat in 2006 (93%) compared with 2005 (91%). A posterior surgical approach was used in 50% of the operations and bone cement in 91%. Just under 3% of all patients received an uncemented implant. In total, however, the use of the uncemented, soon sixty-year-old, Moore prosthesis declined to 5% in 2006 compared to 9% in 2005. The commonest implants are Lubinus and Exeter stems (39% and 22% respectively) and the Vario Cup and UHR Universal head (25% and 14% respectively) (Tables 1 and 2.)

Of the patients registered in 2005-2006, 3.7% had been reoperated on. All open interventions are recorded. Just over 50% of the reoperations were caused by dislocation (Table 3), a clear difference compared with total hip replacement where the commonest cause is aseptic loosening (59%) and only 11 % are caused by dislocations. Longer follow-up will naturally bring more cases of aseptic loosening. The higher age and mortality of the fracture population and different indication distribution for hemi- and total prostheses means that there will always be differences between the groups. As in total hip replacement, closed reduction of dislocation is not registered since this measure is hard to document reliably in a register.

Survival diagrams based on Kaplan-Meier analysis (all diagnoses, all causes of revision) show a successively increasing number of revisions with a tendency towards acceleration after just under two years. The terminal phase of the curve is however uncertain owing to a diminishing number of observations: more certain interpretation cannot be given until after further follow-up. Further analysis according to the Cox regression model including age, gender, side, diagnosis, incision, choice of stem and type of joint head shows that many of the factors included affect the risk of revision if one excludes infection. The most important factor is choice of uncemented stem, which increases the risk about four times (Exp (B) = 3.9 (2.5-6.1), $p < 0.001$). Of the 30 uncemented stems revised, 22 were Moore prostheses. Low age is also an important factor (Exp (B) = 0.96 (0.94-0.98), $p < 0.001$). The patients revised were a mean of two years younger than the non-revised group. This can probably be partly explained by the fact that the younger the patient is the more inclined the physician is to propose revision. Further factors tend to affect the risk of revision, but we judge these factors to be uncertain owing to the relatively few revisions so far. We will return with an updated analysis after a longer observation period.

Although hemi-arthroplasty is a very common intervention, only three countries in the world register hemi-arthroplasty operations in detail so that for example different implants may be compared with one another. Starting in 1999, Australia has the longest experience. There too it has been shown that the Moore prosthesis functions significantly worse than others. Norway has also been registering, since 2005. A striking difference is that in Norway the Charnley-Hastings prosthesis is used in 33% of cases. The large proportion of uncemented stems (20%) also differs from the situation in Sweden. International collaboration to sift out the best hemi-arthroplasty design is of interest.

Even after as little as two years' registration, therefore, significantly poorer results have been shown with uncemented fixation where the Moore prosthesis is responsible for the majority of the revisions. Reduced use of this prosthesis type is also seen, but a number of orthopaedic surgeons still consider it a suitable choice for the very old. In view of the fact that this prosthesis gives a large number of early failures we consider that it should not be used even in a patient with short life expectancy. The quality of life of this frail patient group should, instead, be ensured with a tried and tested prosthesis type. The extent to which other uncemented prostheses are associated with an increased risk of revision cannot yet be assessed.

Reason for reoperation	2005-2006	Share[1)]
Dislocation	151	51.0%
Infection	93	31.4%
Peri-prosthetic fracture	32	10.8%
Acetabular erosion	3	1.0%
Aseptic loosening	2	0.7%
Others	15	5.0%
Total	296	99.9%

Table 3. Reasons for reoperation of hemi-arthroplasty 2005-2006.
[1)] Share of total number of reoperations performed 2005-2006.

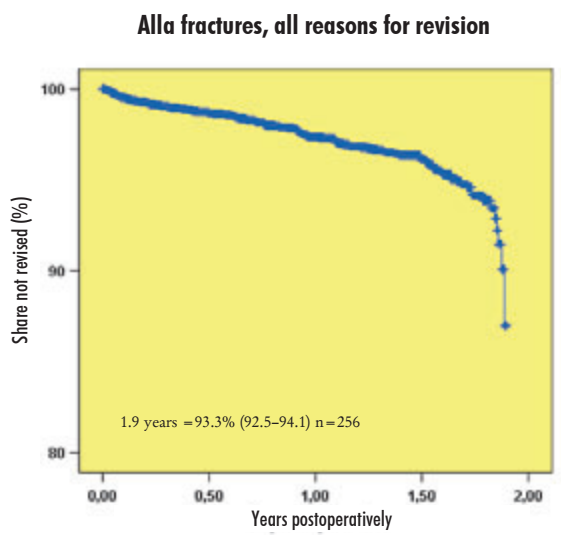


Figure 1. Implant survival based on revision, independent of the reason for revision.

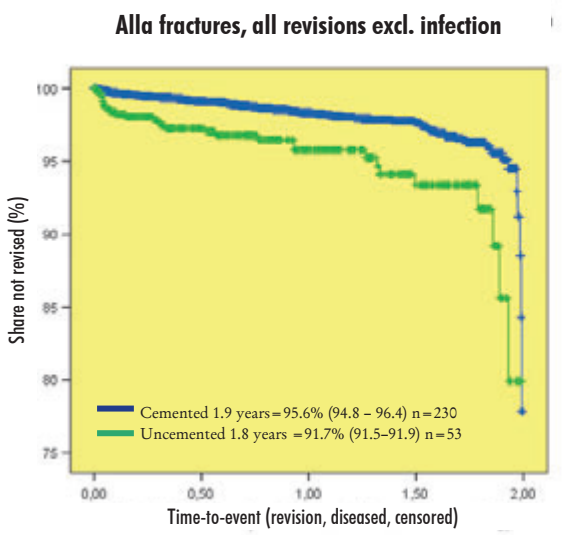


Figure 2. Implant survival based on revision, excluding deep infection. Comparison between uncemented and cemented type of fixation and a diagnosis of fracture.

Type	2005	2006	2005-2006	Share %*
Lubinus SP II	1,453	1,655	3,108	38.9
Exeter Polished	870	895	1,765	22.1
Spectron EF Primary	350	408	758	9.5
Thompson	354	360	714	8.9
Moore	329	199	528	6.6
CPT (CoCr)	187	210	397	5.0
ETS Endo	98	86	184	2.3
Müller Straight	101	82	183	2.3
Corail Stem	25	87	112	1.4
Bi-Metric Fracture Stem	42	53	95	1.2
Charnley	26	31	57	0.7
Basis	0	41	41	0.5
Others	20	26	46	0.6
Total	3,855	4,133	7,988	99.9
Missing	0	4	4	0.1
Total	3,855	4,137	7,992	100.0

*Table 1. The most common hemi-arthroplasty stems used 2005 and 2006. *) Share of total number of operations performed 2005-2006.*

Type	2005	2006	2005-2006	Share %*
Vario Cup	999	1,040	2,039	25.5
UHR Universal Head	589	545	1,134	14.2
Mega Caput	463	655	1,118	14.0
Unipolar Head (Smith&Nephew)	336	449	785	9.8
Modular Biarticular	313	425	738	9.2
V40 Unipolar	278	322	600	7.5
Unipolar Head (Zimmer)	95	57	152	1.9
Moore Modular Hemi-Head (Anatomica)	33	51	84	1.1
Hastings	26	31	57	0.7
Others	17	18	35	0.4
Total	3,149	3,593	6,742	84.3
"Missing" (i.e. Monoblock Prostheses)	706	544	1,250	15.6
Total	3,855	4,137	7,992	100.0

*Table 2. The most common types of joint heads 2005 and 2006. *) Share of total number of operations performed 2005-2006.*

Notes

Regions

In Sweden about 127 primary total hip arthroplasties per 100,000 inhabitants were performed during the period 1992-2006. As previously, the northern and south-eastern regions carried out the most operations and the Stockholm and Gotland region, and the western region, the fewest, after adjustment for number of inhabitants. Compared with 2005 the number of operations increased in Uppsala-Örebro and in the northern region while other regions showed a reduction, which was greatest in the south-eastern region (n=89, -5%). Stockholm and Gotland and the western region are thus still clearly below average. Since age and probably also distribution of diagnoses varies between the regions, a certain variation in the number of primary hip arthroplasties may be expected. The number of hip arthroplasties per inhabitant, adjusted for gender and age, however, exhibits larger variations than can be explained by these factors (see Läkartidningen 2007;104(19):1504-8).

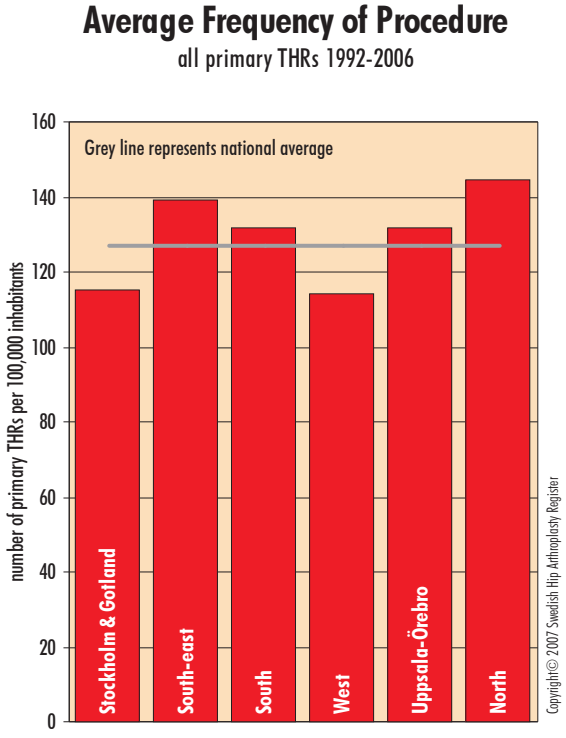
The fifteen most common implants and choices of fixation are reported by region for the period 1979-2001 and then annually until 2005. In addition the number of primary operations and the procedure frequency in relation to the national average per year since 1992 are illustrated. The number of primary operations in the region and the revisions that these have entailed are shown in bar diagram form. The combined revision burden for 1979-2006 and 1992-2006 is given, and for the latter period this is shown by gender. During the latter period the revision burden (RB) was 10.6%-10.9% in the western, Uppsala-Örebro, southern and Stockholm and Gotland regions. The south-eastern region was somewhat lower (10%) and the northern, like last year, was the lowest (8.9%). As noted earlier, the RB to some extent reflects the quality of the operations conducted in the region, but the percentage proportion is also affected by the number of primary prostheses and above all by the region's 'case-mix'. Regions needing, and at the same time able, to conduct a large number of primary total hip replacements automatically gain a lower relative proportion of revisions. Other factors such as variations in 'case-mix' (proportion high-risk) between regions and selection of primary prosthesis will also affect the RB. In the various regions the proportion of low-risk patients (women 60 years or older with primary osteoarthritis) was 36.5%-36.6% of the total in the Uppsala-Örebro, southern and western regions. In the south-eastern region 35.5% were low-risk patients, and in the northern and Stockholm and Gotland regions 38% and 39.2% respectively. Even though certain revisions are performed outside one's own region and our definition of low-risk patients is fairly rough, these data indicate certain differences between the different patient populations. The two survival curves show revision irrespective of cause and diagnosis as well as patients with primary osteoarthritis revised for aseptic loosening.

Regional differences emerge in the choice of fixation, affected by the fact that some regions are responsible for development in the prosthesis area and therefore employ more uncemented, hybrid or reversed hybrid techniques. Note that the table presentations take some account of historical data.

During 2006 the proportion of all cemented prostheses varied between 68% (Stockholm and Gotland region) and 90% (northern region). Stockholm and Gotland had the highest relative use of uncemented (14%) and reverse hybrids (15%). The western region had the largest proportion of hybrid prostheses (9%). Compared with 2005 the proportion of all-cemented fixations declined in all regions. The decrease was negligible in the southern region (1%) and greatest in the Stockholm and Gotland region (9%). The proportion of wholly uncemented fixations changed negligibly (less than 1%) in the western and Uppsala-Örebro regions. In the other regions it increased by 3% to 6%. Hybrids and reversed hybrids were used largely to the same extent as previously with differences of –1% to + 2% between 2005 and 2006. Resurfacing was used conservatively in all regions and represented at the most 2.3% of the total number (southern and western regions).

The differences observed can partly be explained by current studies but they also correspond to shifts in indication in routine production. It is important that they are surveyed and that they are based on evidence from each patient group, not least in view of the cost-utility perspective and the risk of technique-related complications in the change of implant and fixation principles.

The regional differences reflect not only demographic factors but also implant selection and probably, further, variables related to surgical technique. We hope that the reporting of these data from the individual department reports and, where appropriate, data from the follow-up system, will be of help in individual departments' and regions' development and quality control.



Region: Stockholm & Gotland

15 Most Common Implants

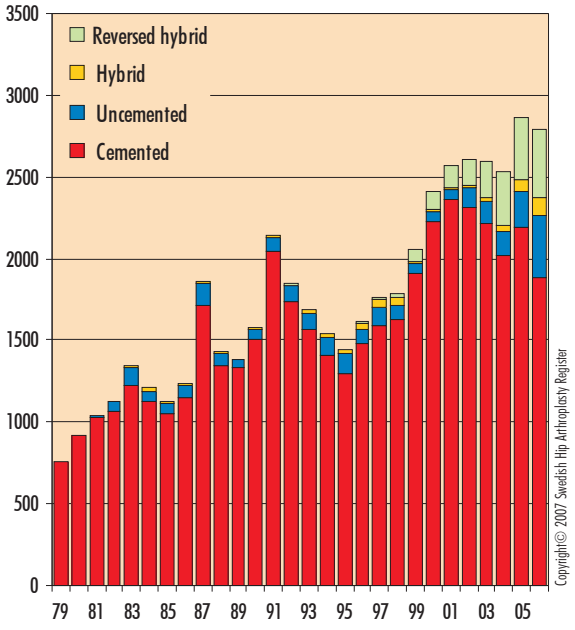
most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Charnley (Charnley)	21,645	630	154	71	6	1	22,507	25.9%
Charnley Elite (Exeter Polished)	1,049	709	772	574	517	503	4,124	17.2%
Reflection (Spectron EF Primary)	379	190	387	361	348	242	1,907	7.9%
Charnley (Exeter Polished)	138	86	188	285	325	195	1,217	5.0%
Weber All-Poly Cup (Straight-stem Standard)	222	115	137	195	164	125	958	4.0%
Biomet Müller (CPT (Steel))	603	212	133	1	0	0	949	3.9%
Lubinus All-Poly (Lubinus SP II)	673	137	82	77	109	162	1,240	3.8%
Contemporary Hooded Duration (Exeter Polished)	1	24	69	65	156	236	551	2.3%
Biomet Müller (CPT (CoCr))	0	0	60	145	137	90	432	1.8%
FAL (Lubinus SP II)	0	60	71	68	109	76	384	1.6%
Charnley Elite (ABG Uncem.)	130	94	127	15	1	0	367	1.5%
Charnley Elite (Lubinus SP II)	70	7	56	65	80	33	311	1.3%
Charnley Elite (Charnley Elite Plus)	295	1	0	0	0	0	296	1.2%
ZCA (CPT (CoCr))	0	0	3	47	136	104	290	1.2%
CLS Spotorno (CLS Spotorno)	0	23	34	37	63	124	281	1.2%
Others (332)	10,926	327	328	528	718	930	13,757	
Total	36,131	2,615	2,601	2,534	2,869	2,821	49,571	

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

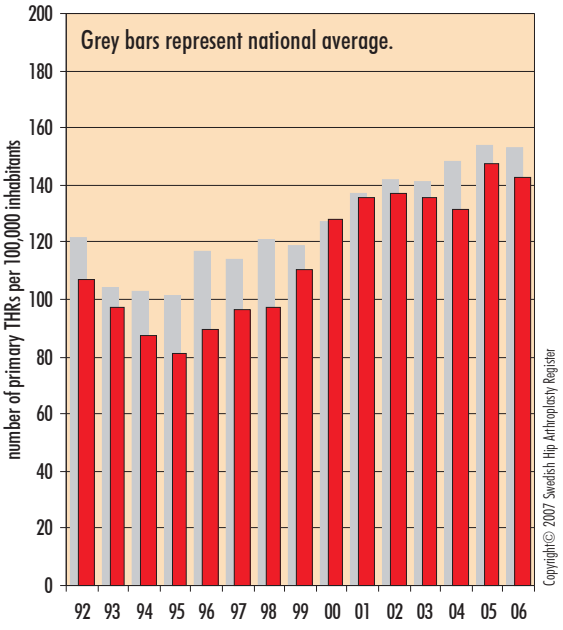
Number of Primary THRs

per type of fixation, 1979-2006



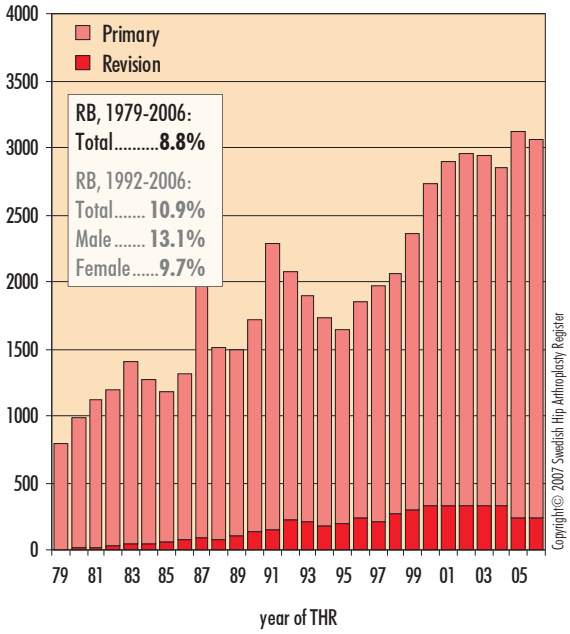
Frequency of Procedure

all primary THRs induded



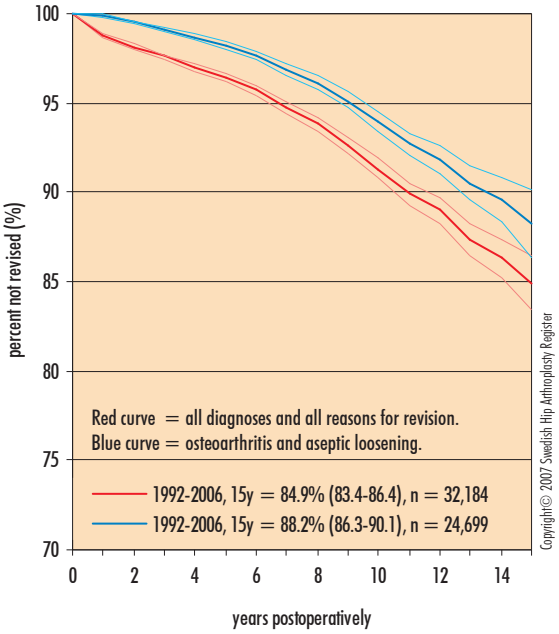
Number of THRs per Year

49,571 primary THRs, 4,784 revisions, 1979-2006



Implant Survival

1992-2006



Number of Primary THRs per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	13,671	2,144	2,118	2,022	2,389	2,355	24,699	76.7%
Fracture	2,206	248	259	308	293	259	3,573	11.1%
Inflammatory arthritis	723	46	55	58	43	52	977	3.0%
Idiopathic femoral head necrosis	577	73	64	62	77	78	931	2.9%
Childhood disease	263	85	79	60	52	60	599	1.9%
Secondary osteoarthritis	152	1	3	2	0	2	160	0.5%
Tumour	96	14	11	11	9	9	150	0.5%
Secondary arthritis after trauma	51	4	12	11	6	5	89	0.3%
(missing)	1,005	0	0	0	0	1	1,006	3.1%
Total	18,744	2,615	2,601	2,534	2,869	2,821	32,184	100%

Average Age per Gender and Year

Gender	1992-2001	2002	2003	2004	2005	2006	Total
Male	67.6	67.4	66.3	65,9	66.0	65.4	67.0
Female	70.6	69.8	69.8	69,9	69.6	69.2	70.2
Total	69.6	68.9	68.4	68.3	68.2	67.7	69.0

Region: South-east

15 Most Common Implants

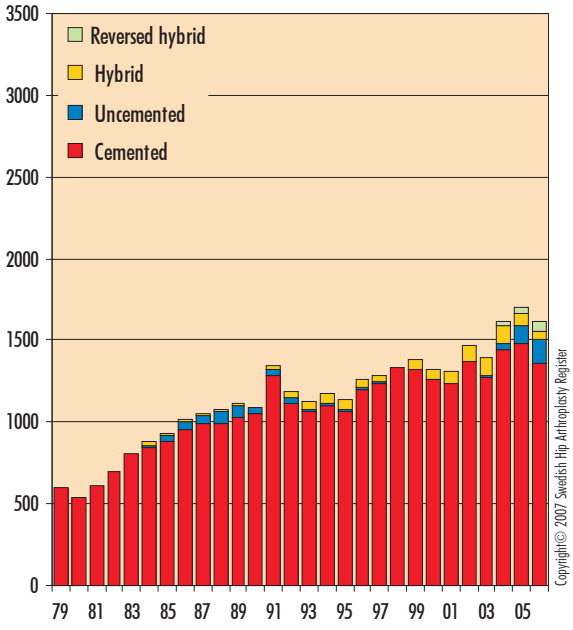
most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Lubinus All-Poly (Lubinus SP II)	8,271	826	796	1,180	1,339	1,283	13,695	64.4%
FAL (Lubinus SP II)	513	315	290	160	66	30	1,374	9.5%
Exeter Duration (Exeter Polished)	432	107	16	1	1	0	557	3.9%
SHP (Lubinus SP II)	557	5	1	3	3	2	571	2.7%
Exeter All-Poly (Exeter Polished)	948	2	0	0	0	0	950	2.6%
Charnley Elite (Exeter Polished)	227	27	20	28	26	12	340	2.2%
Contemporary Hooded Duration (Exeter Polished)	6	67	134	41	12	13	273	1.9%
OPTICUP (Lubinus SP II)	231	0	0	0	0	0	231	1.6%
Trilogy HA (Lubinus SP II)	59	17	40	42	37	20	215	1.5%
Charnley Elite (Lubinus SP II)	221	16	7	3	6	1	254	1.1%
Reflection HA (Lubinus SP II)	37	19	15	23	10	1	105	0.7%
Biomex HA (Lubinus SP II)	39	33	30	3	0	0	105	0.7%
M2a (Bi-Metric HA lat)	0	0	7	20	26	46	99	0.7%
Lubinus All-Poly (Bi-Metric HA lat)	0	0	0	21	28	27	76	0.5%
Mallory-Head uncem. (Lubinus SP II)	86	6	2	3	2	1	100	0.5%
Others (total 169)	12,676	27	33	88	151	182	13,157	
Total	24,303	1,467	1,391	1,616	1,707	1,618	32,102	

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

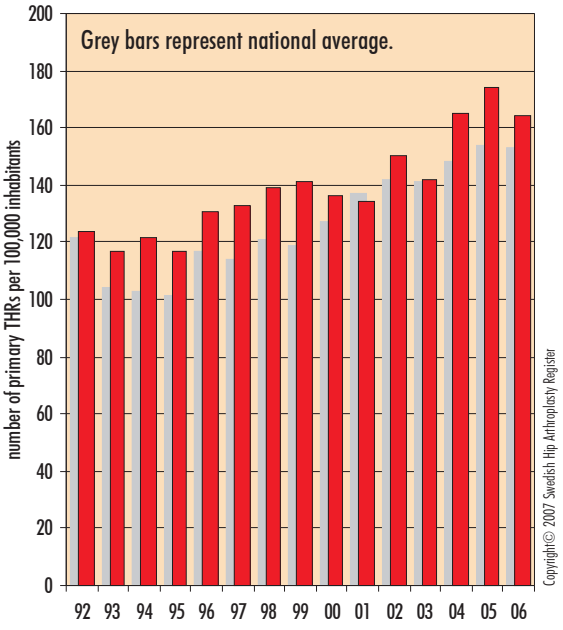
Number of Primary THRs

per type of fixation, 1979-2006



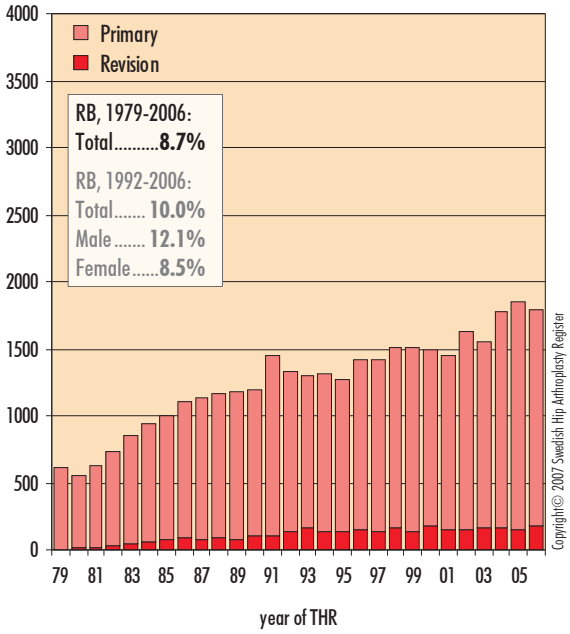
Frequency of Procedure

all primary THRs induded



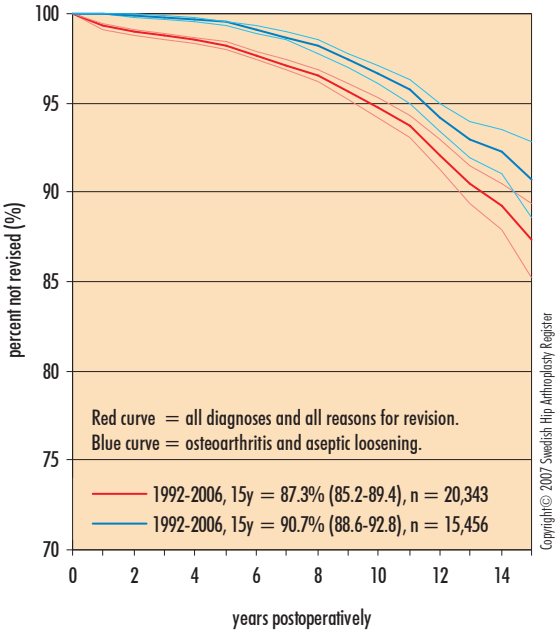
Number of THRs per Year

32,102 primary THRs, 3,074 revisions, 1979-2006



Implant Survival

1992-2006



Number of Primary THRs per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	9,123	1,152	1,101	1,302	1,417	1,361	15,456	76.0%
Fracture	1,731	205	184	222	197	174	2,713	13.3%
Inflammatory arthritis	697	38	43	27	22	20	847	4.2%
Idiopathic femoral head necrosis	404	31	39	30	34	28	566	2.8%
Secondary osteoarthritis	270	0	0	0	0	0	270	1.3%
Childhood disease	136	30	12	23	26	26	253	1.2%
Tumour	24	11	10	10	9	8	72	0.4%
Secondary arthritis after trauma	35	0	2	2	2	0	41	0.2%
(missing)	124	0	0	0	0	1	125	0.6%
Total	12,544	1,467	1,391	1,616	1,707	1,618	20,343	100%

Average Age per Gender and Year

Gender	1992-2001	2002	2003	2004	2005	2006	Total
Male	68.9	68.0	68.3	68.3	68.7	68.0	68.7
Female	71.4	71.0	71.0	71.0	70.3	70.5	71.2
Total	70.4	69.7	69.9	69.9	69.6	69.5	70.1

Region: South

15 Most Common Implants

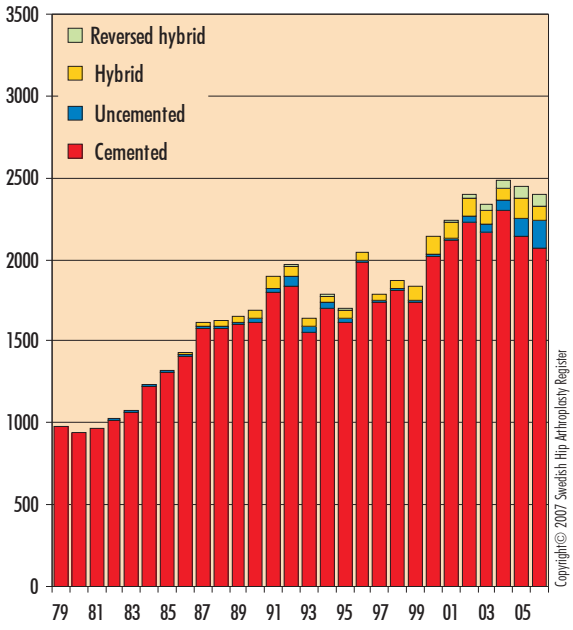
most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Exeter Duration (Exeter Polished)	1,721	931	963	979	736	811	6,141	27.9%
Lubinus All-Poly (Lubinus SP II)	5,058	700	580	697	612	438	8,085	24.9%
OPTICUP (Scan Hip II Collar)	1,545	279	125	10	0	1	1,960	8.4%
Exeter All-Poly (Exeter Polished)	2,686	13	6	10	2	2	2,719	6.2%
Charnley Elite (Exeter Polished)	91	99	158	192	222	285	1,047	4.8%
Charnley (Charnley Elite Plus)	950	0	0	0	0	0	950	3.8%
Contemporary Hooded Duration (Exeter Polished)	1	8	87	120	196	126	538	2.4%
Charnley (Charnley)	6,118	9	5	3	0	0	6,135	2.0%
Trilogy HA (Lubinus SP II)	264	53	40	34	28	21	440	2.0%
Weber All-Poly Cup (MS30 Polished)	14	28	114	150	16	12	334	1.5%
Charnley Elite (Charnley Elite Plus)	320	0	0	0	0	0	320	1.4%
Charnley (Exeter Polished)	75	51	44	43	50	26	289	1.3%
ZCA (MS30 Polished)	0	0	0	7	223	44	274	1.2%
Scan Hip Cup (Scan Hip Collar)	5,353	0	0	0	0	0	5,353	1.1%
ZCA XLPE (MS30 Polished)	0	0	0	0	6	211	217	1.0%
Others (total 263)	12,470	227	220	246	355	421	13,939	
Total	36,666	2,398	2,342	2,491	2,446	2,398	48,741	

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

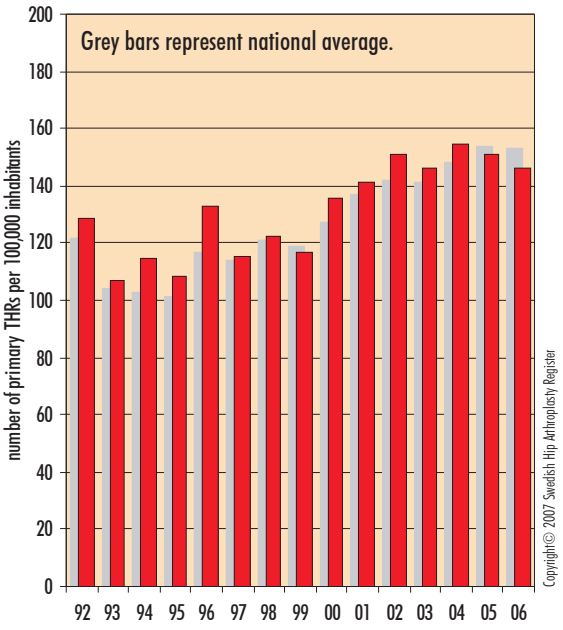
Number of Primary THRs

per type of fixation, 1979-2006



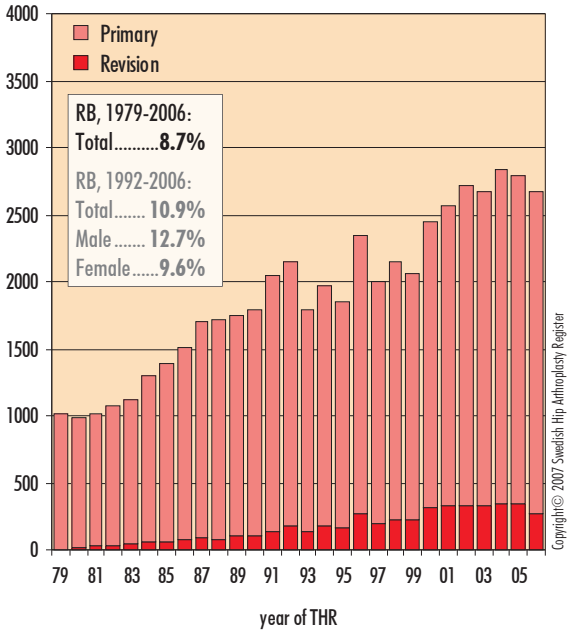
Frequency of Procedure

all primary THRs induded



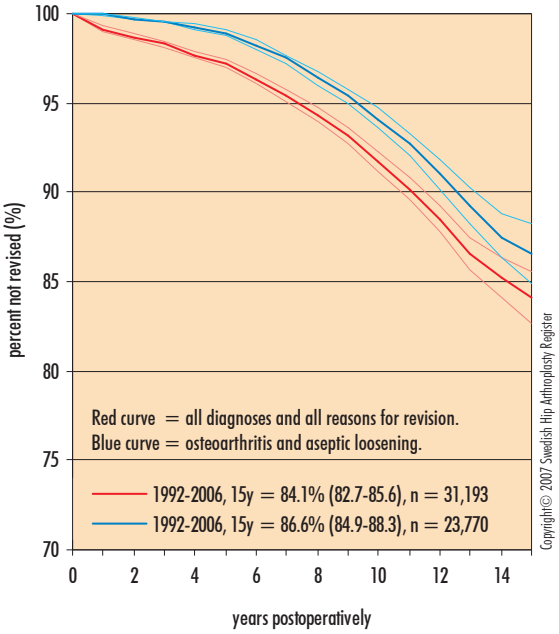
Number of THRs per Year

48,741 primary THRs, 4,648 revisions, 1979-2006



Implant Survival

1992-2006



Number of Primary THRs per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	13,825	1,957	1,857	2,053	2,070	2,008	23,770	76.2%
Fracture	2,493	223	245	225	183	214	3,583	11.5%
Inflammatory arthritis	1,144	80	83	65	68	46	1,486	4.8%
Idiopathic femoral head necrosis	607	77	83	79	61	74	981	3.1%
Childhood disease	262	48	47	44	40	38	479	1.5%
Tumour	123	9	17	20	17	13	199	0.6%
Secondary osteoarthritis	143	0	0	0	4	0	147	0.5%
Secondary arthritis after trauma	33	4	10	5	3	5	60	0.2%
(missing)	488	0	0	0	0	0	488	1.6%
Total	19,118	2,398	2,342	2,491	2,446	2,398	31,193	100%

Average Age per Gender and Year

Gender	1992-2001	2002	2003	2004	2005	2006	Total
Male	68.2	66.8	67.7	66.9	66.6	67.5	67.8
Female	70.7	70.0	69.9	70.3	69.6	69.6	70.4
Total	69.7	68.7	69.0	68.9	68.3	68.8	69.3

Region: West

15 Most Common Implants

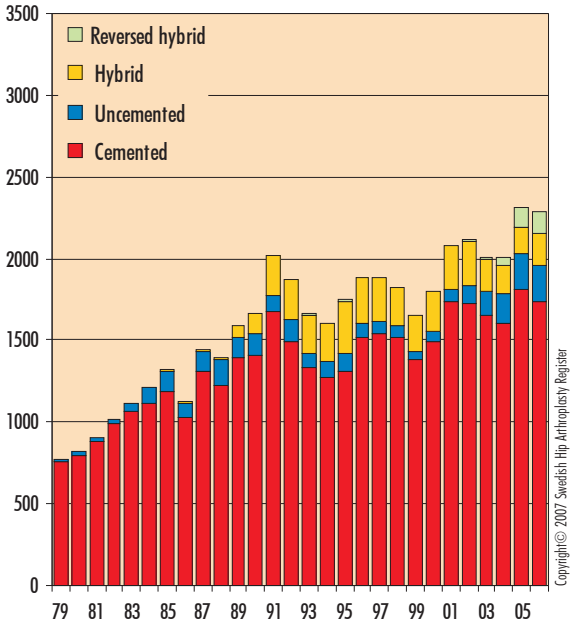
most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share[1)]
Lubinus All-Poly (Lubinus SP II)	6,449	1,184	1,157	1,113	1,364	1,343	12,610	50.1%
Reflection (Spectron EF Primary)	2,157	400	382	356	339	266	3,900	18.5%
Trilogy HA (Spectron EF Primary)	585	174	127	107	80	100	1,173	5.7%
Biomet Müller (RX90-S)	1,360	0	0	0	0	0	1,360	4.0%
Trilogy HA (CLS Spotorno)	7	15	22	65	124	126	359	1.8%
Charnley Elite (Spectron EF Primary)	112	20	36	37	27	24	256	1.3%
ZCA (Stanmore mod)	30	56	53	55	26	23	243	1.2%
OPTICUP (Optima)	450	0	0	0	0	0	450	1.0%
Contemporary (Exeter Polished)	364	2	1	0	0	0	367	1.0%
ABG II HA (Lubinus SP II)	141	10	2	3	0	3	159	0.8%
ABG II HA (ABG uncem.)	77	42	12	9	8	0	148	0.7%
Trilogy HA (Versys stem)	11	23	53	43	8	7	145	0.7%
BHR Acetabular Cup (BHR Femoral Head)	14	17	17	20	35	36	139	0.7%
Stanmore (Stanmore mod)	72	0	0	13	15	21	121	0.6%
Charnley (Charnley)	4,672	0	0	0	0	0	4,672	0.6%
Others (total 319)	18,050	171	141	184	283	336	19,165	
Total	34,551	2,114	2,003	2,005	2,309	2,285	45,267	

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

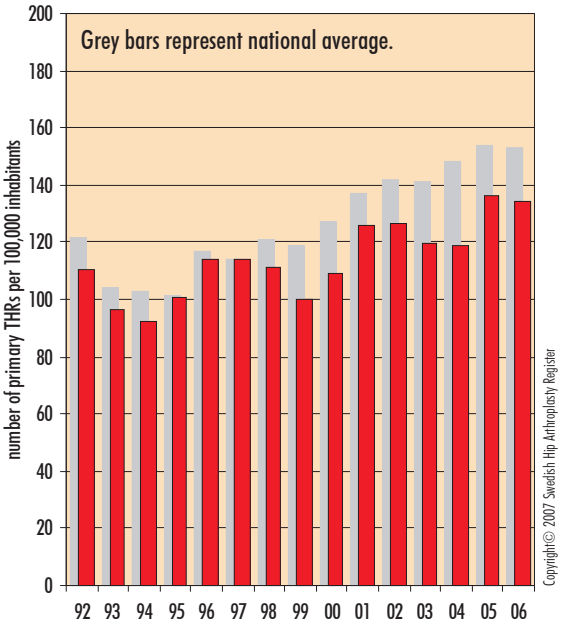
Number of Primary THRs

per type of fixation, 1979-2006



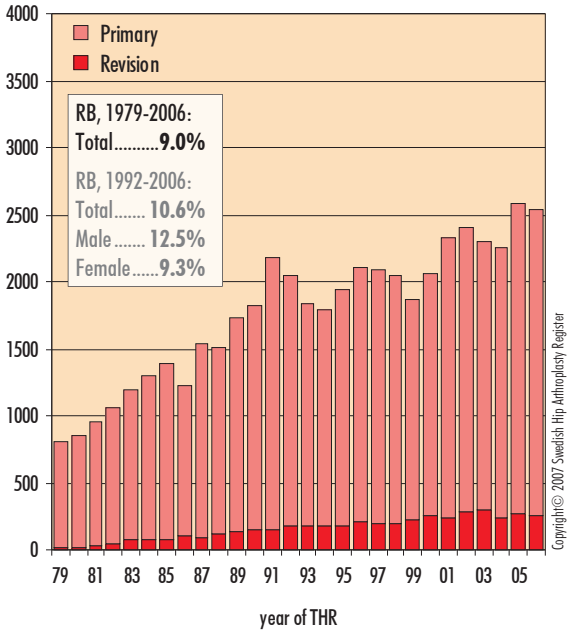
Frequency of Procedure

all primary THRs induded



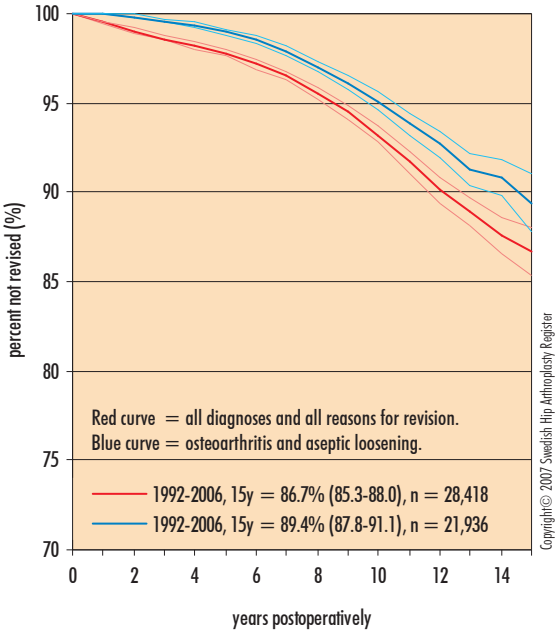
Number of THRs per Year

45,267 primary THRs, 4,450 revisions, 1992-2006



Implant Survival

1992-2006



Number of Primary THRs per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	13,361	1,644	1,550	1,570	1,898	1,913	21,936	77.2%
Fracture	2,007	287	296	242	218	202	3,252	11.4%
Inflammatory arthritis	854	74	65	76	75	62	1,206	4.2%
Idiopathic femoral head necrosis	363	44	44	50	45	48	594	2.1%
Childhood disease	344	51	33	49	59	45	581	2.0%
Secondary osteoarthritis	269	0	0	0	0	0	269	0.9%
Tumour	61	11	9	12	12	12	117	0.4%
Secondary arthritis after trauma	27	3	6	6	2	3	47	0.2%
(missing)	416	0	0	0	0	0	416	1.5%
Total	17,702	2,114	2,003	2,005	2,309	2,285	28,418	100%

Average Age per Gender and Year

Gender	1992-2001	2002	2003	2004	2005	2006	Total
Male	67.7	67.2	68.1	66.9	66.2	67.0	67.4
Female	70.1	70.4	70.2	69.6	69.2	69.9	70.0
Total	69.1	69.1	69.4	68.5	68.0	68.6	69.0

Region: Uppsala-Örebro

15 Most Common Implants

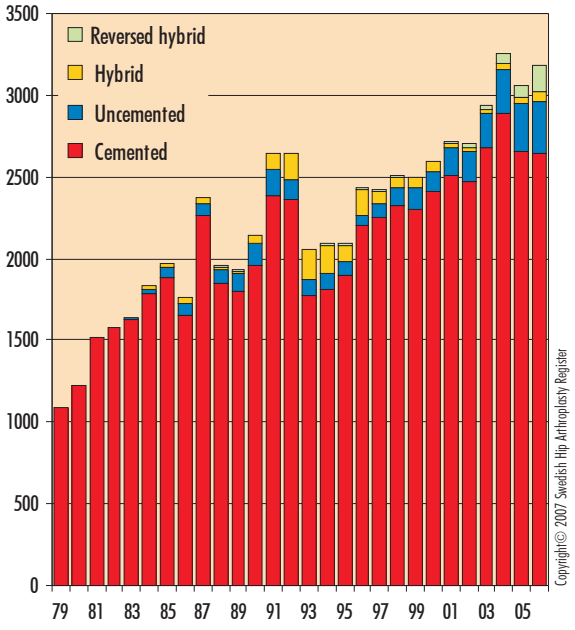
most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Lubinus All-Poly (Lubinus SP II)	5,866	763	1,034	1,140	1,064	1,045	10,912	29.3%
Charnley (Charnley)	15,452	287	122	7	2	1	15,871	12.0%
FAL (Lubinus SP II)	23	295	450	473	423	411	2,075	7.4%
Exeter Duration (Exeter Polished)	902	304	212	161	153	105	1,837	6.6%
Contemporary Hooded Duration (Exeter Polished)	9	178	271	288	210	225	1,181	4.2%
Charnley Elite (Exeter Polished)	65	80	111	203	215	352	1,026	3.7%
Reflection (Spectron EF Primary)	286	103	120	154	101	107	871	3.1%
Müller All-Poly (Müller Straight)	4,030	61	60	77	76	55	4,359	2.5%
Exeter Duration (Lubinus SP II)	144	70	109	114	119	128	684	2.4%
Cenator (Exeter Polished)	656	3	1	0	0	0	660	2.4%
Cenator (Cenator)	1,152	0	0	0	0	0	1,152	2.3%
Exeter All-Poly (Exeter Polished)	1,322	3	0	0	0	0	1,325	1.9%
Charnley Elite (Charnley Elite Plus)	543	9	0	0	0	0	552	1.9%
Stanmore (Stanmore mod)	284	186	18	0	0	0	488	1.7%
Charnley Elite (Lubinus SP II)	112	49	65	95	81	74	476	1.7%
Others (total 338)	16,980	316	370	539	622	681	19,508	
Total	47,826	2,707	2,943	3,251	3,066	3,184	62,977	

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

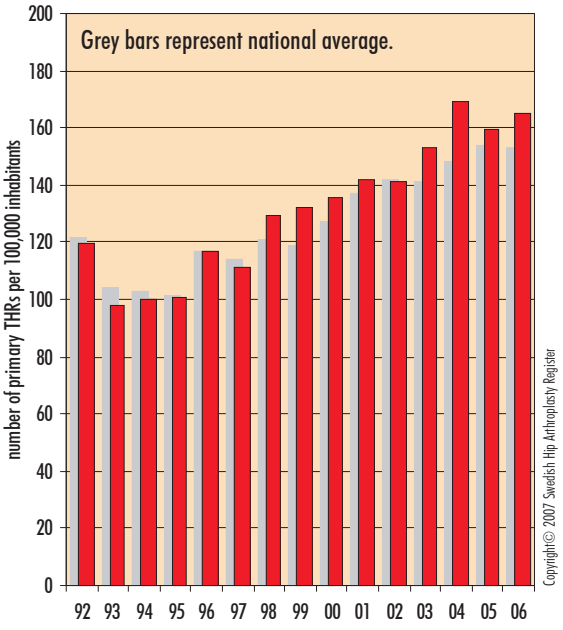
Number of Primary THRs

per type of fixation, 1979-2006



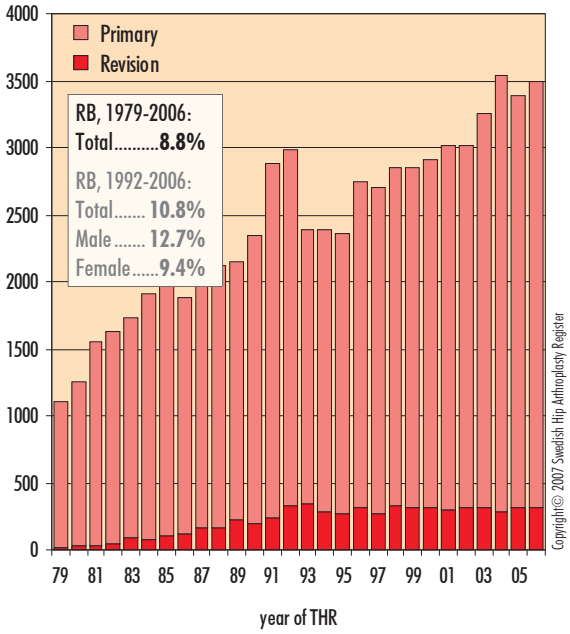
Frequency of Procedure

all primary THRs induded



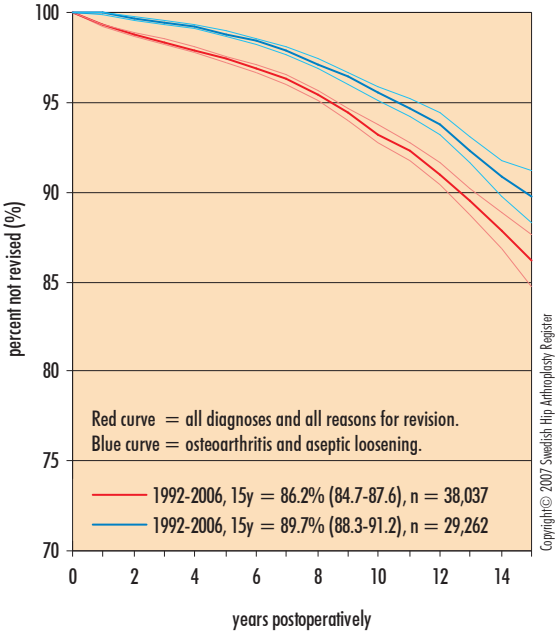
Number of THRs per Year

62,977 primary THRs, 6,098 revisions, 1979-2006



Implant Survival

1992-2006



Number of Primary THRs per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	17,170	2,128	2,303	2,607	2,468	2,586	29,262	76.9%
Fracture	2,647	334	368	339	337	312	4,337	11.4%
Inflammatory arthritis	1,302	99	100	95	86	87	1,769	4.7%
Idiopathic femoral head necrosis	739	78	83	92	85	92	1,169	3.1%
Childhood disease	386	49	69	101	66	92	763	2.0%
Secondary osteoarthritis	193	0	0	0	0	0	193	0.5%
Tumour	95	16	13	14	21	13	172	0.5%
Secondary arthritis after trauma	58	3	7	3	3	2	76	0.2%
(missing)	296	0	0	0	0	0	296	0.8%
Total	22,886	2,707	2,943	3,251	3,066	3,184	38,037	100%

Average Age per Gender and Year

Gender	1992-2001	2002	2003	2004	2005	2006	Total
Male	67.9	67.6	68.0	66.9	67.5	68.0	67.8
Female	70.4	70.8	70.3	70.0	70.5	70.2	70.4
Total	69.4	69.5	69.4	68.7	69.3	69.3	69.3

Region: North

15 Most Common Implants

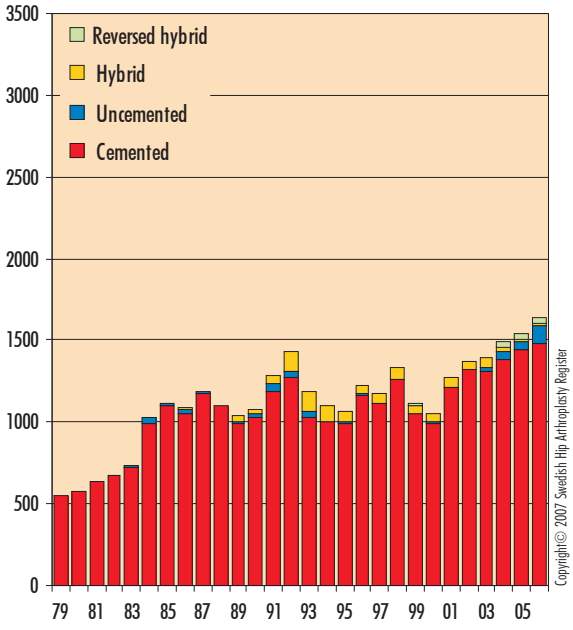
most used during the past 10 years

Cup (Stem)	1979-2001	2002	2003	2004	2005	2006	Total	Share [1)]
Lubinus All-Poly (Lubinus SP II)	9,821	974	1,062	1,190	1,217	1,250	15,514	69.5%
Exeter Duration (Exeter Polished)	633	196	225	187	229	204	1,674	12.5%
Exeter All-Poly (Exeter Polished)	1,131	4	2	0	0	0	1,137	4.2%
FAL (Lubinus SP II)	43	140	20	6	1	15	225	1.7%
Scan Hip Cup (Optima)	423	0	0	0	0	0	423	1.6%
Trilogy HA (Lubinus SP II)	57	53	61	30	5	4	210	1.6%
Reflection (Spectron EF Primary)	212	0	0	0	0	0	212	1.5%
Charnley (Charnley)	2,431	1	1	0	0	0	2,433	1.3%
Reflection HA (Spectron EF Primary)	99	0	0	0	0	0	99	0.7%
Trilogy HA (CLS Spotorno)	0	0	2	1	9	53	65	0.5%
Trident HA (Symax)	0	0	0	0	8	43	51	0.4%
Reflection HA (Lubinus SP II)	82	0	0	0	0	0	82	0.4%
Exeter Duration (Omnifit)	8	0	0	16	10	1	35	0.3%
Scan Hip Cup (Scan Hip Collar)	765	0	0	0	0	0	765	0.3%
Trilogy HA (Omnifit)	0	0	0	17	8	0	25	0.2%
Others (total 184)	8,482	8	28	50	61	66	8,695	
Total	24,187	1,376	1,401	1,497	1,548	1,636	31,645	

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

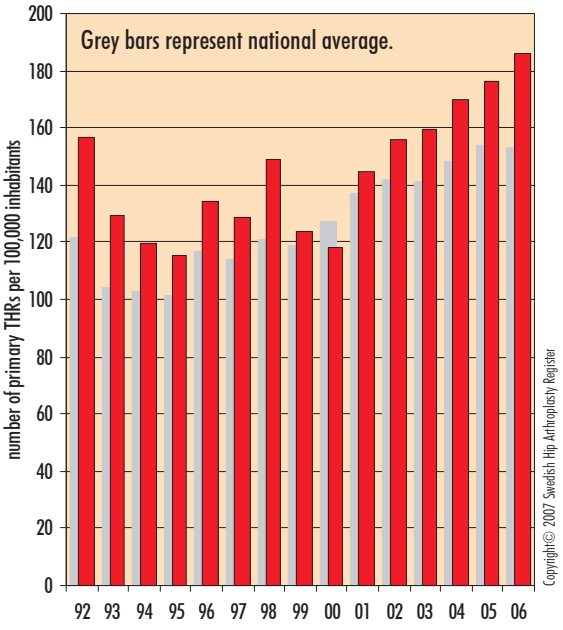
Number of Primary THRs

per type of fixation, 1979-2006



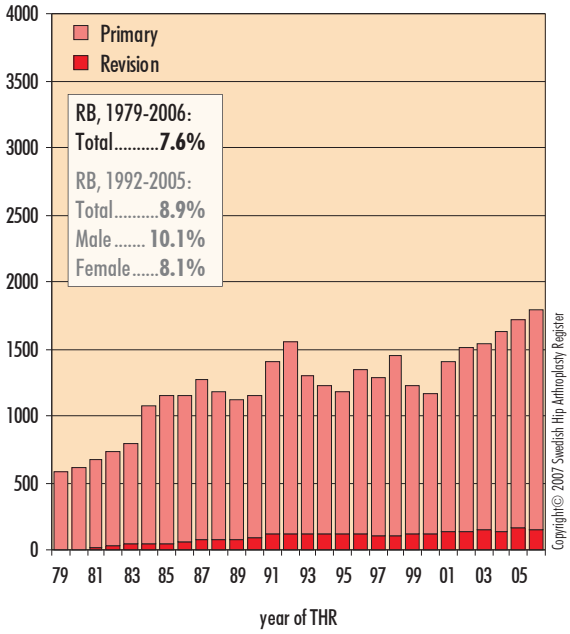
Frequency of Procedure

all primary THRs induded



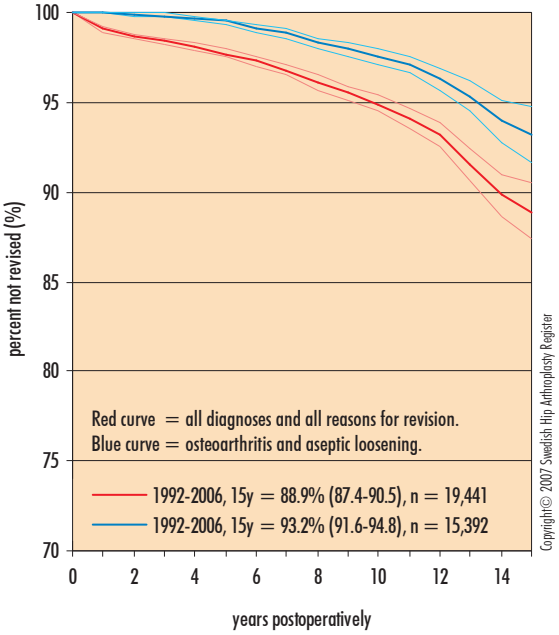
Number of THRs per Year

31,645 primary THRs, 2,604 revisions, 1979-2006



Implant Survival

1992-2006



Number of Primary THRs per Diagnosis and Year

Diagnosis	1992-2001	2002	2003	2004	2005	2006	Total	Share
Primary osteoarthritis	9,038	1,161	1,188	1,229	1,340	1,436	15,392	79.2%
Fracture	1,052	118	114	148	103	86	1,621	8.3%
Inflammatory arthritis	605	37	32	34	31	39	778	4.0%
Idiopathic femoral head necrosis	393	27	30	30	37	30	547	2.8%
Childhood disease	153	26	32	45	27	33	316	1.6%
Secondary osteoarthritis	266	0	0	0	0	0	266	1.4%
Secondary arthritis after trauma	89	0	0	1	0	2	92	0.5%
Tumour	33	7	5	10	10	10	75	0.4%
(missing)	354	0	0	0	0	0	354	1.8%
Total	11,983	1,376	1,401	1,497	1,548	1,636	19,441	100%

Average Age per Gender and Year

Gender	1992-2001	2002	2003	2004	2005	2006	Total
Male	67.9	67.5	67.2	67.3	67.5	67.3	67.7
Female	70.0	69.7	69.4	68.9	68.9	68.7	69.7
Total	69.2	68.7	68.5	68.3	68.3	68.1	68.9

Notes

National quality indicators

Background

The Swedish government earlier commissioned the National Board of Health and Welfare and Swedish Association of Local Authorities and Regions (SALAR) as follows:

- The National Board of Health & Welfare in consultation with SALAR is to formulate national quality indicators able to reflect various aspects of quality in health and medical care.
- The indicators should be clear, reliable, measurable, accepted and possible to register continuously in management systems such as registers and other sources of data.
- Principals are to run systematic quality control and to report their results in an open, comparable and accessible manner.
- All care providers are to use nationally established quality indicators when following-up their activities and must openly report results, quality and costs as part of ongoing improvement programmes.

The above commission for the National Board of Health and Welfare is basically the same as that given by SALAR to the national quality registers for implementation at hospital level.

Implementation

Within the medical areas in which national quality registers had already been established, the National Board of Health and Welfare and SALAR started collaboration with the registries to produce adequate indicators. One basic demand was that the indicators should be reported openly. Following discussion with Registry management, the following indicators were selected from the Hip Arthroplasty Register:

- **Short-term complications**, i.e. reoperation (of all types) within two years of primary surgery, are reported for the four most recent years. This variable should be considered in this context as a 'rapid' quality indicator. Note that the report covers complications that have been dealt with surgically, see section 'Short-term complications – reoperation within two years'
- **Ten-year survival of prostheses according to traditional Kaplan-Meier statistics.** The definition of failure is replacement of one or both components or definitive removal of the implant. All primary diagnoses and all causes of revision surgery are included. The result relates to the period 1992 to 2006 inclusive. This variable must be considered as 'slow' but in the long-term is an important quality indicator.
- **EQ-5D index benefits one year after surgery.** The government's commission stipulates 'that indicators reflecting patient-perceived quality should be included'. The patient-related outcome with health benefits is an important variable for this patient group undergoing surgery with low HRQoL as an indicator for the measure. This variable should also be considered as a 'fast' quality indicator.

On 19 June 2006 the report *'Quality and Efficiency in Swedish Health Care – comparisons between county councils 2006'* was published. This report presented 57 national indicators of quality and efficiency in different sections of health and medical care. The report aroused great reaction in the mass media since for certain indicators it showed great variability in results for different county councils/regions. The indicator from the Hip Arthroplasty Register most discussed in the media was the newly-reported variable Reoperation within two years.

In October 2007 report number two was published. In the next report the same indicators are to be published at county-council/regional level. Eventual publication of the national indicators at hospital level has been discussed centrally; however, the Swedish Hip Arthroplasty Registry already started this in last year's Report.

In this year's analysis we have also taken into account the gender perspective, i.e. all three indicators are presented as whole-group results and then by gender.

Results

When interpreting these results it is important to take account of the confidence intervals shown clearly in the diagrams. Where the confidence intervals overlap there is probably no statistically significant difference between the results presented.

Patient demography ('case-mix' – included in the tables) must also be taken into account between the various county councils. Some county councils lack a university/regional hospital within their area and can then work with a lower-risk patient composition.

Short-term complications. As already stated the complication ratio is low and should be evaluated with caution. This quality indicator can really only be evaluated over time, i.e. if there are clear trends in the previous two years' analyses.

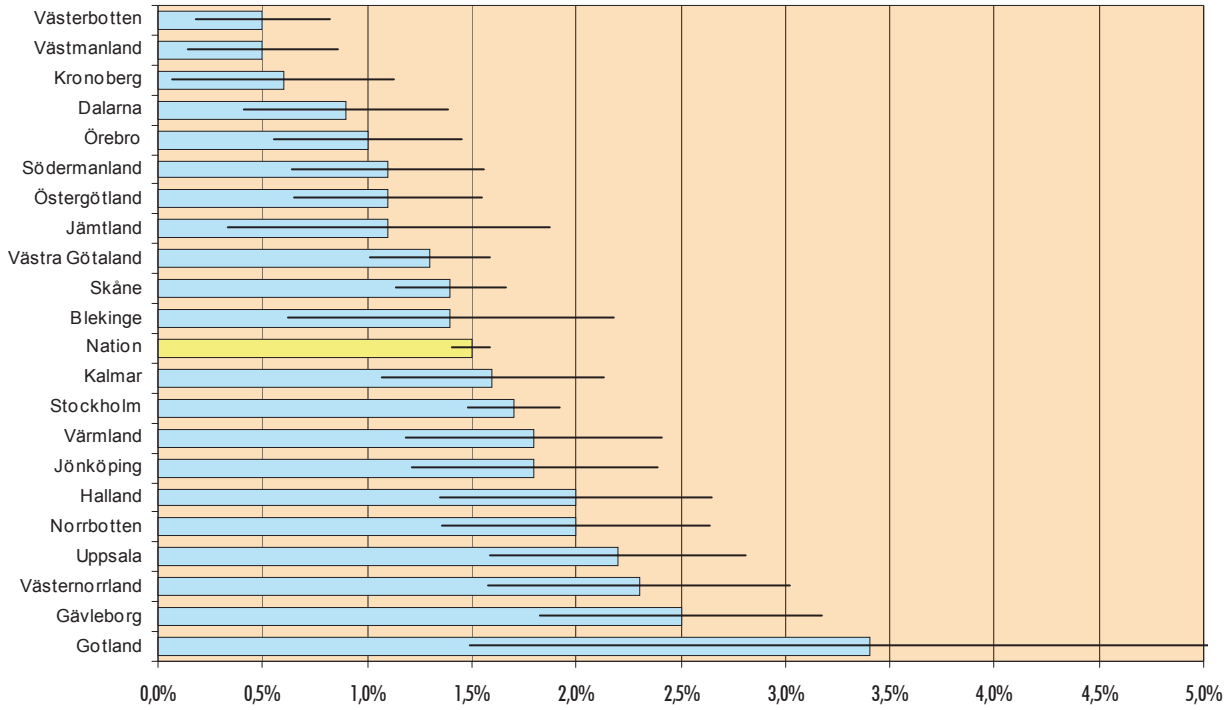
Ten-year survival. Four county councils/regions have statistically lower ten-year survival and the rest better than or equivalent to the national average. Each county council/region should analyse its results.

EQ-5D index benefit. Starting next year, all county councils and regions will be able to present one-year results. It is however very important to report these indicators now in support of the continued introduction. For this variable, the confidence interval is not stated since health benefit measurement has not yet achieved national coverage.

Gender perspectives. All three indicators show differences between the sexes. Many earlier studies have shown a generally increased risk of reoperation and revision for men. The present results confirm these earlier findings. Large population studies (cross-sectional studies) in Sweden have shown that women in general report poorer HRQoL than men of corresponding ages. However, the EQ-5D gain is the result of a prospective longitudinal study in which the women gave marginally better mean health benefit values.

Reoperation within 2 years per County

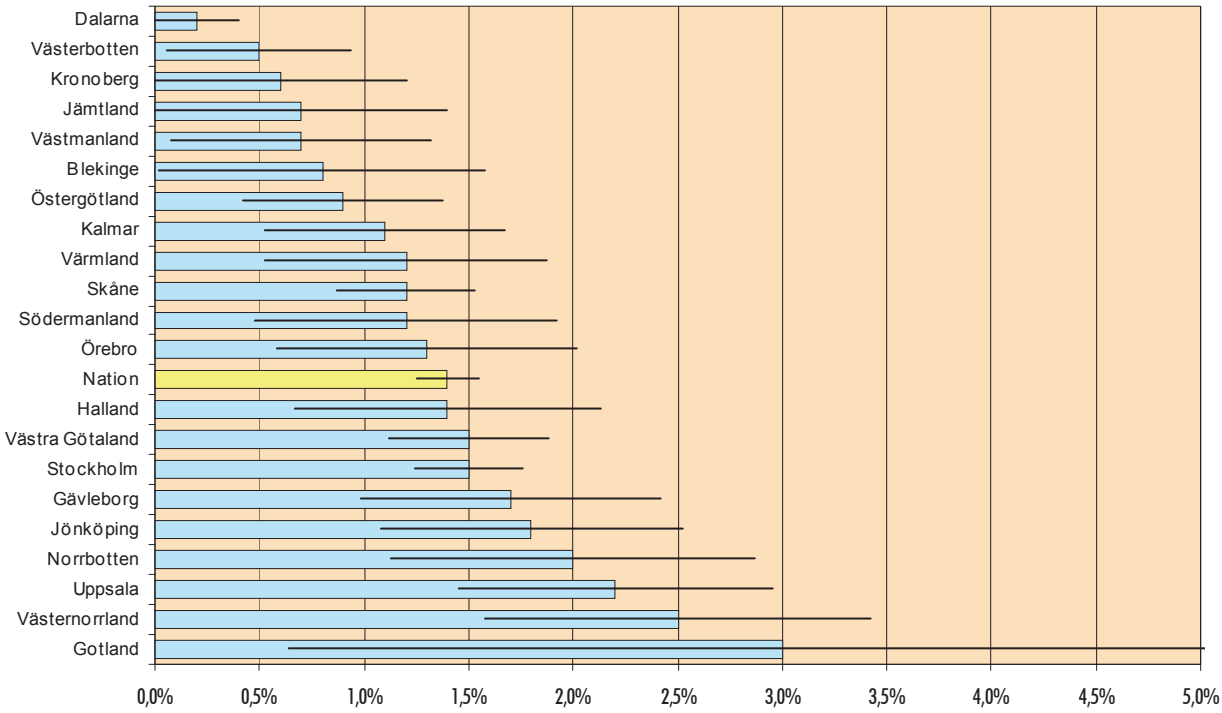
2003-2006



	Primary THRs	— Total —		— Infection —		— Dislocation —		— Loosening —		— Others —	
	Number	Number	%	Number	%	Number	%	Number	%	Number	%
Västmanland	1,347	7	0.5%	0	0.0%	5	0.4%	1	0.1%	1	0.1%
Västerbotten	1,711	9	0.5%	4	0.2%	3	0.2%	2	0.1%	3	0.2%
Kronoberg	889	5	0.6%	0	0.0%	1	0.1%	1	0.1%	3	0.3%
Dalarna	1,617	14	0.9%	5	0.3%	5	0.3%	2	0.1%	2	0.1%
Örebro	1,755	18	1.0%	9	0.5%	7	0.4%	0	0.0%	8	0.5%
Jämtland	758	8	1.1%	1	0.1%	4	0.5%	0	0.0%	3	0.4%
Östergötland	2,349	25	1.1%	4	0.2%	16	0.7%	1	0.0%	5	0.2%
Södermanland	1,654	19	1.1%	5	0.3%	5	0.3%	5	0.3%	12	0.7%
Västra Götaland	7,859	99	1.3%	35	0.4%	41	0.5%	9	0.1%	27	0.3%
Blekinge	847	12	1.4%	0	0.0%	8	0.9%	3	0.4%	1	0.1%
Skåne	6,033	87	1.4%	30	0.5%	33	0.5%	9	0.1%	31	0.5%
Nation	53,962	819	1.5%	297	0.6%	326	0.6%	79	0.1%	242	0.4%
Kalmar	1,963	32	1.6%	20	1.0%	13	0.7%	0	0.0%	6	0.3%
Stockholm	10,426	180	1.7%	53	0.5%	77	0.7%	29	0.3%	58	0.6%
Jönköping	2,020	36	1.8%	12	0.6%	17	0.8%	1	0.0%	9	0.4%
Värmland	1,625	30	1.8%	22	1.4%	4	0.2%	1	0.1%	7	0.4%
Norrbotten	1,858	37	2.0%	16	0.9%	17	0.9%	3	0.2%	8	0.4%
Halland	1,738	35	2.0%	23	1.3%	7	0.4%	1	0.1%	10	0.6%
Uppsala	2,225	49	2.2%	17	0.8%	14	0.6%	5	0.2%	19	0.9%
Västernorrland	1,755	40	2.3%	17	1.0%	19	1.1%	0	0.0%	10	0.6%
Gävleborg	2,221	55	2.5%	20	0.9%	24	1.1%	3	0.1%	9	0.4%
Gotland	356	12	3.4%	2	0.6%	3	0.8%	2	0.6%	5	1.4%

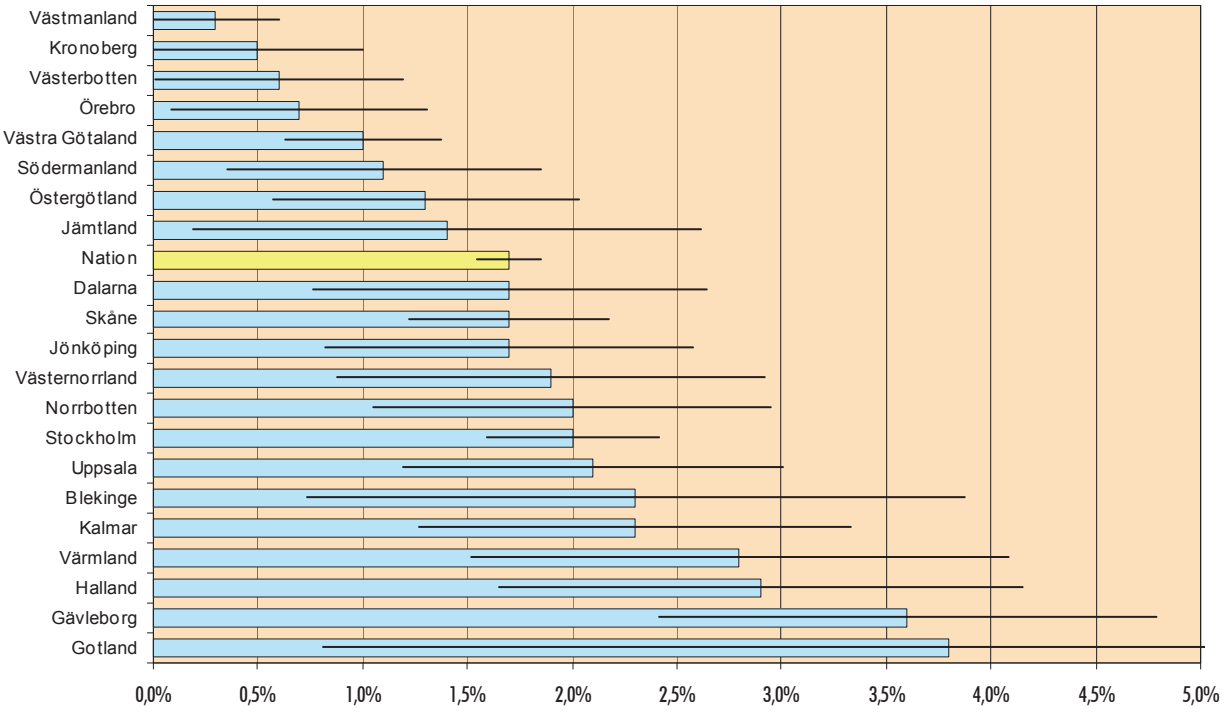
Reoperation within 2 years per County – Women only

2003-2006



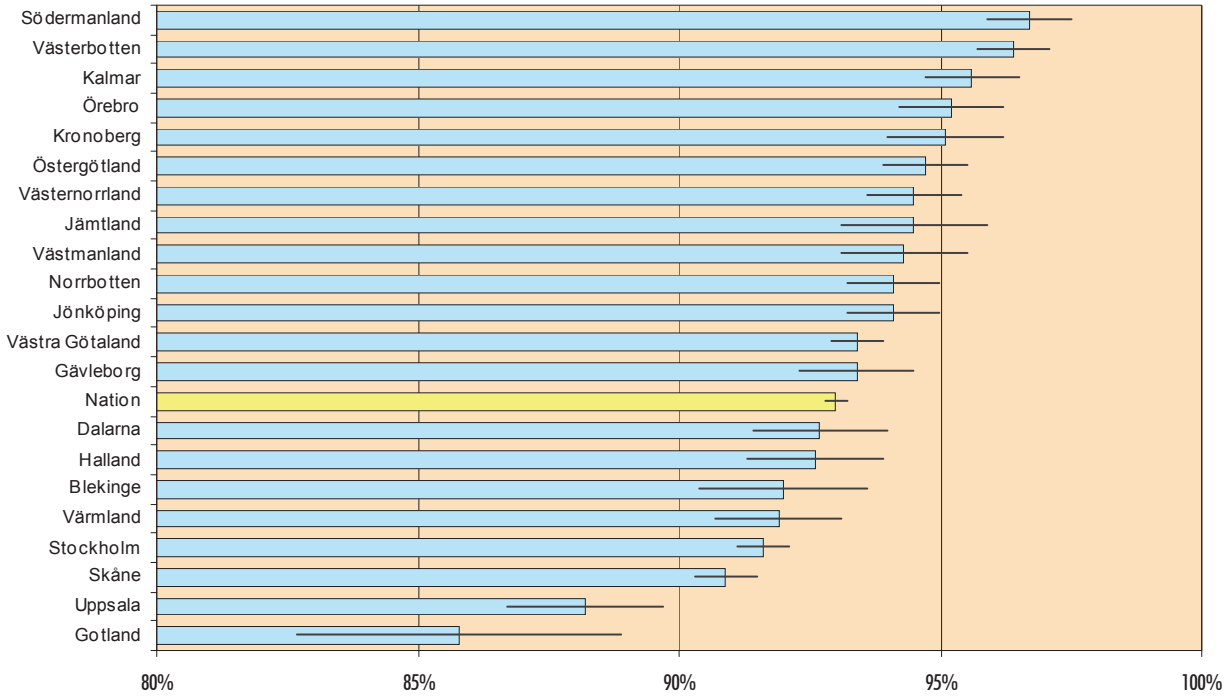
Reoperation within 2 years per County – Men only

2003-2006



Implantat Survival after 10 Years per County

1992-2006

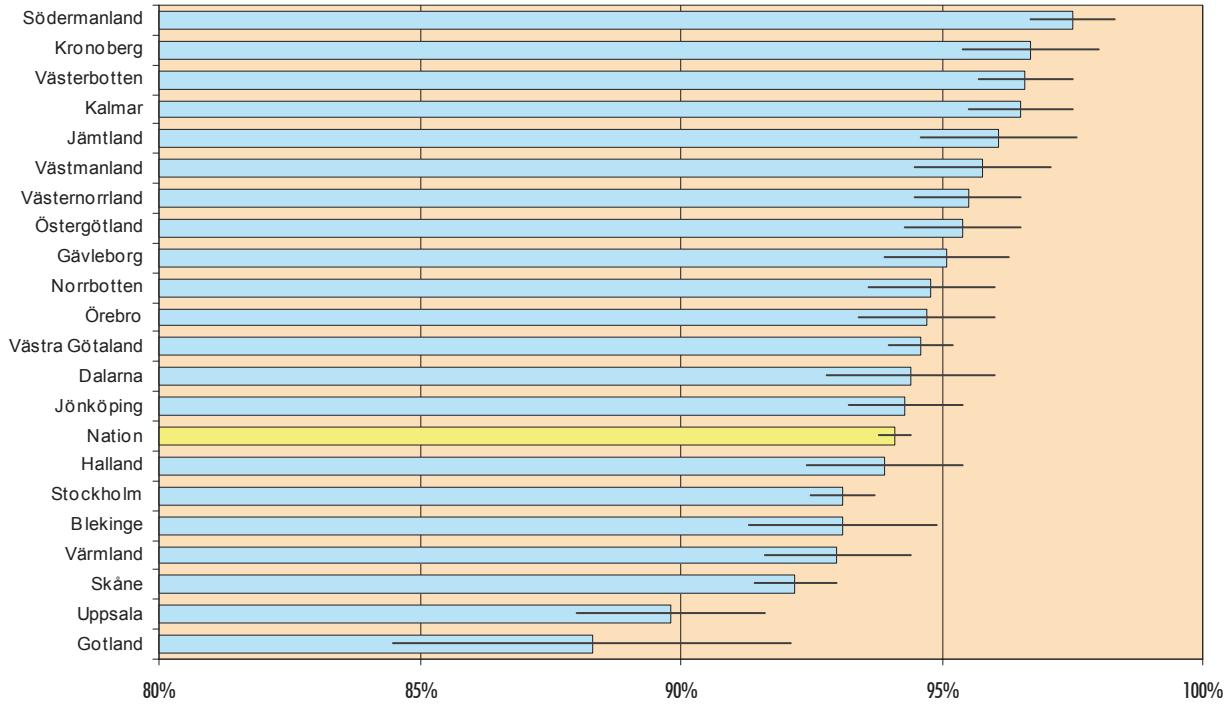


	Number of THRs	OA [1]	≥60 yrs [2]	Female [3]	10 yrs	CI
Södermanland	5,523	76.4%	82.7%	58.4%	96.7%	±0.8%
Västerbotten	5,516	79.3%	81.0%	61.9%	96.4%	±0.7%
Kalmar	5,691	75.3%	84.8%	58.0%	95.6%	±0.9%
Örebro	5,657	79.5%	83.3%	58.8%	95.2%	±1.0%
Kronoberg	3,151	85.4%	82.4%	55.4%	95.1%	±1.1%
Östergötland	8,047	71.6%	82.9%	60.4%	94.7%	±0.8%
Jämtland	2,303	83.5%	83.3%	55.7%	94.5%	±1.4%
Västernorrland	5,795	84.8%	81.6%	61.2%	94.5%	±0.9%
Västmanland	4,237	82.3%	82.6%	57.9%	94.3%	±1.2%
Jönköping	6,605	83.3%	84.3%	57.5%	94.1%	±0.9%
Norrbotten	5,827	76.7%	82.2%	60.7%	94.1%	±0.9%
Gävleborg	6,325	76.5%	83.8%	60.0%	93.4%	±1.1%
Västra Götaland	25,875	77.6%	81.1%	59.6%	93.4%	±0.5%
Nation	169,623	78.2%	81.9%	60.3%	93.0%	±0.2%
Dalarna	4,804	84.6%	82.1%	56.6%	92.7%	±1.3%
Halland	5,325	80.9%	84.1%	57.6%	92.6%	±1.3%
Blekinge	2,677	82.0%	81.2%	60.1%	92.0%	±1.6%
Värmland	5,563	78.9%	84.7%	60.0%	91.9%	±1.2%
Stockholm	30,881	79.0%	80.1%	64.4%	91.6%	±0.5%
Skåne	19,691	74.9%	81.7%	60.8%	90.9%	±0.6%
Uppsala	5,928	67.4%	79.3%	61.2%	88.2%	±1.5%
Gotland	1,239	83.2%	82.4%	55.2%	85.8%	±3.1%

[1] Share of primary THRs performed due to primary osteoarthritis.
[2] Share of primary THRs in the age-group 60 years or older (age at primary operation).
[3] Share of women.

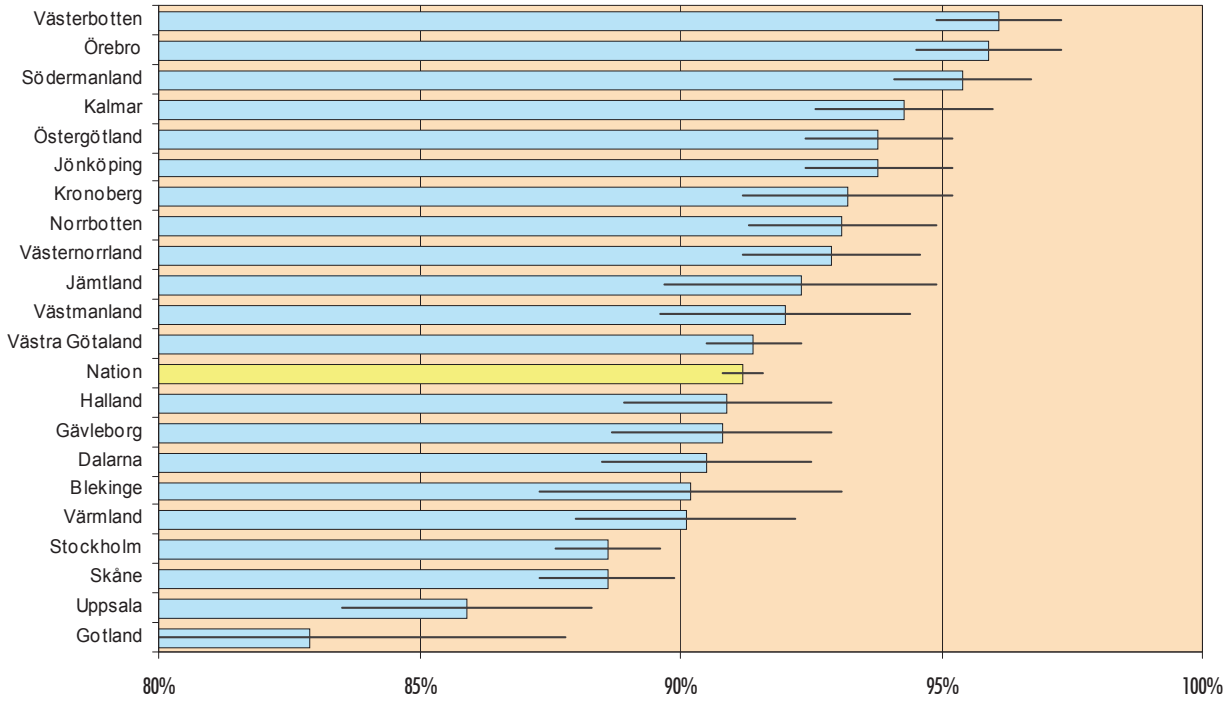
Implant Survival after 10 years per County - Women only

1992-2006



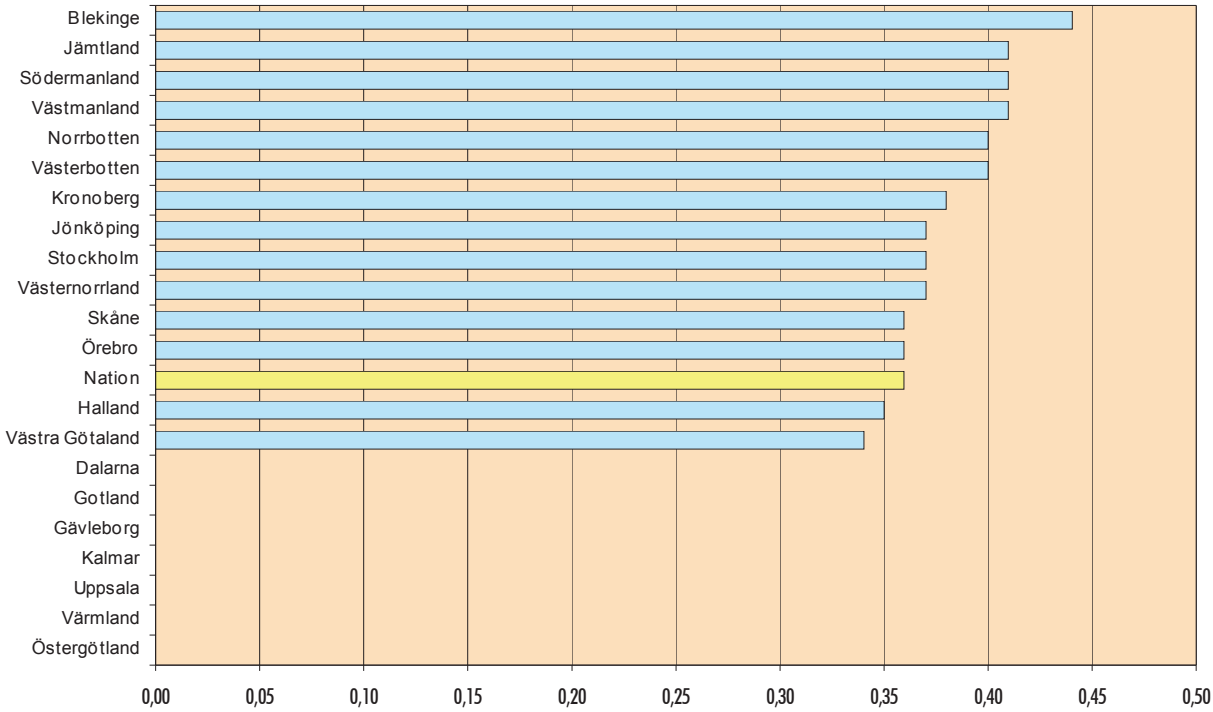
Implant Survival after 10 years per County - Men only

1992-2006



EQ-5D Index Gain after 1 year per County

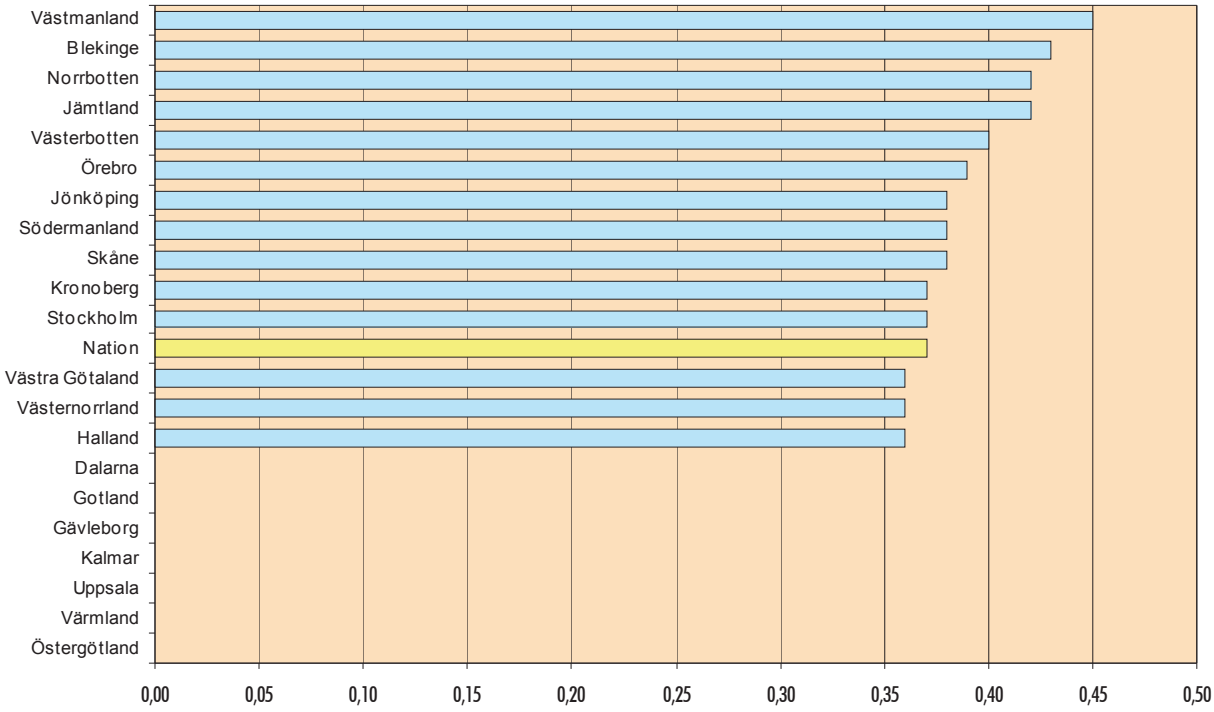
2002-2006



	Share of C-pat. preop.	EQ-5D index preop.	EQ-5D index 1 year	EQ-5D index gained after 1 year	Comments
Blekinge	37%	0.39	0.83	0.44	
Jämtland	33%	0.36	0.77	0.41	
Södermanland	50%	0.33	0.74	0.41	Nyköping has not joined.
Västmanland	36%	0.36	0.77	0.41	
Norrbotten	46%	0.35	0.75	0.40	
Västerbotten	45%	0.37	0.77	0.40	
Kronoberg	45%	0.42	0.80	0.38	
Jönköping	38%	0.41	0.78	0.37	
Stockholm	43%	0.36	0.73	0.37	Huddinge, Norrtälje, Ort.Huset, Sophiahemmet, Stockholms Spec.vård have not joined.
Västernorrland	45%	0.40	0.77	0.37	
Skåne	45%	0.38	0.74	0.36	Helsingborg has not joined.
Örebro	43%	0.45	0.81	0.36	
Nation	43%	0.39	0.75	0.36	
Halland	43%	0.40	0.75	0.35	
Västra Götaland	44%	0.40	0.74	0.34	GMC has not joined.
Dalarna					Joined 2007
Gotland					Joined 2007
Gävleborg	43%	0.39			Joined 2006 (no 1-year results)
Kalmar	40%	0.47			Joined 2006 (no 1-year results)
Uppsala	33%	0.50			Joined 2006 (no 1-year results)
Värmland					Joined 2007
Östergötland	40%	0.45			Motala joined 2006. Norrköping and Linköping have not joined.

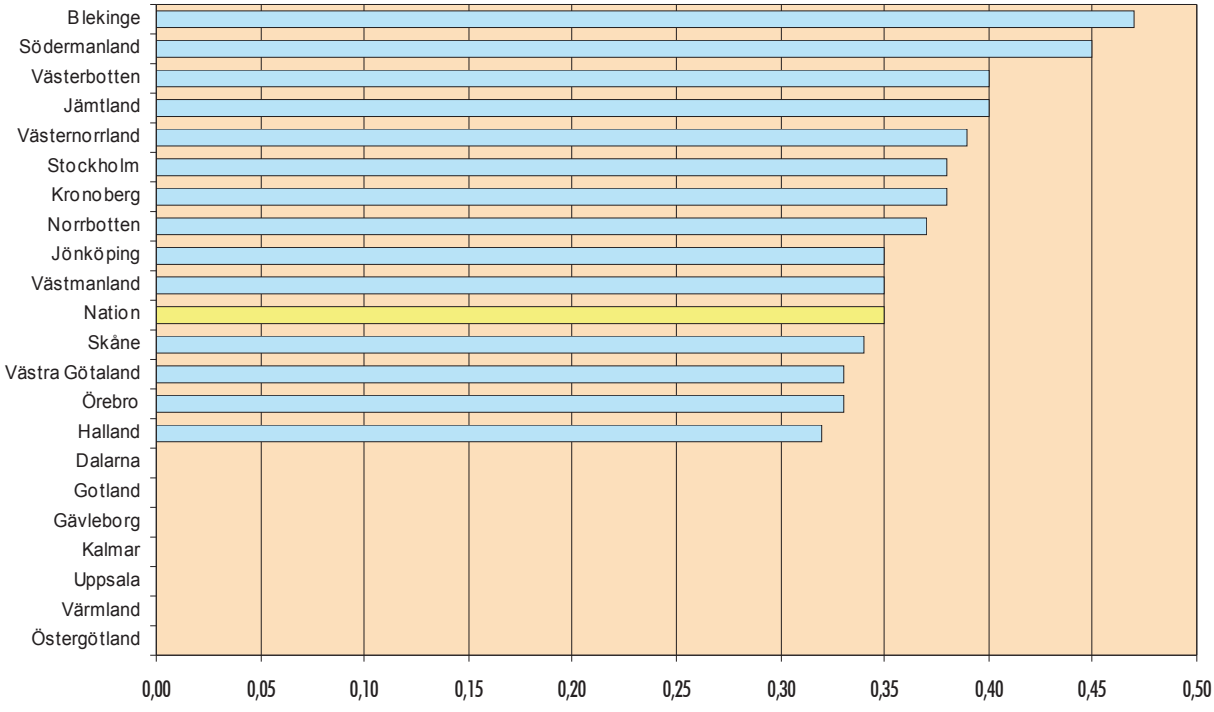
EQ-5D Index Gain after 1 year per County - Women only

2002-2006



EQ-5D Index Gain after 1 year per County - Men only

2002-2006



Summary

Introduction

The Annual Report of the Swedish Hip Arthroplasty Register has as its objective to give an all-round picture of hip replacement surgery in Sweden and to feed back the results to the participating departments so that they may initiate local analyses and, where necessary, start improvement programmes.

Work on the Annual Report is growing in extent as an effect of increased data capture, more openly-reported outcome variables per department and more in-depth analyses. Through development of the new website we had planned for the Report to be available only via the internet. We have, however, noted a stated wish – not least from the profession – for a printed version, for which reason we are continuing to publish the Annual Report in paper form. The Report is also published on our website in its entirety in PDF format.

In Sweden almost exactly the same number of primary hip arthroplasties were carried out in 2006 as in the previous year. This should be seen in the light of increasing demand, that is, there is a need for increased production which, however, may not be at the expense of the quality that Swedish arthroplasty has achieved.

New this year

- This year's big news was the arrival of the hemiarthroplasty database. The infrastructure of the Hip Arthroplasty Register, with local contact secretaries and decentralised data capture, has been exploited and registration thereby achieved national coverage. The first analysis of this new database can already after two years' follow-up clearly show that one of the prostheses used, the Moore prosthesis, has an appreciably poorer result than other implants. We therefore consider that it should not be used. It is our hope that this new part of the Registry will quality-assure an operation that is becoming increasingly common.

- Starting with this year's Report, eight outcome variables per department are reported openly. The chief purpose of these public indicators is not to expose the individual department but to initiate quality-raising measures. Measuring outcome with standardised instruments and openly reporting these has earlier had positive and dramatic effects in e.g. cardiac and diabetes care.

- This year's Report presents the openly-reported variables using a modified clinical value compass. This graphic presentation summarises eight parameters related to outcome and costs, affording an overview of the individual department's follow-up of activities in several dimensions.

- During the autumn the Registry started a thorough modification of its website. The new website has greater focus on information both to patients and to decision-makers. When the website is finished, all department-associated open outcome variables will be reachable direct on the web. It is our hope that the new website will gain a further dimension of interactivity and that it will be a daily tool for the country's orthopaedic departments, GPs and physiotherapists alike. The new website is expected to be complete during the first quarter of 2008 but parts can already be reached via our ordinary web address (www.jru.orthop.gu.se).

- As a step towards further IT development, the Registry has developed an internet-based follow-up questionnaire.

This year's in-depth analyses

This year's Report presents a number of specific analyses.

- **'Case-mix'.** We have earlier indicated the importance of describing the profiles of patients operated on at each department for correct assessment of the demands the activity places upon that department and the expected outcome. In the present Report we therefore present a more extensive analysis of the 'case-mix' factor. We believe that this variable can in the future be further improved. One prerequisite for this however, is increased data capture, and this entails extensive steps. It is not possible to make fair comparisons of results between different hospitals without considering different patient profiles.

- **The patient group up to 50 years.** Following an in-depth analysis of the younger patient group, we can confirm that certain diagnosis groups have a divergent outcome. The result strongly indicates that in the case of sequelae to childhood diseases one should delay hip arthroplasty until all possibilities of conservative joint surgery have been exhausted. These patients should probably also be centralised to units with specific competence. We can note that all cemented prostheses give better results in the younger patient group. We should await long-term results concerning contemporary uncemented implants, and above all the use of highly-cross linked polyethylene, before drawing firm conclusions from the promising short-term results.

- **Gender perspective.** In previous reports we have found that women undergo surgery at higher ages and to a greater extent than men, generally also with better outcomes in terms of risk of reoperation. In this year's Report we elucidate the gender perspective in more detail. We confirm earlier observations but also show that surgical technique regarding choice of surgical approach and fixation method differ between men and women in the combined material. This difference may well be explained by differences in skeletal anatomy, but other causes cannot be excluded. This interesting area should be the object of further study. A further observation is that women report more pronounced pain on a VAS scale but appear to have a better effect of the intervention, which could explain why they are somewhat more satisfied than men. This finding tallies well with earlier studies and cannot therefore be considered unique for Swedish conditions.

- **Operations with 'socket wall addition' following dislocation.** Reoperation owing to repeated dislocation can be an expensive intervention since well-fixed prosthesis components must sometimes be replaced. One way of simplifying the operation is to fix a wall addition onto a well-fixed cup. The intervention is so unusual that individual departments find it difficult to obtain extensive experience, and the literature only discusses results on small material. At the Registry we have been able to study the outcome of almost 1,000 operations, a unique material. In future analyses we plan to compare this with alternative surgical measures. In anticipation of these analyses and in view of the relatively low survival time (about three of 10 revised after ten years) it appears wise to limit the use of 'socket wall additions' to the cases where a more extensive replacement may for various reasons be considered unsuitable.

Improvement programmes

Nationally

The year's analyses show continued reduction in the number of reoperations following total hip replacement in Sweden. The difference compared with last year is small but the trend has been clear for many years. One explanation is that we in Sweden use few and well-documented prosthesis types and similar techniques, and are careful with the introduction of new implant technology and operation techniques. This national continual quality improvement can at least partly be explained by the fact that the Registry has now been active for many years and that Swedish orthopaedic surgeons receive the repeated feedback that the Registry gives via its website, annual reports and orthopaedic meetings.

Locally

Last year's new open variable Short-term complications – reoperation within two years was noted by both decision-makers and the media and led among other things to a very successful local improvement programme at the orthopaedic department in Sundsvall. This variable is a much faster indicator than traditional Kaplan-Meier analyses. The Registry management hope that the departments will continue to run an annual and equally exemplary review of their serious short-term complications, even in departments with low complication frequencies.

Patient-related follow-up via the national follow-up system is now entering its sixth year. Already in the present year's analysis we found large differences in outcome between departments (even those with similar patient demography). These differences are probably due to different routines regarding patient care, information and accessibility. We now have an instrument that can be used for local development of activities regarding care programmes for patients with hip diseases, i.e. measures that can improve a patient's degree of satisfaction and health benefits and that do not need to be directly linked to the actual surgical interventions.

Achievement of goals

The goal of total hip replacement is a satisfied patient with optimal pain relief and satisfaction and an essentially normalised health-related quality of life. The result must also be long-lasting.

The standardised follow-up of all patients with their own evaluations of the result of hip surgery has successively been extended to the whole country. The goal was national coverage of the routine in 2006-2007. However, we still lack nine departments (of 77) for this goal to be achieved. It is chiefly units in the Stockholm region that are not yet connected, but there are now clear indications that the goal can be reached during 2008. Since health benefits measured with the EQ-5D since 2007 are considered as a national quality indicator, the county councils in question have now urged the departments to join.

Hemi-arthroplasty registration achieved national coverage from the beginning on 1 January 2005, see under New for this year. Thus the Registry very quickly achieved its goal of coverage and long-term quality assurance of this surgical measure. Its introduction shows that an established registry can expand or help a newly-started register to reach national coverage – i.e. function as a centre of competence for assistance with data capture, IT solutions and analysis.

It is being discussed nationally and internationally whether patients with dislocated cervical hip fractures should be operated on using hemi- or total arthroplasty. Now that this alternative treatment is collected in one and the same register, we shall within a few years be able to perform unique and relevant analyses of this issue. The results will arouse great international attention.

Problem areas

The problems of declining procedure frequency at the university hospitals remains and is tending rather to increase. This trend must be broken, otherwise there is a great risk that the

quality of the procedure will deteriorate owing to worsened opportunities for education and development. In addition, the possibility of carrying out clinical trials disappears, studies for which Sweden has been praised all over the world.

Since the rural hospitals and above all private hospitals operate on healthier patients with less co-morbidity, and technically simpler cases, this may, paradoxically, and in the age of the care guarantee, lead to worsening accessibility for the more seriously ill and difficult cases.

The purpose of the new care guarantee is to improve the individual patient's opportunities of obtaining adequate care within a reasonable time. Since many county councils have not been able to achieve the goal of the care guarantee they have been forced to adopt short-term solutions with separate contracts with both public and private providers of hip arthroplasty. In this way, accessibility has been improved for those patients who have accepted operations at a different hospital from their own. The Registry management maintain, however, as in previous years, that improved accessibility must be quality-assured both in the short-term and the long-term before it can be adduced as an improved indicator.

The ability of patients who have chosen to use the care guarantee is worsened by the fact that some county councils and regions are unwilling to disclose which patients have been sent to other hospitals due to local lack of resources. It should be in the evident interest of the ownership structure to cooperate in analysing the outcome for this patient group.

Reoperation due to recurrent dislocation remains a problem in Sweden. While the frequency has fallen marginally since the peak in 2004, there is in this area a clear potential for improvement. If all departments followed the programme that the Sundsvall department carried out successfully after last year's Report, the Registry management are convinced that we should achieve an appreciable and lasting decline in this complication with high patient morbidity.

Patients revised owing to earlier and serious complications such as dislocation and infection constitute a problem group,

since the risk is great that they will have to be reoperated on several times. At first revision, they together represent about 15% of the total number. In the group revised more than twice, this proportion has increased to almost half (48.2%). In the group revised more times, there is also an excess representation of patients with inflammatory joint disorders, sequelae of childhood disease and secondary osteoarthritis following trauma.

This result may indicate that technically difficult or unusual revisions should be centralised to special units.

The Registry has for many years reported the procedure frequency from all regions throughout the country. Two regions: Stockholm and Gotland and the western region have since 1992 had lower procedure frequencies per 100,000 inhabitants than the rest of the country. For the western region this difference has even been accentuated during the past few years. Even though reporting has for many years shown lower production in these parts of the country, no active measures known to the Registry management have been taken.

Politicians and other decision-makers should make better use of the extensive register results as a tool for control and decision in medical care.

Current trends

The greatest change regarding selection of implants is a trend towards greater use of uncemented implants. Choice of implant within each fixation group remains fairly constant and is based on choice of a relatively small number of well-documented prosthesis designs. This is in all probability an effect of the fact that information from the Hip Arthroplasty Register has influenced the whole profession to the great benefit of Swedish medical care. How far the trend change towards increasing use of uncemented fixation is warranted remains to be seen.

Conclusion

The increasing activity of the Hip Arthroplasty Register is reflected in rising annual costs. Work on the new website, consolidation of databases and incorporation of the hemiarthroplasty database have entailed, and will entail, increasing costs. Complete funding of our activity by the community should be self-evident in view of the fact that the Hip Arthroplasty Register has contributed to Sweden having the world's lowest reported reoperation frequency. This has saved Swedish medical care between SEK 1 and 1.5 billion during the past ten years.

The year has seen continued discussions on future financing, but as yet we have made no final decision on this. Decision-makers within the county councils must act rapidly to avoid financial crises among the quality registers. Every year the Registry management devotes considerable time to chasing

one-off and short-term financing: this time could instead have been used for continued development of the register.

The Swedish Hip Arthroplasty Registry cooperates with other orthopaedic registries in the National Competence Centre for Orthopaedics (NKO, Lund, www.nko.se). The goal is to coordinate techniques for collection and reporting of data and to increase collaboration between the various regions, among other things with joint research projects. Together with the Knee Arthroplasty Registry, the Hip Arthroplasty Registry has carried out health-economic and mortality analyses.

The newly-introduced Nordic association – the Nordic Arthroplasty Register Association – is an exciting novelty with great potential for continued development of relevant 'case-mix' variables. This in turn will improve opportunities for making international comparisons of the results of hip replacement surgery.

Other promising news is that the new Swedish Patient Data Act will make individual-based co-processing with other quality registers and with the EpC registers more easy. This may in the future create unique possibilities for continued studies of hip arthroplasty regarding patient demography, outcome, costs and mortality, and more. If the new Act can also create increased opportunities for co-processing with municipal and insurance office databases, this will create material for health-economic analyses of high quality and transparency.

The Registry's management wish to record their thanks for good cooperation during the past year. It is evident that our joint work is becoming increasingly interactive and is thereby also stimulated by the reporting of results in a more active and constructive way. Together, we can further improve the quality of Swedish hip arthroplasty surgery and gain more and more satisfied patients. We are happy to receive suggestions for further in-depth analyses. The management are also grateful for comments and views on this Annual Report, both from the profession and from decision-makers.

Photo: Göran Garellick

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2.2 Operative Steps: Femur, pages 28-36
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