Swedish Hip Arthroplasty Register

Annual Report 2008
Shortened Version

TOTAL ARTHROPLASTY

299 368
PRIMARIES
1979-2008

36 307
REOPERATIONS
1979-2008
(closed reduction excl.)

29 401
REVISIONS
1979-2008

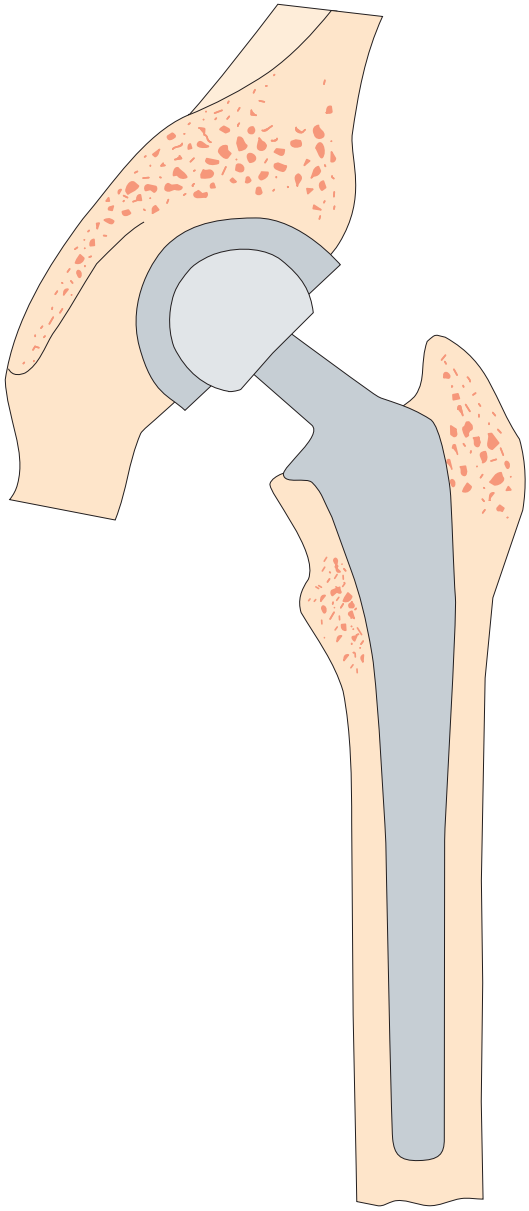
2 313
ENV./TECH PROFILES
1979-2008

74 111
PATIENT OUTCOME
2002-2008

HEMI ARTHROPLASTY

16 835
PRIMARIES
2005-2008

820
REOPERATIONS
2005-2008



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Swedish Hip Arthroplasty Register

Annual Report 2008

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Introduction

The work carried out by the Swedish Hip Arthroplasty Register and other National Quality Registers is attracting more and more attention within all parts of the Swedish healthcare establishment – from politicians, employees and the various professions. Focus on the Register has increased so radically in the past years, that this year we chose to provide information about the interests of the various players for register-based improvements and clinical research in the following section: Vision of the future for National Quality Registers (page 6).

The Swedish Hip Arthroplasty Register has now been active for more than 31 years. Analyses of the significance of different types of prostheses and techniques on the frequency of reoperations in the short and long-term remain as a central task for the registry. The registry's continuous feedback to the profession, has resulted in nationwide adjustment to optimal technique and use of a few and well-documented types of prostheses, which has resulted in continuous improved prosthesis survival.

However, it is the principal task of the registry to analyse the whole process surrounding hip replacement surgery – i.e. to identify predictors for both good and poor results in a multidimensional and individual based manner. In 2002 the registry started to include patient reported results (PROM = patient reported outcome measure) in its set of variables – a measure adopted by several other registries. As the indication for hip replacement surgery, in the first instance, is pain and low health-related quality of life, today it must be seen as obligatory to register and follow these parameters. The 10-year survival of our most common and best-documented prostheses is today over 95% and there is potential for improvement mainly within certain patient groups. There is probably a greater possibility to improve the results seen from the patient perspective by optimising the indication work and implementing non-surgical early care of patients with osteoarthritis of the hip – i.e. to operate on the right patient at the right time.

The structural change within Swedish orthopaedics with development of a few but major elective units and the guarantee of care has contributed to the continued interest for budget driven productivity thinking. Decision-makers have their focus on availability measured as time to treatment irrespective of where it is carried out or the result. These process measures say nothing of the results as experienced by patients, long-term quality and prosthesis function or about the cost-effectiveness of the treatment. Therefore the work of the Hip Arthroplasty Register with both early and late measures of results is of major importance for the future quality of Swedish hip replacement surgery.

The Swedish Hip Arthroplasty Register is now a merger of two registers: one for procedures with total hip prosthesis with osteoarthritis/arthritis as a main indication and one for procedures with so-called hemi-prosthesis with hip fracture as a main indication. The patient groups differ widely: a relatively healthy population with an average age of approximately 70 and a group of patients with an average age of more than 80 with pronounced medical co-morbidity and limited expected survival. Hemiarthroplasty has increased significantly from around 300/year nationally to 4,500/year, as a result of the changed treatment algorithm, for primarily the dislocated femoral neck fracture.

Open reporting

The Hip Arthroplasty Register openly reports a large number of result variables at unit and aggregated county council level. Three of these variables: patient reported health gains (EQ-5D index gain after 1 year), short-term complications of 2-year and 10-year prosthesis survival, are included as national quality indicators in reports issued by Swedish Association of Local Authorities and Regions (SALAR) and the Swedish National Board of Health and Welfare's Öppna jämförelser (*Open comparisons*), which now include 124 indicators.

Open reporting of the hospitals' results is important as a driving force for clinical improvement. However, the interpretation of the results is sometimes difficult and can lead to simplistic and unscientific debate. As quality registry reporting is used more and more for control and planning within the care services, there is a desire on the part of decision-makers to create easily accessible ways of summarising difficult to interpret results in the form of indexation (of several variables) and the ranking of hospitals. This shall then, in turn, be used in a 'choice of care perspective' for the patient. This type of reporting has major statistical methodological problems (mainly dropouts, patient demography and co-morbidity). The Hip Arthroplasty Register avoids totally ranking outcomes but encourages all clinics to analyse their own results as a step in the process of continual improvements.

This year's areas of development

Collaboration with the Nordic Arthroplasty Register Association (NARA) during the year has strengthened. A joint database (Denmark, Norway and Sweden) for hip replacement surgery from 1995 onward has been created, and the first scientific report published. A further 5 manuscripts have been submitted and Finland has announced that they will be joining the organisation. During the year the registry has continued its collaboration with the Epidemiological Centre (EpC, the Swedish National Board of Health and Welfare). A data merging with the Patient Register (PAR) at individual level has also this year been used for analysis of the degree of cover in hospitals and at individual level. Three chapters of this Annual Report build upon material from PAR and several collaborations are, following ethical approval, in preparation.

In last year's report we published cost and cost-effectiveness analysis at hospital level. This year we have abandoned this owing to completely unstandardised cost calculations but will return with this type of analysis when the CPP (cost per patient) system is implemented at all hospitals.

This year's in-depth analyses

The registry's continuous registration and regular reports of standard results are important for maintaining high quality of hip arthroplasty surgery. We have also, for several years, carried out and reported a number of in-depth analyses of different issues. These analyses are not only aimed at clinical improvements but are important for new development and publication of scientific reports.

- The importance of the surgical incision for prosthesis survival, frequency of dislocation and patient reported outcome
- Cups with hydroxylapatite – revision frequency
- Reversed hybrid – revision frequency
- Resurfacing prostheses – revision frequency
- Optimal antibiotic prophylaxis
- Hemi-arthroplasties:
- Posterior versus anterior incision – revision frequency
- Bipolar versus unipolar heads – revision frequency

Degree of completeness

All units (79 hospitals), public and private, that carry out hip replacement surgery are included in the register. All 58 hospitals performing hemi-arthroplasties are also included in the register. The Hip Arthroplasty Register thus has 100% degree of coverage of hospitals (coverage). The degree of coverage for primary replacement at individual level (completeness) is this year controlled via co-processing with the Patient registry at EpC and is reported in detail on page 8. The degree of coverage at national level was 98% for total arthroplasties and 96% for hemi-arthroplasties.

Checking of the degree of coverage for reoperations has still not been implemented owing to the fact that the profession shows a very mixed quality in use of ICD-10 with regard to diagnosis and measure codes. Just as in last year's annual report, we would encourage all hospitals and colleagues to improve within this area. The benefit of high qualitative reporting cannot be overestimated and each unit should strive for 'zero-vision' with regard to dropouts. Patient-reported outcome was reported during 2008 from all hospitals with the exception of two.

Reporting

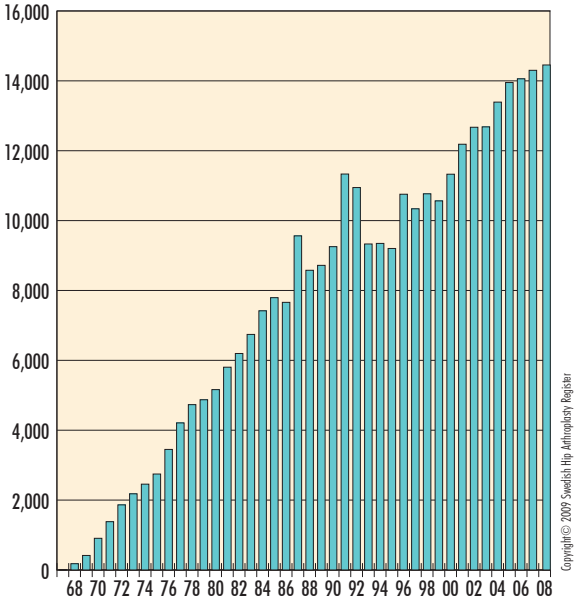
Most units report via the web application. Copies of medical records from reoperations are sent during the year with varying levels of delay. Going through copies of medical records and systemised data collection is necessary for the registration analysis.

Feedback

All publications, annual reports and scientific exhibitions are shown on our website. This year's Report is seriously delayed owing to a number of interacting factors.

The Swedish Hip Arthroplasty Register in collaboration with the Swedish Knee Arthroplasty Register invites all hospitals to an annual user meeting at Arlanda.

Primary total hip replacement in Sweden



Numbers of primary total hip arthroplasties performed in Sweden between 1967 (6 operations) and 2008 (14,105 operations), inclusive.

Center of Registers in Region Västra Götaland

The Swedish Hip Arthroplasty Register moved in late autumn 2008 to new premises at Nordiska Högskolan för Folkhälsovetenskap (NHV) (the Nordic School for Public Health) and together with the Swedish National Diabetes Register and support from Region Västra Götaland (VGR), established the Center of Registers in Region Västra Götaland. On August 24, 2009, the Decision Group for National Quality Registers decided to designate the Center of Registers in Region Västra Götaland Sweden's fifth quality register centre of expertise.

Thank you to all employees

The Hip Arthroplasty Register builds upon decentralised data capture, which is why the hospitals' contact secretaries' and doctors' input are indispensable and invaluable for the functioning of the register.

Many thanks for all your help during the past year!

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Vision of the future for National Quality Registers

During 2008 and 2009 many different players in the community, within politics, health and medical services, academics and business have shown an increased interest in the Swedish National Quality Registers. During the more than 30 years that the Swedish Hip Arthroplasty Register has been in operation interest in its activities and other quality registers has never been as great as now.

This account doesn't have so much to do with the results of Swedish Hip replacement surgery, but we believe that the reader of this report may have a general interest in the following:

- The report *Open comparisons* of the quality of health and medical services will be published for the 4th time in late autumn 2009. 22 national quality registers will contribute this time with 40 quality indicators. The report involves a paradigm shift within Swedish health and medical care, as, instead of budget-driven medical care, it focuses on process and primarily performance measurements, i.e. that medical care in the future will be driven via efficiency rather than productivity. This is something to which the Swedish National Quality Registry has devoted its time over many years but it is actually only now that via the impact of *Open comparisons* (as a broad national assembled report) it has resulted in decision-makers and the professions slowly changing their focus.

- Within the area of Research and Development there has been an increased interest in observation studies (register studies) as a complement to the previous golden standard, i.e. the randomised studies. First and foremost this applies to the surgical disciplines. Both the Delegation for Collaboration within clinical research (the Ministry of Enterprise, Energy and Communications), the Swedish Research Council and the report from the Boston Consulting Group (BCG, see below) highlight the Swedish National Quality Register as an unexploited goldmine of clinical research.

- The possibility in Sweden (after ethical vetting) to carry out data merging between all the personal ID number based statistic databases to which we have access, is unique. As examples, we can mention the health data register which is administered at the Swedish National Board of Health and Welfare, such as the Patient Register (previously the Inpatient Care Register), Cancer, Cause of Death (not ethically protected) and the National Register of Pharmaceutical Products) and the CPP (cost per patient) database of Swedish Association of Local Authorities and Regions.

  One of the most important components in a register's aim for a good degree of coverage is that consensus be reached on registering as few variables as possible but still describes adequate process and performance measurements within the disease group. The collaborations in accordance with the above can result in that fewer variables need to be included in the quality registry's continual data capture.

- Since 2006 Sweden has used a National IT strategy for healthcare. The purpose is e.g. to create a uniform information structure and an enhanced technical infrastructure to facilitate time saving and safe information transfer between systems, such as e.g. a direct transfer of data from the medical notes system to the quality register's databases. Pilot projects with this as a goal have already begun. Only when direct transfer is fully implemented (a number of years from now) and when using touchscreen technology and online questionnaires can the registry's data capture be simplified, double registration avoided and the amount of variables increased.

  Direct transfer is no longer a utopia, but it is important to remember that it will take several years before all registries and medical record systems are adapted to this labour-saving function. Direct transfer will probably not work fully for registers within medical technical areas, such as e.g. The Swedish Hip Arthroplasty Register. In this type of register it is obligatory to generically describe implants, which are not always described in surgery reports. In operating departments, reading off the barcodes on the prosthesis packaging would be an ideal solution – unfortunately, however, there is still no international standard for these barcode descriptions.

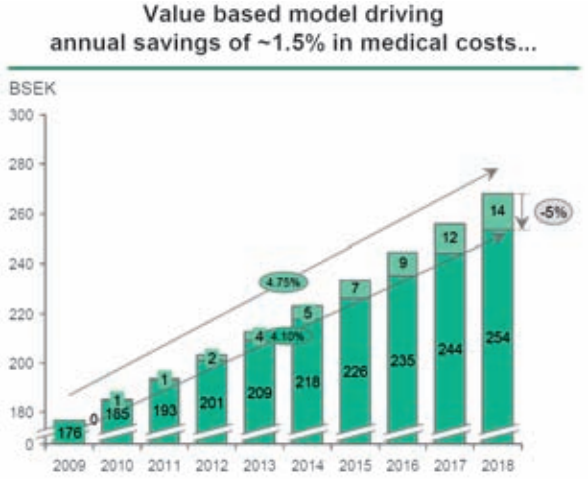
- In spring 2009 the international Boston Consulting Group was commissioned by Carl Bennet AB and AstraZeneca, to investigate the role of the Swedish National Quality Registers within Swedish clinical research. This commission resulted in the report: *Value guided healthcare as a platform for industrial development in Sweden*... The report has e.g. been commented upon in Dagens Industri and Svenska Dagbladet. In the report it was concluded that the Swedish register covers 25–30% of the medical care and that there was a possibility for an expansion to a degree of coverage of approx. 60% of the area. Furthermore, that the register is under-exploited for clinical research, business development and for implementation of best practice. To a large extent this under-utilisation is due to under-financing of the register. The Boston Consulting Group proposes a tenfold increase in the financial support for development of the existing register and for establishing new ones. A part of the finance should come from the pharmaceuticals industry but also from the med-tech area. However, this possible involvement requires an overhaul of legal regulations and the role of the registry as independent auditor.

  The report maintains, with examples from a number of registers, that high quality medical care is cheap medical care, i.e. that an increased financial involvement in the register should be cost-effective. A case study from the report shows that the effect would be a slowing down of the future estimated cost increase regarding healthcare and medical services in Sweden – a commitment of SEK 5 billion over a ten-year period would reduce the cost increase by 1.5%, which expressed in financial terms would be SEK 50 billion. See diagram on following page.

  The report points out 10 of the current registers (69) as leaders in the development ('…exceptional level of quality') and the Swedish Hip Arthroplasty Register is one of these registers. The report has had a major influence on politics, employees and government authorities within the healthcare and medical services sector. An expedited investigation (SALAR-initiated) during the first half year 2010 will have great significance for improved long-term financing of the register

and possibilities for improved clinical research in Sweden.

- 'The third instance'. The present government is currently investigating a 'third instance' outside SALAR and the Swedish National Board of Health and Welfare, which would be given the task of taking responsibility for outcome measurement within health and medical services as well as social services. On June 26, 2009 the Swedish Ministry of Health and Social Affairs published a memorandum: *National strategy for quality development through open comparisons within the social services and health and medical services.* An important source for *Open comparisons* is given as the National Quality Registers. It is therefore possible that the ongoing investigation will propose that the 'third instance' will then administer the register. In the memorandum it points out, precisely as in the BCG report, the profession's crucial role in development, management and interpretation rights of the register.



The figure shows a prognostic calculation from the BCG-report. A tenfold increase of the resources to the national quality registers will result in a 5% decrease of cost development during a 10-year period within the health- and medical care system. An investment of 5 billions during this period would according to the prognosis reduce the cost development with 50 billions. This is under the assumption that the registries cover 60% (today around 30%) of Swedish healthcare system. The figure is published with permission from the Boston Consulting Group.

- The choice of care perspective. Within politics there has for some time been a desire for open reporting from the national quality registers and it will be possible for *Open comparisons* to be used by the patients in a free choice of care situation. This will probably be a requirement in the future and put registry management face to face with tactful pedagogical commissions. In order to achieve adequate and fair patient orientated information requires an increased resource for the use of advanced biostatisticians, communicators and preferably also professional medical journalists. Already, a website, (OmVård.se), financed by the Confederation of Swedish Enterprise, has published three national quality registers results for use for choice of care. The current registry's annual reports are written with the profession as a target group and are not 'case-mix' adjusted, which is why we consider that this web application can only lead to unjust comparisons and is directly misleading for a confused patient in a choice of care situation.

- SALAR and the decision group for the national quality registers, published in 2008 a vision document for continued development of existing and newly established registers:

- The national quality registers follow-up the quality in nursing and healthcare in a multidimensional manner: medical quality (survival, complications, pharmaceuticals etc.), functional quality (whether the patient can walk, dress him/herself, shop etc.) and patient-experienced quality (the patient's assessment of the medical result, pain, treatment, health related quality of life, etc.).

- The national quality registers work actively within measurement-based, patient-focused constant improvement.

- The national quality registers follow the patient through their care and bridge over organisational and professional boundaries.

- The established national quality registers contribute to presenting their results openly, accessibly and adapted to the medical professions, the general public and the management bodies within health and medical services.

- The national quality registers are IT integrated with the medical note system.

Degree of coverage

A high degree of coverage is perhaps the most important of all factors that decide a quality register's success, reliability and possibility of carrying out qualitative improvements and clinical research. Degree of coverage should be stated at individual level (*completeness*). Degree of coverage in respect of participating clinics (*coverage*) is, of course, an important variable, but if the respective participating unit under-reports at individual level, analyses and feedback will be misleading. All units performing hip arthroplasties in Sweden, both public and private, have for many years, participated in reporting to the registry so that the aim of current analyses, is to highlight the degree of coverage at individual level.

In last year's report, the departments' degree of coverage was reported as an open variable, after a collaboration with the Patient Register (PAR, formerly the Inpatient Care Registry), which is one of several health registries in the Epidemiological Centre (EpC) at the Swedish National Board of Health and Welfare. It is a legally compulsory to register with PAR.

Method

After collaborations between the register's databases with the Patient Register (NFB 29, 39, 49 and 99 for total prosthesis; NFB 09 and NFB 19 for hemi-prosthesis) at individual level (personal ID number) there are three different outcomes:

1. Matching of individuals, i.e. patients that were registered in both registers.

2. Individuals who were only registered in the Hip Arthroplasty Register.

3. Individuals who were only registered in PAR.

Degree of coverage for the Hip Arthroplasty Register is stated in the following table as the sum of outcome 1 + 2 and the degree of coverage for PAR as the sum of 1 + 3. We do not know if these results reflect the true degrees as patients may have been operated on with a hip prosthesis without the respective care unit having registered the measure in either of the registries. The number of such cases should be very low in Sweden in 2008.

Weak points in the analyses

1. **Laterality.** In most cases the Patient Register lacks laterality, i.e. right/left do not exist as unique variables, which is the case in the Hip Arthroplasty Register. Patients operated bilaterally in one stage and patients operated on both hips during 2008 may disappear from the Patient Register with the selection criteria chosen in the co-processing. The majority of national and local care registries lack laterality, which should be changed in order to improve the quality of these registers if it is wished to analyse illnesses /operations involving pair organs.

2. **Time lag in registration.** Certain units are chronic 'laggers' – frequently from one year to the next, which is a great disadvantage in this type of necessary quality assurance. Last year's analysis was carried out on the previous year's business year, i.e. 2006, in order to avoid incorrect values owing to 'lagging'. In this year's analysis we have chosen to test the current year (2008). From experience we know that a further 250 to 300 operations will be registered during the following year. The probability is that if we change the co-processing of a year in respect of 2008 the individual based degree of coverage, at least at national level, will increase by a further 1–2%.

3. **Administrative mergers of hospitals and the opposite, i.e. operations carried out at 'satellite hospitals'.** Both these results of structural changes within orthopaedics constitute an interpretation problem in open reporting. Difference in degree of coverage can then be due to non-medical logistical reasons, such as e.g. that a hospital reports to PAR via 'the main hospital' and to the registry via the unit where surgery was carried out. The Karolinska University Hospital/Solna is such an example. KS/Solna takes care of registration to the Swedish National Board of Health and Welfare (PAR). A number of the Karolinska University Hospital/Solna's elective total arthroplasties are carried out at the Ortho Centre (Löwenströmska) and from there reported to the Hip Arthroplasty Register. The registry is always open and will always require that the procedure registration takes place from the hospital body at which the patient has been operated owing to the fact that only then do we have the possibilities to analyse and provide feedback on short-term complications such as infections and dislocations. These complications can be due to process faults / technical faults connected to the current operating unit.

Another example is Trelleborg, where three hospitals (Lund, Malmö and Ystad) carry out operations on the majority of their elective cases. At the last analysis Trelleborg had almost 100% reports to PAR (financial incentive) but only 88.5% degree of coverage to the registry. For local analysis it was found that it was one of the operating units, that at this 'satellite unit', lacked procedures for reporting to the registry. This has now been actioned.

Results

Total arthroplasties. The registry management can, with great satisfaction, establish that in 2008 the participating units further improved their reporting of primary procedures to the register. We think that the open accounting of degree of coverage has had the anticipated effect, i.e. the pressure for local improvement becomes more obvious with open reporting. Hospitals with values under a standard deviation from the national average are marked red in the table. Only five clinics have such a mark.

Just as in the previous analysis, the private units were poor at reporting to PAR; 6 out of 10 were clearly under the standard value and some large units on the whole did not report to the Swedish National Board of Health and Welfare. This fact is notable as registration to PAR is statutory – see last year's report! Only one public hospital was given the red mark for low degree of reporting to this official register.

Hemi-arthroplasties. Hemi-arthroplasty registration has only been in operation for four years. It is therefore noteworthy that the degree of coverage at national level is already up at 96%. Many national quality registers with many years of history only achieve degrees of coverage of 60–80%. There are eight hospitals that fall below the standard value for reporting. It is noteworthy that five hospitals did not achieve the goals for registration to the patient administrative system as these form the basis of the county councils' financial compensation system.

Reoperations and revisions. In a good degree of coverage for this type of intervention register is, of course, included degree of coverage regarding reporting of reoperations/revisions. Analysis of secondary interventions, however, appears to be much more difficult owing to low quality with regard to coding of diagnosis and procedure at the reoperation. Unfortunately, we must state that the situation remains unchanged compared with last year, which is why we cannot account for the units' docility with regard to this important reporting. Again, the registry management would like to encourage all surgeons to devote time and consideration to the code categorisation. This, for statistics and financial compensation such important issues should be included as a defined part of the specialist training.

Degree of fill for new variables. One of the most important parameters with regard to docility to a national register is that as few variables as possible are included in the routine and decentralised data capture. The Hip Arthroplasty Register had fewer than 10 variables up until 2002 when we started including patient reported results. The pressure for new in-depth analyses meant that we, following discussion at a user meeting two years ago, decided to further expand the variables and added length and weight (BMI) and ASA degree for all individual registrations. The registry management is aware of the difficulty of rearranging the input procedures which is why we chose to present degree of coverage/degree of fill of these new variables this year. The national average value for the new variables lies between 80-90%, which must be regarded as a good result but approximately 15 hospitals are wavering somewhat and six have refrained completely from registering. We are hoping for a gradual improvement!

Discussion

We are planning in the future to carry out an annual degree of coverage analysis and to publish the results openly at hospital level in the annual report. This is important for several reasons:

- The new Patient Data Act, which, for the quality registers was introduced on 1 July 2009, places increased demands on registered units to inform patients that they are registered in a national quality register. This could result in more patients choosing not to be included. Therefore the individual hospitals are being set with a pedagogical challenge: to have a procedure for satisfactorily explaining to the patient about the benefit of a national register and that its task is to give each patient optimal treatment. It will probably increase the need for such information in a time of increased public debate about the integrity of the individual in society.

- The continued structural change within Swedish orthopaedic places increased demands on the fact that the patient's operation is registered at the right unit.

- Open reporting and recurrent discussions about the data quality of the register are included as a successful part of a general strategy for increased degree of coverage for all national quality registers.

- The hospital's degree of coverage reimburses costs in the year's hospital specific value compasses (page 80)

- An important part of improving a unit's degree of coverage is to appoint an interested contact doctor and above all, that the current contact secretary is given a job description where it states that he/she be given allocated working time to take care of input in the registry, as well as to allow him/her to visit the Hip Arthroplasty Register for training. The latter is particularly important when the unit for some reason or another changes contact secretary and in the event of reorganisations.

Use the correct ICD-10 diagnosis and measure code!

Degree of coverage for total arthroplasties

registrations during 2008

Hospital	No. [1]	SHAR [2]	PAR [3]
University/Regional Hospitals			
KS/Huddinge	223	98.2%	97.4%
KS/Solna	261	**92.9%**	99.3%
Linköping	58	100.0%	94.8%
Lund	95	**91.3%**	**88.5%**
Malmö	96	100.0%	91.7%
SU/Sahlgrenska + Mölndal + Östra [4]	404	95.5%	95.0%
Umeå	85	97.7%	95.4%
Uppsala	285	98.0%	98.0%
Örebro	164	100.0%	97.6%
Central Hospitals			
Borås + Skene [5]	271	95.8%	96.1%
Danderyd	407	99.0%	98.3%
Eksjö	207	98.1%	99.1%
Eskilstuna	103	100.0%	93.2%
Falun	290	98.0%	98.6%
Gävle	133	97.8%	100.0%
Halmstad	202	98.0%	98.0%
Helsingborg	49	96.1%	98.0%
Hässleholm-Kristianstad	854	99.8%	99.5%
Jönköping	198	99.0%	98.5%
Kalmar	165	99.4%	99.4%
Karlskrona + Karlshamn [6]	199	93.0%	95.3%
Karlstad	234	99.2%	98.3%
Norrköping	265	99.3%	98.1%
S:t Göran	360	98.3%	98.0%
Skövde + Lidköping + Falköping [7]	445	98.2%	97.8%
Sunderby	45	97.9%	97.9%
Sundsvall	112	97.4%	98.3%
Södersjukhuset	445	97.4%	99.1%
Uddevalla	309	98.1%	98.7%
Varberg	203	99.5%	99.5%
Västerås	237	94.8%	97.6%
Växjö	142	94.0%	94.7%
Ystad	6	**75.0%**	100.0%
Östersund	183	98.9%	95.7%
Rural Hospitals			
Alingsås	208	99.1%	97.2%
Arvika	146	**91.9%**	96.3%
Bollnäs	243	96.4%	99.2%
Enköping	220	99.6%	98.7%
Frölunda Specialistsjukhus	78	**89.6%**	96.5%
Gällivare	102	100.0%	99.0%
Hudiksvall	110	100.0%	98.2%
Karlskoga	100	99.0%	99.0%
Katrineholm	250	97.6%	96.4%
Kungälv	191	99.4%	98.9%
Köping	70	100.0%	98.6%
Lindesberg	153	100.0%	98.7%
Ljungby	104	100.0%	98.1%
Lycksele	228	99.5%	99.5%
Mora	196	97.5%	98.5%
Motala	352	98.0%	98.8%
Norrtälje	119	96.7%	99.2%
Nyköping	173	98.3%	93.2%
Oskarshamn	217	98.7%	97.8%
Piteå	332	98.3%	96.8%
Skellefteå	91	98.9%	95.7%
Sollefteå	116	**74.3%**	98.0%
Södertälje	108	97.3%	96.4%
Torsby	79	100.0%	97.5%
Trelleborg	585	99.6%	98.9%
Visby	131	95.6%	96.4%
Värnamo	150	98.1%	98.1%
Västervik	110	99.1%	99.1%
Örnsköldsvik	189	95.5%	94.9%
Private Hospitals			
Carlanderska	44	100.0%	**0.0%**
Elisabethsjukhuset	143	100.0%	**0.0%**
Movement	190	97.9%	99.0%
Nacka Närsjukhus Proxima	13	100.0%	**61.5%**
Ortho Center Stockholm	208	97.2%	98.1%
OrthoCenter IFK-kliniken	91	100.0%	**0.0%**
Ortopediska Huset	500	97.6%	**59.1%**
Sophiahemmet	178	100.0%	**0.0%**
Spenshult	152	96.9%	95.6%
Nation	14,411	97.6%	93.3%

Red marking indicates values one standard deviation below nationwide average.

1) Refers to the number of registrations in the Swedish Hip Arthroplasty Register

2) Refers to the proportion of registrations in both registers or only in the Swedish Hip Arthroplasty Register

3) Refers to proportion of registrations in both registers or only in the National Patient Register

4) These departments are in the National Patient Register combined to 'Sahlgrenska University Hospital'

5) These departments are in the National Patient Register combined to 'SÄ medical care'

6) These departments are in the National Patient Register combined to 'Blekinge Hospital'

7) These departments are in the National Patient Register combined to 'Skaraborg Hospital'

Degree of coverage for hemi-arthroplasties

registrations during 2008

Hospital	No. [1]	SHAR [2]	PAR [3]
University/Regional Hospitals			
KS/Huddinge	67	95.7%	98.6%
KS/Solna	58	92.0%	93.6%
Linköping	57	**80.3%**	100.0%
Lund	170	92.9%	90.7%
Malmö	220	99.6%	94.2%
SU/Sahlgrenska + Mölndal + Östra [4]	328	96.5%	90.9%
Umeå	69	97.2%	95.8%
Uppsala	144	97.3%	91.2%
Örebro	106	100.0%	95.3%
Central Hospitals			
Borås + Skene [5]	108	95.6%	94.7%
Danderyd	105	97.2%	93.5%
Eksjö	47	94.0%	96.0%
Eskilstuna	65	98.5%	97.0%
Falun	113	94.9%	94.9%
Gävle	124	100.0%	89.5%
Halmstad	78	100.0%	97.4%
Helsingborg	146	96.1%	94.7%
Hässleholm-Kristianstad	130	100.0%	96.9%
Jönköping	60	96.8%	90.3%
Kalmar	119	98.4%	95.1%
Karlskrona + Karlshamn [6]	103	92.0%	**76.8%**
Karlstad	46	95.9%	93.8%
Norrköping	62	98.4%	96.8%
S:t Göran	166	97.6%	95.9%
Skövde + Lidköping + Falköping [7]	112	96.5%	89.6%
Sunderby	140	99.3%	97.2%
Sundsvall	55	100.0%	96.4%
Södersjukhuset	236	97.1%	93.0%
Uddevalla	235	97.1%	95.5%
Varberg	67	91.7%	97.2%
Västerås	128	92.1%	88.5%
Växjö	57	**82.6%**	94.2%
Ystad	43	**89.6%**	89.6%
Östersund	72	96.0%	88.0%
Rural Hospitals			
Alingsås	35	94.6%	94.6%
Arvika	16	**88.9%**	88.9%
Gällivare	5	100.0%	100.0%
Hudiksvall	61	100.0%	95.1%
Karlskoga	24	100.0%	95.8%
Katrineholm	1	100.0%	100.0%
Kungälv	57	96.7%	**84.8%**
Lindesberg	14	**87.5%**	100.0%
Ljungby	31	100.0%	96.8%
Mora	48	98.0%	95.9%
Motala	38	97.4%	**79.5%**
Norrtälje	13	**72.2%**	100.0%
Nyköping	38	92.7%	90.2%
Skellefteå	47	96.0%	91.9%
Sollefteå	46	95.9%	**81.3%**
Södertälje	30	96.8%	100.0%
Torsby	30	93.8%	90.7%
Trelleborg	4	**80.0%**	100.0%
Visby	21	100.0%	95.2%
Värnamo	35	100.0%	94.3%
Västervik	27	93.1%	100.0%
Örnsköldsvik	30	**81.1%**	**86.5%**
Nation	4,487	95.9%	93.1%

Red marking indicates values one standard deviation below nationwide average.

1) Refers to the number of registrations in the Swedish Hip Arthroplasty Register

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4) These departments are in the National Patient Register combined to 'Sahlgrenska University Hospital'

5) These departments are in the National Patient Register combined to 'SÄ medical care'

6) These departments are in the National Patient Register combined to 'Blekinge Hospital'

7) These departments are in the National Patient Register combined to 'Skaraborg Hospital'

Degree of filling for new variables

concerns primary THRs performed in 2008

Hospital	Number	ASA
Alingsås	207	100%
Arvika	148	95%
Bollnäs	243	99%
Borås	193	99%
Carlanderska	44	91%
Danderyd	404	94%
Eksjö	208	100%
Elisabethsjukhuset	143	100%
Enköping	222	100%
Eskilstuna	103	100%
Falköping	212	100%
Falun	289	100%
Frölunda Specialistsjukhus	78	26%
Gällivare	102	97%
Gävle	136	99%
Halmstad	202	94%
Helsingborg	49	0%
Hudiksvall	111	97%
Hässleholm-Kristianstad	853	90%
Jönköping	204	84%
Kalmar	165	99%
Karlshamn	182	30%
Karlskoga	100	100%
Karlskrona	17	18%
Karlstad	243	93%
Katrineholm	255	100%
KS/Huddinge	220	67%
KS/Solna	261	99%
Kungälv	191	92%
Köping	70	100%
Lidköping	134	95%
Lindesberg	153	100%
Linköping	58	88%
Ljungby	104	99%
Lund	96	19%
Lycksele	230	98%
Malmö	97	94%
Mora	195	92%
Motala	352	57%
Movement	190	99%
Nacka Närsjukhus Proxima	13	31%
Norrköping	265	100%
Norrtälje	120	97%
Nyköping	178	0%
Ortho Center Stockholm	208	100%

(continued on next page.)

Degree of filling for new variables (cont.)

concerns primary THRs performed in 2008

Hospital	Number	ASA
OrthoCenter IFK-kliniken	94	100%
Ortopediska Huset	500	99%
Oskarshamn	217	99%
Piteå	333	100%
S:t Göran	360	99%
Skellefteå	91	96%
Skene	78	97%
Skövde	98	100%
Sollefteå	112	0%
Sophiahemmet	178	100%
Spenshult	153	99%
SU/Mölndal	294	99%
SU/Sahlgrenska	8	75%
SU/Östra	106	95%
Sunderby (incl. Boden)	45	89%
Sundsvall	114	96%
Södersjukhuset	431	97%
Södertälje	107	99%
Torsby	79	99%
Trelleborg	599	91%
Uddevalla	309	64%
Umeå	83	37%
Uppsala	288	92%
Varberg	203	100%
Visby	132	99%
Värnamo	149	92%
Västervik	110	93%
Västerås	239	97%
Växjö	142	92%
Ystad	7	0%
Ängelholm	6	0%
Örebro	164	100%
Örnsköldsvik	189	95%
Östersund	185	99%
Nation	14,451	90%

Red marking indicates values one standard deviation below nationwide average.

Primary total hip replacement

In the past 10-year period the number of primary arthroplasties has increased by almost 4,000 operations per year. During 2008 14,451 primary hip arthroplasties were registered, an increase of 149 compared with the previous year. During the past five years the percentage of women has remained relatively constant between 58.7 and 59.6%. The average age for men fluctuates around 67 and the average age for women around 70. Since 2005 the proportion of primary osteoarthritis constituted approximately 83%. The diagnosis group inflammatory joint disease is small and is steadily falling. During the past 5-year period its proportion has reduced from 2.7 to 1.9%. As a comparison it can be mentioned that in 1992 a corresponding patient group constituted 8.8% of the total number of primary hip prostheses inserted. Around 10% of the patients that have a primary prosthesis have the diagnosis, fracture. Since 2004 the proportion has fluctuated between 8.8 and 10.9%. During 1998 the highest value was noted. Then these patients constituted 13.1% of all registered hip arthroplasties.

Clinic group

Since 1992 the proportion of patients operated upon at university hospitals has more than halved. During the past three years it appears, however, that there has been a certain stabilisation at the level 11 to 12% of the total number. Even the proportion operated upon at central hospitals has been reduced, however, not to the same extent, from 44.4% 1992 to 37.8% 2008. The private hospitals have almost increased tenfold their share from 1.2% 1992 to 10.5% 2008. The increase gained pace at the end of the last century and continues still.

During 2008 younger patients were operated upon at university and private hospitals (average age 65.9 and 66.1 respectively) than at central and rural hospitals (average age 69.5 and 69.1 respectively). Central hospitals and university hospitals operated upon the largest proportion of women (61.5 and 59.1% respectively) whilst the rural hospitals and private hospitals operated upon relatively fewer women (57.9 and 56.6% respectively). The average ASA degree was highest at the university hospitals and lowest at private hospitals. The proportion of patients with primary osteoarthritis was lowest for the university hospitals (61%) and increased for central hospitals and rural hospitals to 78.5 and 90.2% respectively. At the private hospitals the diagnosis primary osteoarthritis, constituted 95.4% of the patients.

Summary: We find clear demographic differences depending on type of hospital where the university hospitals have a dominance of somewhat younger and sicker patients with secondary osteoarthritis, the central hospitals showed a similar profile, yet closer to the national average whilst the rural hospitals and above all, the private hospitals have a relative dominance of healthier and somewhat younger men with primary osteoarthritis.

Operation technique

Posterior approach incisions, from having comprised more than 65% of the total proportion during the year 1992, have slowly reduced to 52% in 2008. This reduction has above all taken place during the past years and in favour of anterior lateral incisions, patient lying on side (Figure 1). The background to this is probably a desire to reduce the risk of dislocation (see separate heading, Incision). In 2003 the mini-incision technique began to be used in Sweden. This technique became more and more common up until 2007 but from 2008 decreased from 2.1% during 2007 to slightly less than 0.8%. In last year's Annual Report we showed a strong increased risk of early revision with mini incision, something that together with other studies has probably influenced the development in Sweden.

Both anterior and posterior approach incisions are used at all types of hospitals. During the past 3 years the anterior lateral incision has dominated at university and private hospitals whilst the posterior has been more common at central and rural hospitals. The mini incision is mainly carried out at university and private hospitals.

Summary: There is a reduction in the use of the posterior incision and an increase in the anterolateral, patient on side approach.

Choice of fixation

During the past 10-year period there has been a slow but continual fall in the number of all-cemented prostheses (Figure 2). Similarly the proportion of all uncemented prostheses has increased. The proportion of hybrids is largely unchanged in 2008 compared with 2007 (1.4-1.5%) whilst the reversed hybrids are increasing and now constitute slightly less than 10%. The proportion of resurfacing prostheses increased up until 2007 and then constituted approximately 2%. During 2008 the proportion has largely remained unchanged. In total this means that both uncemented cups and stems are on the increase. There

When indicating risks in the report these shall be stated in comparison with a reference group, the composition of which must be made clear in the text. For an increase in risk (value over 1) or reduction (value under 1) it shall be regarded as guaranteed by at least 95% probability if the 95% confidence interval lie outside 1. Relative risk is abbreviated in the report as RR. In all cases the risk calculation is based upon different forms of regression analysis (logistic regression, Cox regression) in order as far as possible to compensate for imbalance regarding e.g. gender, age and diagnosis between the groups compared.

is an increase in the number of cups of the resurfacing type despite that the corresponding stem component remains still, probably in order to attain maximum size of the joint head and thus better joint stability.

During 2008, 512 cups of the resurfacing type were inserted and only 280 stems for resurfacing prostheses. In the remaining 232 cases uncemented conventional stem prostheses were used almost exclusively.

When choosing a fully cemented prosthesis, Lubinus SPII stem dominates, followed by Exeter and Spectron EF Primary. The two first decline somewhat between 2007 and 2008. However, an increase is seen in Spectron EF Primary as for MS30 polished, which during the past three years has been the fourth most common stem when choosing an all cemented prosthesis. On the cup side, Lubinus all-plastic dominates, followed by Charnley Elite and Contemporary Hooded Duration. Also here can be seen a slight reduction in the two first-mentioned, whilst Contemporary Hooded Duration increased between 2007 and 2008. Between 2007 and 2008 the greatest increase was noted for ZCA with 'cross-linked' high molecular plastic. During the 3-year period 2006-2008 it ends up in fourth place. The three most used cemented cups constituted 69.6% of the total proportion of cemented cups inserted from 2006 to 2008 within the group. The corresponding proportion with regard to cemented stems was 90.0%.

For insertion of all uncemented prostheses the Trilogy cup with ceramic surface, the Trident cup with ceramic surface and Allofit have dominated during the past 3-year period. Together they constitute slightly more than 60% of the uncemented cups.

On the stem side CLS Spotorno dominate, followed by Accolade and Bimetric without ceramic coating. These three prostheses constitute 68% of the total number of uncemented stems.

In 2008, hybrid prostheses constituted only 1.5% of the total number of hip prostheses. During the period 2006-2008 mainly Trilogy or Trident were used, both with ceramic coating, alternatively, Ranavat Burstein cup (83 9% of cases). On the stem side, either Lubinus SPII, Spectron EF Primary or MS30 were used, which together constituted 78% of the cases.

With regard to reversed hybrid prosthesis implants, Charnley Elite, Lubinus and ZCA with 'cross-linked' high molecular plastic has been used most frequently on the acetabular side (in all 65.1%) during the past 3 years. The corresponding implants on the femur side were CLS, Bimetric with hydroxylapatite coating and Corail. Furthermore, with the addition of Bimetric without hydroxylapatite these constituted in all 77% of all used stems for reversed hybrid prostheses.

With regard to resurfacing prostheses, BHR, ASR and Durom were used in more than 95% of cases.

Summary: The proportion of all cemented hybrid prostheses has decreased in favour of all uncemented, reversed hybrid and resurfacing prostheses. The Swedish market is dominated by relatively few and in the majority of cases well-documented implants. In the situations where this is not the case, the volumes are small and are often included in a clinical study.

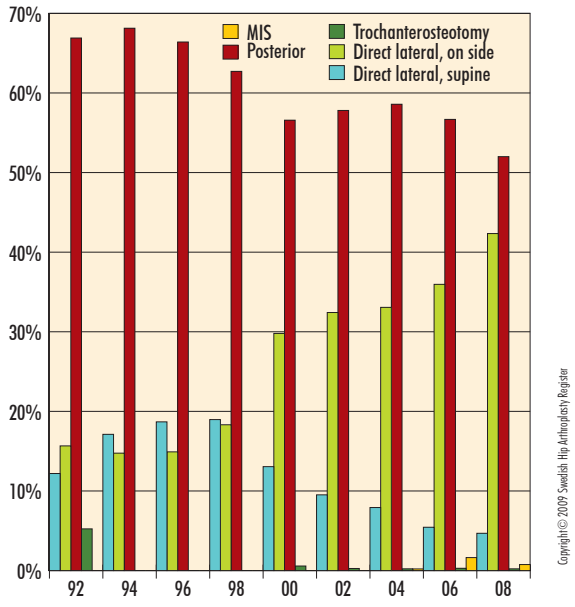


Figure 1. Type of incision 1992–2008. Posterior approach incision has reduced in favour of anterior lateral on the side. Every second year is excluded in favour of better rading.

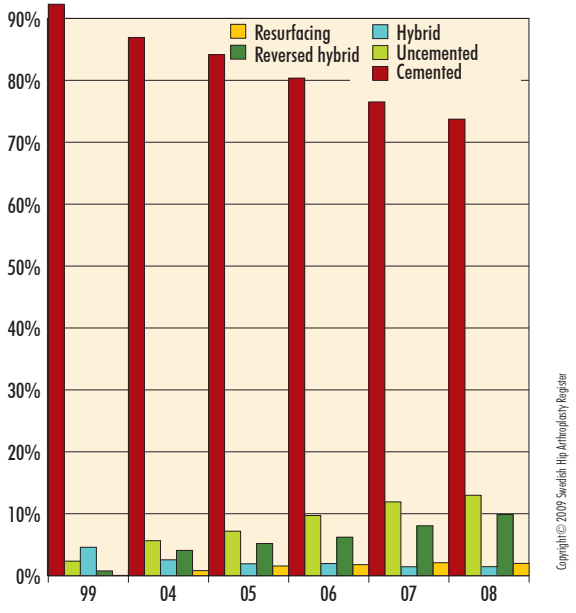


Figure 2. Type of fixation during the last 5 years and 1999 as comparison. The proportion all-cemented and hybrid prostheses are reduced in favour of totally uncemented, reversed hybrids and resurfacing prostheses.

Surface treatment of cups with hydroxylapatite

This project is a collaboration between Nils Hailer and Stergios Lazarinis, Uppsala University Hospital, who have been co-authors. Hydroxylapatite (HA) is the most important inorganic constituent of bone tissue. Clinical and above all, experimental studies have shown that implants that are coated with this substance mend faster and in certain cases better to the surrounding bone tissue. Many prosthesis manufacturers therefore supply their implants with HA coating. There is no consensus with regard to the advantages of the HA coating. Certain studies have shown that some prostheses are associated with problems that could be caused by worn HA particles, which are deemed to contribute to plastic wear, osteolysis and loosening.

In the register we have studied if surface treatment of cups with HA affects the risk of loosening based upon registrations between 1992 and 2007. In order to achieve a fair comparison only cups that were available on the Swedish market were analysed, both with and without HA coating. Only implants with more than 500 observations fairly evenly distributed between with and without HA coating were included. The three that remained were Trilogy (n=5 536), Romanus (n=1 531) and Harris-Galante II (n=976), in total 8,043 cups in 6,646 patients. The risk of cup revision or liner change was evaluated with Cox regression analysis. The analysis included the variables gender, age, primary diagnosis, type of hospital, incidence of coating with HA, type of stem fixation and type of cup. Both all-cemented and hybrid arthroplasties were included in the analysis.

The risk of cup revision irrespective of cause was generally increased if the HA coated version of the respective design was used (relative risk increase: 1.44, 95% confidence interval = 1.18-1.75). The risk of cup revision due to aseptic loosening was also higher for cups with HA coating (1.65; 1.32–2.06). Harris-Galante and Romanus design were associated with significant increased risk of cup revision, regardless of whether all reasons for revision or only mechanical loosening were included. HA coating did not affect the risk of revision due to infection.

Comment: Cup revision can be carried out as an isolated procedure or together with stem revision. With further reviews of both groups of cups with and without HA coating we found that both the groups were mostly used with well-documented stems. Therefore, we do not think that an uneven representation of the implant selection to the disadvantage of the group of cups with HA coating has conclusively influenced the result. As the quality of the plastic gradually improved during the observation period and the use of HA coating also increased during the same period, we find it less likely that an uneven distribution between HA/non HA regarding the quality of the plastic lining has influenced the result. To what extent increased use of 'cross-linked' high molecular plastic on the one of the three cups that is still used (Trilogy) affects this result, can at present, not be answered, as the new plastic is only been in use for a short time.

The result cannot be generalised to other types of prostheses as the quality of the HA coating can vary partly with regard to chemical composition and degree of crystallinity, partly depending upon which type of metal surface is used as a fixation base.

Summary: In general the risk of revision increased when using HA coating of the three studied implants. Separate analysis showed significant increase in risk for Romanus and Harris-Galante, two types that are no longer used. Regarding Trilogy, we find no advantages with ceramic coating. The result speaks instead in favour of an increased use of implants without HA coating in the primary prosthesis case.

Resurfacing arthroplasties

During 2008, 280 resurfacing prostheses were registered, which corresponds to a slight decrease compared to 2007 (n=295). Three implants BHR, Durom and ASR have dominated corresponding to 1,281 implants of the total 1,325 registered. The average follow-up period is still short, 2.6 years and only 20% of the cases have been followed longer than 4 years. The majority of these are BHR, which began to be used earliest of the three implants inserted to any great extent.

In last year's in-depth analysis we presented demographics for the whole patient group up until 2007. This year we have updated the outcome analysis but made minor changes in order that data should be more correct. The analysis is based upon implants inserted from 2001, the first year when more than 10 prostheses were inserted. In addition, patients older than 73 have been filtered away, which is the highest patient age registered for a patient with resurfacing prosthesis. This means that 1,305 resurfacing prostheses are compared with 66,649 conventional stem prostheses inserted 2001-2008.

In a Cox-regression with adjustment for age, gender, side, bilaterality, diagnosis and incision we find that the risk of revision excluding infection is increased 2.9 times (2.1–4.1) for resurfacing prosthesis compared with conventional prosthesis fixed with or without cement. Within the group resurfacing prosthesis we find that the Durom prosthesis compared with BHR runs an increased risk of revision (RR = 3.6; 1.6–8.1, p=0.002) whilst there is no certain difference between BHR and ASR (RR= 2.7; 0.9–7.7, p=0.06) which have a shorter follow-up period.

Summary: In general the use of resurfacing prostheses are associated with an increased risk of early revision. This problem could mainly be related to the design of certain prostheses or related factors such as the design of the instrumentation and the training of individual surgeons, factors that cannot be evaluated in the registry.

Notes

Notes

15 most common implants

most used during the past 10 years

Cup (stem)	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
Lubinus All-Poly (Lubinus SP II)	45,441	5,395	5,706	5,546	5,266	4,911	72,265	36.3%
Exeter Duration (Exeter Polished)	6,710	1,329	1,121	1,122	812	227	11,321	8.7%
Charnley Elite (Exeter Polished)	3,414	998	982	1,165	1,205	1,030	8,794	6.7%
Charnley (Charnley)	55,413	81	8	2	3	1	55,508	4.9%
Reflection (Spectron EF Primary)	4,616	871	788	672	285	160	7,392	4.7%
FAL (Lubinus SP II)	2,220	706	599	534	448	419	4,926	3.8%
Contemporary Hooded Duration (Exeter Polished)	859	513	575	637	785	1,392	4,761	3.7%
Charnley (Exeter Polished)	1,099	435	518	282	206	78	2,618	1.6%
ZCA XLPE (MS30 Polished)	0	0	7	222	402	859	1,490	1.1%
OPTICUP (Scan Hip II Collar)	1,972	10	0	1	0	0	1,983	1.1%
Trilogy HA (CLS Spotorno)	53	80	178	284	347	379	1,321	1.0%
Weber all-poly cup (Straight-stem standard)	474	196	164	125	192	11	1,162	0.9%
Charnley Elite (Lubinus SP II)	645	176	187	124	96	52	1,280	0.8%
Trilogy HA (Spectron EF Primary)	894	107	88	102	24	18	1,233	0.8%
Allofit (CLS Spotorno)	220	87	127	129	131	292	986	0.8%
Others (1 175)	105,184	2,408	2,904	3,110	4,100	4,622	122,328	
Total	229,214	13,392	13,952	14,057	14,302	14,451	299,368	

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)	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
Trilogy HA (CLS Spotorno)	53	80	178	284	347	379	1,321	15.6%
Allofit (CLS Spotorno)	220	87	127	129	131	292	986	11.6%
CLS Spotorno (CLS Spotorno)	559	68	110	163	193	69	1,162	10.0%
Trident HA (Accolade)	0	33	70	133	147	162	545	6.4%
Trilogy (CLS Spotorno)	134	78	86	88	93	80	559	6.4%
Trilogy HA (Versys Stem)	148	75	25	9	0	0	257	3.0%
Trident HA (ABG II HA)	0	0	24	30	107	80	241	2.8%
Trilogy (Wagner Cone Prosthesis)	101	35	23	23	37	19	238	2.6%
Trident HA (Symax)	0	0	17	68	79	45	209	2.5%
Trilogy HA (Bi-Metric HA uncem)	134	28	22	4	3	4	195	2.3%
Trilogy HA (Bi-Metric lat)	2	0	19	51	51	70	193	2.3%
ABG II HA (ABG uncem)	164	14	18	2	0	0	198	2.3%
M2a (Bi-Metric HA lat)	7	21	26	47	36	16	153	1.8%
TOP Pressfit HA (CFP Stem HA)	26	6	9	7	32	55	135	1.6%
Trilogy HA (Corail Stem)	0	0	0	2	47	80	129	1.5%
Others (245)	5,976	230	246	320	382	491	7,645	
Total	7,524	755	1,000	1,360	1,685	1,842	14,166	

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

Cup (Stem)	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
Trilogy HA (Spectron EF Primary)	894	107	88	102	24	18	1,233	27.9%
Trilogy HA (Lubinus SP II)	733	114	73	51	55	66	1,092	24.9%
ABG II HA (Lubinus SP II)	202	6	0	3	0	0	211	4.5%
TOP Pressfit HA (Lubinus SP II)	89	31	16	5	4	1	146	3.9%
Reflection HA (Lubinus SP II)	154	23	10	1	2	11	201	3.3%
Biomex HA (Lubinus SP II)	104	3	0	0	0	0	107	2.8%
Trilogy HA (Stanmore mod)	62	9	8	7	8	2	96	2.5%
Allofit (MS30 Polished)	74	0	3	2	5	1	85	2.2%
Trilogy (Lubinus SP II)	56	7	4	1	2	2	72	1.9%
ABG II HA (Exeter Polished)	66	0	1	0	0	0	67	1.8%
Trident HA (ABG II Cemented)	0	0	14	21	21	5	61	1.6%
Trilogy HA (Exeter Polished)	22	4	5	9	13	17	70	1.5%
Mallory-Head uncem (Lubinus SP II)	97	3	2	1	2	3	108	1.5%
Trilogy HA (MS30 Polished)	0	0	0	3	18	27	48	1.3%
Ranawat/Burstein (Lubinus SP II)	0	0	2	14	9	21	46	1.2%
Others (231)	5,447	35	41	53	40	32	5,648	
Total	8,000	342	267	273	203	206	9,291	

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

15 most used reversed hybrid implants

most used during the past 10 years

Cup (Stem)	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
Charnley Elite (CLS Spotorno)	20	48	47	80	90	90	375	6.8%
Charnley Elite (ABG uncem)	353	16	1	0	0	0	370	6.6%
Contemporary Hooded Duration (ABG II HA)	0	1	56	94	85	100	336	6.1%
Charnley Elite (Corail Stem)	1	10	6	43	70	147	277	5.0%
Lubinus All-Poly (CLS Spotorno)	1	7	27	41	100	100	276	5.0%
Lubinus All-Poly (Corail Stem)	1	0	4	14	69	169	257	4.6%
Charnley (ABG II HA)	0	93	78	34	22	7	234	4.2%
Charnley Elite (ABG II HA)	20	56	19	22	20	61	198	3.6%
Charnley Elite (Bi-Metric lat)	1	3	12	74	77	31	198	3.6%
Biomet Müller (Bi-Metric HA uncem)	149	26	14	6	2	2	199	3.5%
Biomet Müller (Bi-Metric HA lat)	9	28	45	58	28	19	187	3.4%
Lubinus All-Poly (Bi-Metric HA lat)	0	25	34	34	37	51	181	3.3%
ZCA XLPE (CLS Spotorno)	0	0	1	19	82	64	166	3.0%
ZCA XLPE (Bi-Metric HA lat)	0	0	0	0	43	118	161	2.9%
Charnley Elite (Bi-Metric HA uncem)	50	34	43	15	2	8	152	2.6%
Others (186)	531	198	336	336	413	433	2,247	
Total	1,136	545	723	870	1,140	1,400	5,814	

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

15 most common resurfacing implants

most used during the past 10 years

Cup (Stem)	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
BHR Acetabular Cup (BHR Femoral Head)	114	74	118	117	111	112	646	49.0%
Durom (Durom)	48	33	75	66	70	34	326	24.7%
ASR Cup (ASR Head)	0	1	22	50	94	118	285	21.6%
Adept (Adept Resurfacing Head)	0	0	0	5	9	1	15	1.1%
Durom studiecup (Durom)	0	0	0	3	5	5	13	1.0%
BHR Dysplasia Cup (BHR Femoral Head)	2	0	1	3	4	0	10	0.8%
ReCap Cup (ReCap Head)	0	0	1	0	0	6	7	0.5%
BHR Acetabular Cup (BMHR)	0	0	0	0	2	4	6	0.5%
Cormet 2000 resurf (Cormet 2000 resurf)	5	0	0	0	0	0	5	0.4%
ReCap HA Cup (ReCap Head)	0	0	0	3	0	0	3	0.2%
Cormet 2000 resurf (Cormet 2000 HA resurf)	2	0	0	0	0	0	2	0.2%
ASR Cup (BHR Femoral Head)	0	0	0	1	0	0	1	0.1%
McMinn resurf (McMinn resurf)	6	0	0	0	0	0	6	0.0%
Others (0)	0	0	0	0	0	0	0	
Total	177	108	217	248	295	280	1,325	

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	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
Lubinus All-Poly	67,608	5,467	5,826	5,701	5,547	5,304	95,453	37.2%
Charnley Elite	6,899	1,457	1,408	1,640	1,658	1,513	14,575	10.2%
Exeter Duration	7,106	1,471	1,264	1,282	912	243	12,278	9.5%
Charnley	59,492	665	636	330	239	88	61,450	7.4%
Reflection	6,051	888	831	709	316	182	8,977	4.9%
Contemporary Hooded Duration	863	561	691	844	1,040	1,611	5,610	4.3%
FAL	2,242	727	618	558	472	441	5,058	3.9%
Trilogy HA	2,388	467	459	567	619	752	5,252	3.6%
ZCA XLPE	1	0	10	269	774	1,678	2,732	2.1%
Biomet Müller	4,802	204	211	174	106	45	5,542	1.8%
OPTICUP	3,637	91	63	37	21	7	3,856	1.6%
Weber All-Poly cup	712	363	197	152	262	18	1,704	1.3%
ZCA	350	134	477	239	197	5	1,402	1.0%
Trident HA	2	67	167	294	374	299	1,203	0.9%
Allofit	318	102	146	145	145	306	1,162	0.9%
Others (167)	66,743	728	948	1,116	1,620	1,959	73,114	
Total	229,214	13,392	13,952	14,057	14,302	14,451	299,368	

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

15 most common stem components

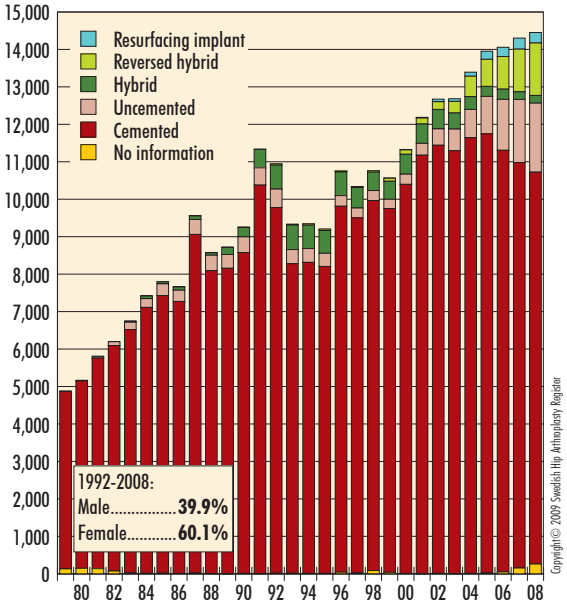
most used during the past 10 years

Stem	1979-2003	2004	2005	2006	2007	2008	Total	Share [1]
Lubinus SP II	53,875	6,685	6,821	6,491	6,163	5,830	85,865	43.9%
Exeter Polished	29,303	3,300	3,221	3,228	3,055	2,890	44,997	22.0%
Spectron EF Primary	6,332	1,041	928	825	614	741	10,481	6.7%
Charnley	56,536	81	9	2	4	1	56,633	4.9%
CLS Spotorno	1,302	448	698	927	1,258	1,249	5,882	4.2%
MS30 Polished	412	183	268	297	496	922	2,578	2.0%
Scan Hip II Collar	2,269	10	0	1	0	0	2,280	1.2%
Charnley Elite Plus	3,084	0	0	1	0	0	3,085	1.1%
Straight-stem standard	598	207	208	173	256	16	1,458	1.1%
ABG II HA	69	203	215	221	276	278	1,262	1.0%
CPT (steel)	1,433	48	3	1	0	0	1,485	0.9%
Bi-Metric HA lat	23	115	186	242	273	352	1,191	0.9%
Stanmore mod	953	80	50	71	32	37	1,223	0.9%
Bi-Metric lat	9	15	104	281	344	382	1,135	0.9%
CPT (CoCr)	64	224	315	204	188	102	1,097	0.8%
Others (180)	72,952	752	926	1,092	1,343	1,651	78,716	
Total	229,214	13,392	13,952	14,057	14,302	14,451	299,368	

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

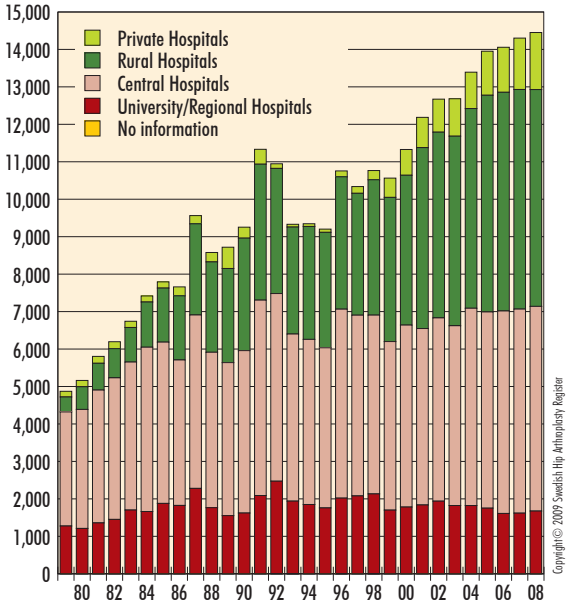
Number of primary THRs

per type of fixation, 1979-2007



Number of primary THRs

per type of hospital, 1979-2007



Notes

Number of primary THRs per hospital and year

Hospital	1979–2003	2004	2005	2006	2007	2008	Total	Share
Alingsås	1,321	147	201	209	211	207	2,296	0.8%
Arvika	913	118	145	97	88	148	1,509	0.5%
Bollnäs	1,345	275	253	265	262	243	2,643	0.9%
Borås	4,455	196	234	211	214	193	5,503	1.8%
Carlanderska	1,062	50	56	69	50	44	1,331	0.4%
Danderyd	5,726	267	406	354	418	404	7,575	2.5%
Eksjö	3,624	190	191	190	183	208	4,586	1.5%
Elisabethsjukhuset	202	121	116	159	164	143	905	0.3%
Enköping	1,101	149	155	181	187	222	1,995	0.7%
Eskilstuna	3,696	65	75	106	76	103	4,121	1.4%
Falköping	1,683	213	227	274	233	212	2,842	0.9%
Falun	4,701	301	231	239	260	289	6,021	2.0%
Frölunda Specialistsjukhus	35	61	48	52	75	78	349	0.1%
Gällivare	1,911	94	117	137	70	102	2,431	0.8%
Gävle	4,645	149	140	131	129	136	5,330	1.8%
Halmstad	3,199	164	177	267	238	202	4,247	1.4%
Helsingborg	3,465	102	73	85	60	49	3,834	1.3%
Hudiksvall	2,303	161	129	123	139	111	2,966	1.0%
Hässleholm-Kristianstad	5,491	710	670	751	851	853	9,326	3.1%
Jönköping	3,378	221	185	206	179	204	4,373	1.5%
Kalmar	3,519	225	235	183	173	165	4,500	1.5%
Karlshamn	1,469	174	149	164	196	182	2,334	0.8%
Karlskoga	2,004	111	90	100	106	100	2,511	0.8%
Karlskrona	2,208	44	31	35	35	17	2,370	0.8%
Karlstad	3,566	235	220	282	335	243	4,881	1.6%
Katrineholm	1,401	226	194	185	201	255	2,462	0.8%
KS/Huddinge	4,493	221	239	315	257	220	5,745	1.9%
KS/Solna	3,558	273	297	187	189	261	4,765	1.6%
Kungälv	1,783	124	229	169	225	191	2,721	0.9%
Köping	1,684	210	217	218	179	70	2,578	0.9%
Lidköping	1,556	118	149	140	133	134	2,230	0.7%
Lindesberg	1,579	161	119	147	147	153	2,306	0.8%
Linköping	4,968	122	74	41	52	58	5,315	1.8%
Ljungby	1,759	103	101	120	127	104	2,314	0.8%
Lund	4,039	103	106	83	80	96	4,507	1.5%
Lycksele	1,754	212	274	243	238	230	2,951	1.0%
Malmö	5,477	128	116	115	104	97	6,037	2.0%
Mora	2,287	144	158	132	152	195	3,068	1.0%
Motala	1,677	229	421	431	402	352	3,512	1.2%
Movement	8	6	90	112	98	190	504	0.2%

(continued on next page.)

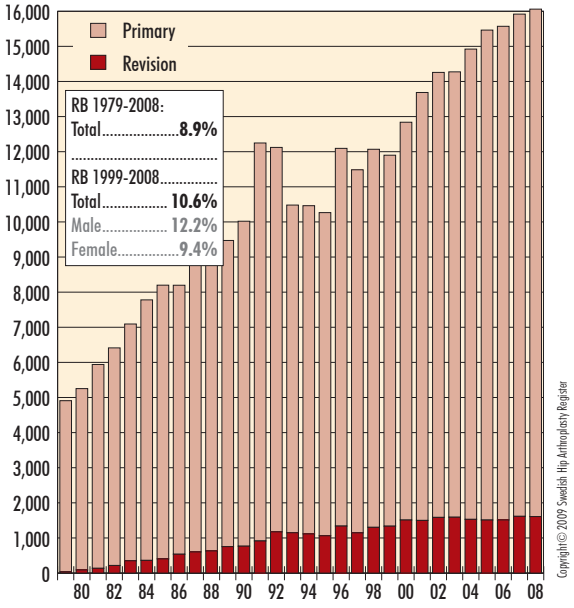
Number of primary THRs per hospital and year (cont.)

Hospital	1979–2003	2004	2005	2006	2007	2008	Total	Share
Nacka Närsjukhus Proxima	0	1	18	54	34	13	120	0.0%
Norrköping	4,327	243	171	70	135	265	5,211	1.7%
Norrtälje	1,044	87	116	87	105	120	1,559	0.5%
Nyköping	2,153	124	153	138	131	178	2,877	1.0%
Ortho Center Stockholm	305	136	207	168	197	208	1,221	0.4%
OrthoCenter IFK-kliniken	0	0	0	0	18	94	112	0.0%
Ortopediska Huset	656	244	298	380	535	500	2,613	0.9%
Oskarshamn	1,426	137	176	258	233	217	2,447	0.8%
Piteå	811	137	183	337	363	333	2,164	0.7%
S:t Göran	7,834	509	474	443	300	360	9,920	3.3%
Skellefteå	1,974	119	120	108	86	91	2,498	0.8%
Skene	788	89	71	65	88	78	1,179	0.4%
Skövde	4,812	150	160	160	139	98	5,519	1.8%
Sollefteå	1,324	150	136	154	97	112	1,973	0.7%
Sophiahemmet	4,048	257	348	210	190	178	5,231	1.7%
Spenshult	0	0	0	0	75	153	228	0.1%
SU/Mölndal	931	88	93	38	224	294	1,668	0.6%
SU/Sahlgrenska	4,392	202	204	149	6	8	4,961	1.7%
SU/Östra	3,938	100	92	151	135	106	4,522	1.5%
Sunderby (incl. Boden)	4,315	151	128	82	58	45	4,779	1.6%
Sundsvall	4,817	161	149	128	136	114	5,505	1.8%
Södersjukhuset	5,793	219	257	415	468	431	7,583	2.5%
Södertälje	774	122	110	127	117	107	1,357	0.5%
Torsby	1,142	71	74	67	96	79	1,529	0.5%
Trelleborg	2,461	169	511	578	621	599	4,939	1.6%
Uddevalla	4,141	256	321	347	326	309	5,700	1.9%
Umeå	3,855	77	77	76	84	83	4,252	1.4%
Uppsala	5,010	328	286	266	290	288	6,468	2.2%
Varberg	3,319	192	182	201	247	203	4,344	1.5%
Visby	1,761	61	102	123	120	132	2,299	0.8%
Värnamo	1,929	127	146	150	130	149	2,631	0.9%
Västervik	2,209	121	106	91	117	110	2,754	0.9%
Västerås	2,931	122	145	157	181	239	3,775	1.3%
Växjö	2,804	129	125	154	108	142	3,462	1.2%
Ystad	2,268	108	44	5	6	7	2,438	0.8%
Ängelholm	2,675	105	51	0	0	6	2,837	0.9%
Örebro	4,346	180	168	190	198	164	5,246	1.8%
Örnsköldsvik	1,951	154	149	168	188	189	2,799	0.9%
Östersund	3,426	158	215	204	193	185	4,381	1.5%
Others [1)]	21,479	685	248	50	11	0	22,473	7.5%
Total	229,214	13,392	13,952	14,057	14,302	14,451	299,368	

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

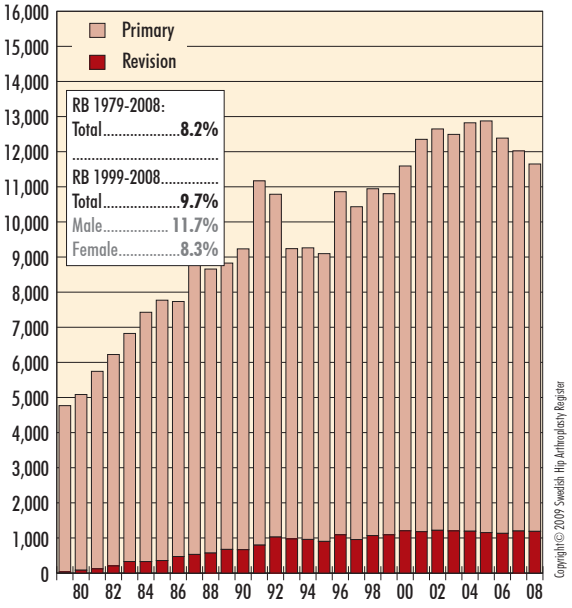
All THRs

284,630 primary THRs, 27,690 revisions, 1979-2008



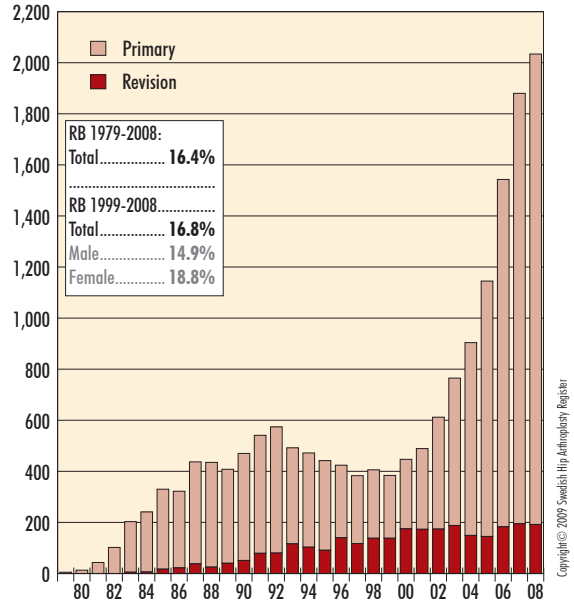
THR with cemented implants

256,689 primar THRs, 22,641 revisions, 1979-2008



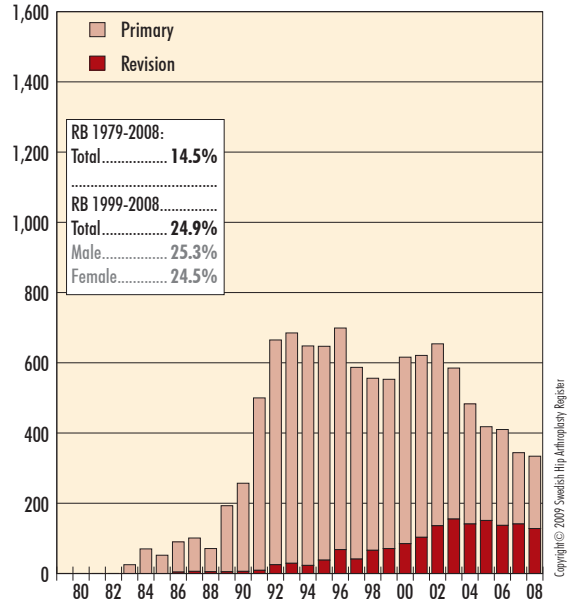
THR with uncemented implants

12,289 primary THRs, 2,569 revisions, 1979-2008



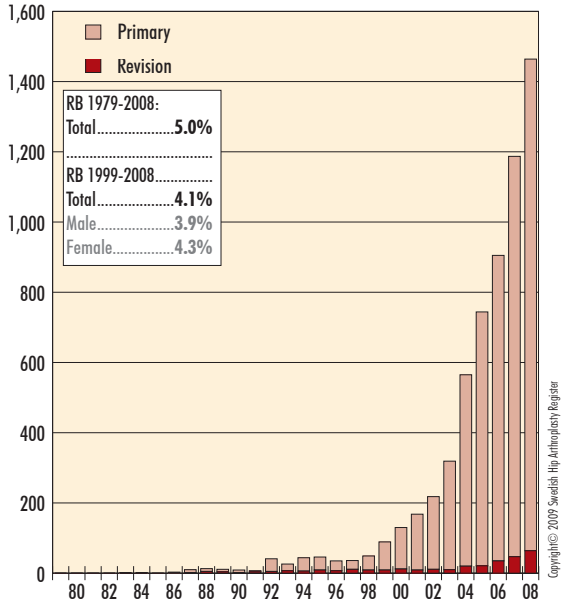
THR with hybrid implants

9,082 primary THRs, 1,421 revisions, 1979-2008



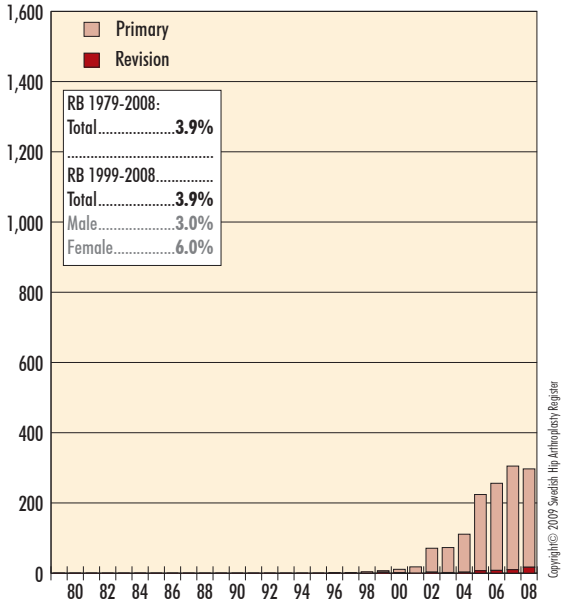
THR with reversed hybrid implants

4,395 primary THRs, 239 revisions, 1979-2008



THR with resurfacing implant

1,041 primary THRs, 37 revisions, 1979-2008



Number of primary THRs per diagnosis and year

Diagnosis	1992-2003	2004	2005	2006	2007	2008	Total	Share
Primary osteoarthritis	97,292	10,779	11,588	11,767	11,860	11,982	155,268	78.1%
Fracture	15,049	1,464	1,317	1,242	1,413	1,405	21,890	11.0%
Inflammatory arthritis	6,132	357	325	308	297	268	7,687	3.9%
Idiopathic femoral head necrosis	3,834	345	341	356	336	391	5,603	2.8%
Childhood disease	2,142	322	270	297	291	291	3,613	1.8%
Secundary osteoarthritis	1,293	2	4	2	1	0	1,302	0.7%
Tumor	637	93	89	67	86	92	1,064	0.5%
Secondary arthritis after trauma	352	29	18	17	18	22	456	0.2%
(missing)	1,873	1	0	1	0	0	1,875	0.9%
Total	128,604	13,392	13,952	14,057	14,302	14,451	198,758	100%

Number of primary THRs per diagnosis and age

1992-2008

Diagnosis	< 50		50-59		60-75		> 75		Total	Share
Primary osteoarthritis	5,475	57.2%	21,462	81.2%	84,650	83.5%	43,681	71.1%	155,268	78.1%
Fracture	292	3.1%	1,098	4.2%	8,118	8.0%	12,382	20.2%	21,890	11.0%
Inflammatory arthritis	1,388	14.5%	1,479	5.6%	3,603	3.6%	1,217	2.0%	7,687	3.9%
Idiopathic femoral head necrosis	612	6.4%	706	2.7%	2,053	2.0%	2,232	3.6%	5,603	2.8%
Childhood disease	1,412	14.8%	1,111	4.2%	905	0.9%	185	0.3%	3,613	1.8%
Secundary osteoarthritis	100	1.0%	111	0.4%	472	0.5%	619	1.0%	1,302	0.7%
Tumor	117	1.2%	223	0.8%	473	0.5%	251	0.4%	1,064	0.5%
Secondary arthritis after trauma	64	0.7%	65	0.2%	162	0.2%	165	0.3%	456	0.2%
(missing)	110	1.1%	171	0.6%	887	0.9%	707	1.2%	1,875	0.9%
Total	9,570	100%	26,426	100%	101,323	100%	61,439	100%	198,758	100%

Number of primary THRs with uncemented implants per diagnosis and age

1992-2008

Diagnosis	< 50		50-59		60-75		> 75		Total	Share
Primary osteoarthritis	1,823	60.0%	3,971	86.4%	2,763	91.2%	123	74.5%	8,680	80.1%
Childhood disease	571	18.8%	301	6.6%	78	2.6%	4	2.4%	954	8.8%
Inflammatory arthritis	297	9.8%	103	2.2%	58	1.9%	5	3.0%	463	4.3%
Idiopathic femoral head necrosis	202	6.6%	109	2.4%	52	1.7%	3	1.8%	366	3.4%
Fracture	61	2.0%	73	1.6%	58	1.9%	28	17.0%	220	2.0%
Secundary osteoarthritis	34	1.1%	7	0.2%	4	0.1%	1	0.6%	46	0.4%
Secondary arthritis after trauma	21	0.7%	3	0.1%	1	0.0%	1	0.6%	26	0.2%
Tumor	1	0.0%	7	0.2%	4	0.1%	0	0.0%	12	0.1%
(missing)	30	1.0%	21	0.5%	12	0.4%	0	0.0%	63	0.6%
Total	3,040	100%	4,595	100%	3,030	100%	165	100%	10,830	100%

Number of primary THRs per type of fixation and age

1992-2008

Type of fixation	< 50		50-59		60-75		> 75		Total	Share
Cemented	3,423	35.8%	15,874	60.1%	92,680	91.5%	60,218	98.0%	172,195	86.6%
Uncemented	3,040	31.8%	4,595	17.4%	3,030	3.0%	165	0.3%	10,830	5.4%
Hybrid	1,388	14.5%	3,056	11.6%	2,977	2.9%	457	0.7%	7,878	4.0%
Reversed hybrid	869	9.1%	2,143	8.1%	2,286	2.3%	471	0.8%	5,769	2.9%
Resurfacing implant	628	6.6%	536	2.0%	161	0.2%	0	0.0%	1,325	0.7%
(missing)	222	2.3%	222	0.8%	189	0.2%	128	0.2%	761	0.4%
Total	9570	100%	26426	100%	101323	100%	61439	100%	198758	100%

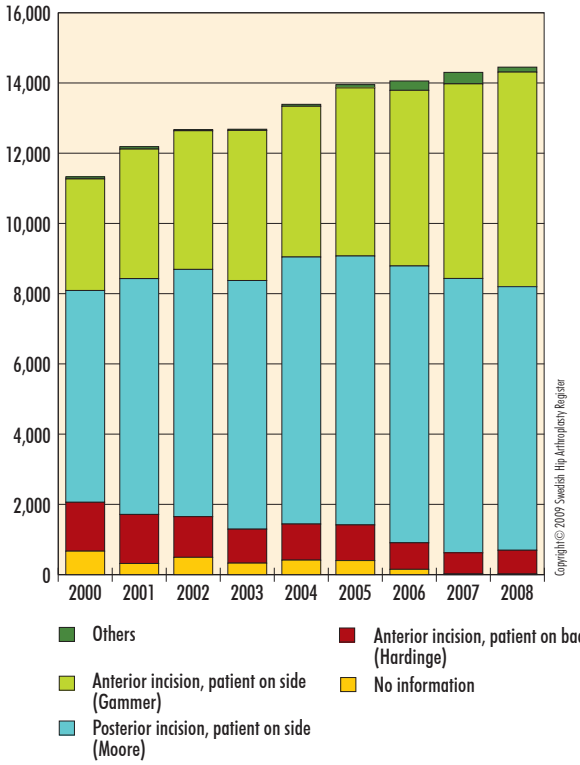
Number of primary THRs per type of incision and year

Type of incision	2000-2003	2004	2005	2006	2007	2008	Total	Share
Posterior incision, patient on side (Moore)	26 870	7 604	7 658	7 883	7 812	7 506	65 333	54.9%
Anterior incision, patient on side (Gammer)	15 087	4 292	4 787	5 001	5 542	6 111	40 820	34.3%
Anterior incision, patient on back (Hardinge)	4 916	1 028	1 016	757	603	676	8 996	7.6%
(missing)	1 800	412	399	149	18	17	2 795	2.3%
Others	196	56	92	267	327	141	1 079	0.9%
Total	48 869	13 392	13 952	14 057	14 302	14 451	119 023	100%

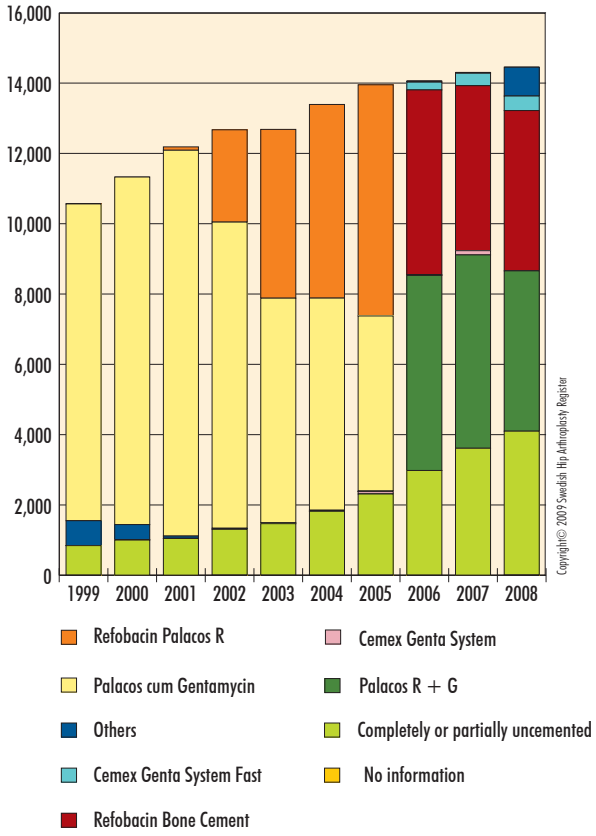
Number of primary THRs per type of cement and year

Brand of cement	1999-2003	2004	2005	2006	2007	2008	Total	Share
Palacos cum Gentamycin	44,965	6,033	4,978	0	0	0	55,976	43.2%
Refobacin Palacos R	7,525	5,508	6,576	0	0	0	19,609	15.1%
Palacos R + G	0	0	0	5,548	5,500	4,560	15,608	12.0%
Refobacin Bone Cement	0	0	0	5,254	4,693	4,560	14,507	11.2%
Cemex Genta System Fast	0	0	1	221	354	413	989	0.8%
Cemex Genta System	16	1	69	23	120	0	229	0.2%
Others	1,259	30	16	30	22	819	2,176	1.7%
(Completely or partially uncemented)	5,660	1,819	2,310	2,980	3,613	4,093	20,475	15.8%
(missing)	8	1	2	1	0	6	18	0.0%
Total	59,433	13,392	13,952	14,057	14,302	14,451	129,587	100%

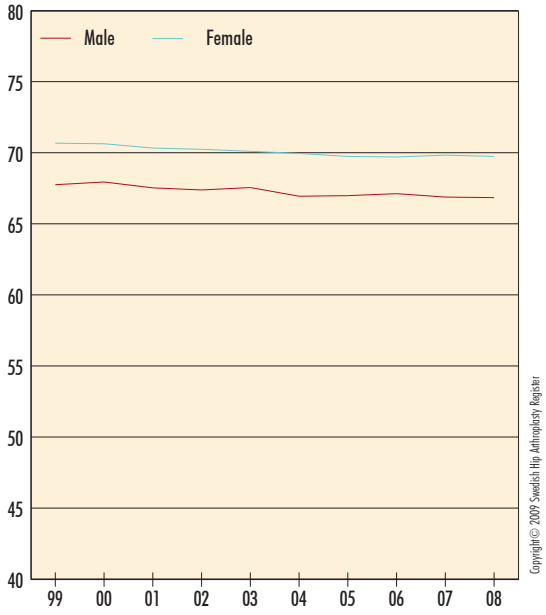
Type of incision
2000-2008



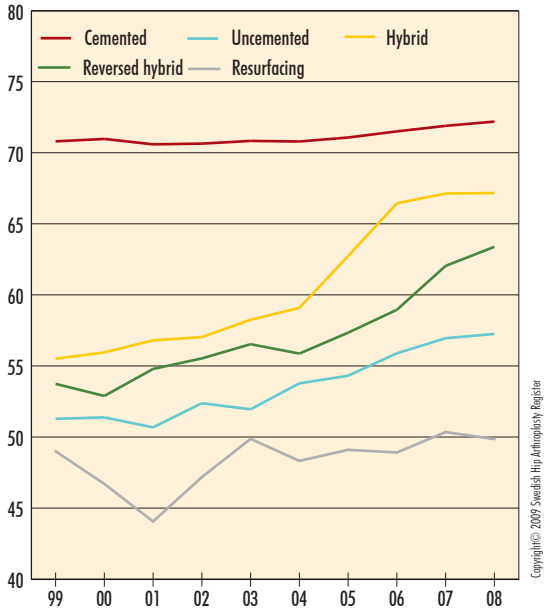
Type of cement
1999-2008



Mean age per gender
the past 10 years, 129,587 primary THRs



Mean age per type of fixation
the past 10 years, 129,026 primary THRs



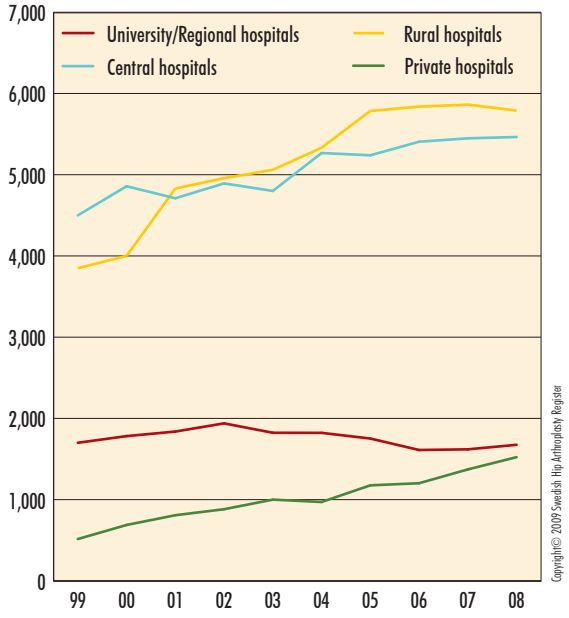
Average age per diagnosis and gender
the past 10 years

Diagnosis	Man	Kvinna	Total
Fracture	73.6	76.1	75.4
Secondary arthritis after trauma	69.1	74.0	71.3
Primary osteoarthritis	67.3	69.9	68.8
Idiopathic femoral head necrosis	61.8	71.5	68.3
Tumor	69.7	62.6	65.8
Secundary osteoarthritis	65.3	66.0	65.6
Inflammatory arthritis	59.3	61.8	61.1
Childhood disease	54.6	53.6	54.0
(missing)	76.0	68.7	71.6
Total	67.3	70.1	68.9

Average age per type of hospital and gender
the past 10 years

Type av hospital	Man	Kvinna	Total
Central Hospitals	67.8	70.8	69.6
Rural Hospitals	68.1	70.3	69.4
University/Regional Hospitals	64.3	68.5	67.0
Private Hospitals	65.1	67.8	66.7
Total	67.3	70.1	68.9

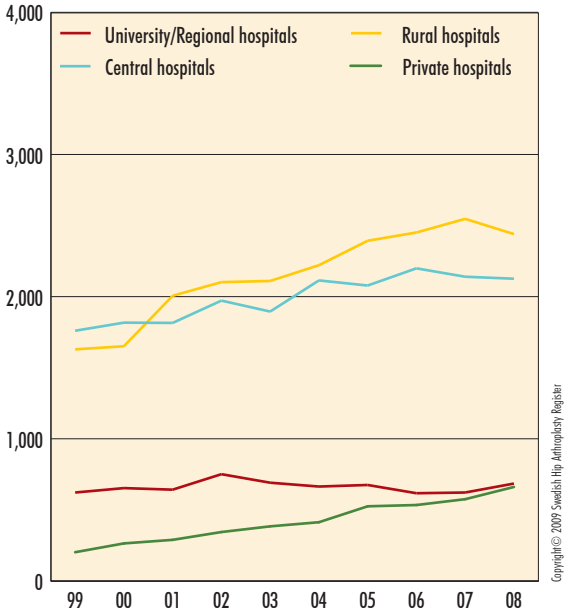
Trend in number of primary THRs
the past 10 years divided by type of hospital



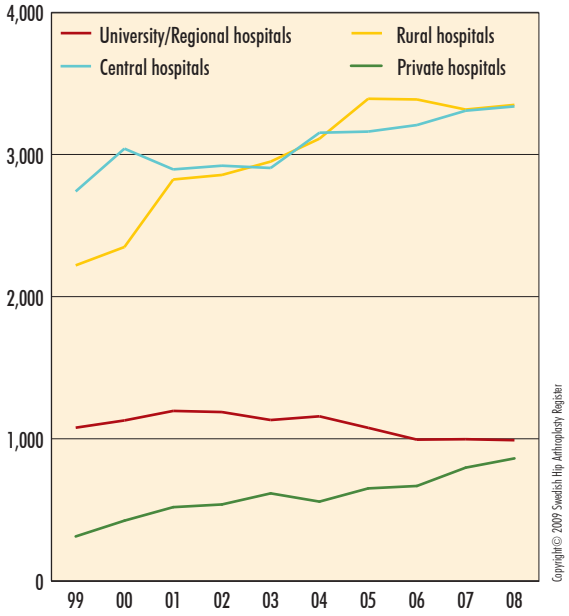
The structural change within Swedish elective orthopaedics is shown clearly in the adjacent figure. In 2008 the Swedish private hospitals carried out almost as many primary arthroplasties as the university/regional hospitals. This trend has clear advantages and disadvantages. It is possible that the productivity of prosthesis operations is increasing 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, it may be that accessibility for the 'more seriously ill' and more difficult cases will worsen. Other disadvantages in the long-term are:

- Possibilities for continual training for surgeons and theatre staff declines as the training is concentrated to university/regional hospitals.
- Material for clinical studies of primary arthroplasties decreases dramatically. This may in the long-term slow down the development of hip replacement surgery in Sweden.
- It appears that comparatively more men than women undergo surgery in private units.

Trend in number of primary THRs
the past 10 years – only male



Trend in number of primary THRs
the past 10 years – only female



Notes

Reoperation

Reoperation is defined as a surgical procedure localised to the hip joint, which in some way can be related to a previously inserted hip prosthesis. Reoperation is classified in three groups. For the first two, minor or major surgical interventions, soft-tissue and/or bone surgery where no part of the implant is exchanged or removed. The third type is called revision and always means that all or parts of the implant are exchanged or extracted.

Since 1999 the number of reoperations has increased by approximately 20%. At the same time a redistribution has taken place so that the relative proportion of revisions has decreased and the proportion of minor surgical measures has increased. Of these, wound revision is absolutely the most common and in 1999 represented 67% within the group minor surgical interventions, amounting to 83.8% in 2008. Among the major surgical interventions fracture reconstruction without exchange of prosthesis components dominates. During the most recent ten-year period this measure has varied between 25.7 and 44.6%. However, no certain change during the period can be shown. 1999 it represented 44.8% and in 2008 barely 40% of the total number.

The most common cause of reoperations during 2008 was aseptic loosening followed by dislocation and deep infection. During the period 1999 to 2008 a gradual redistribution has taken place between the cause groups aseptic loosening and deep infection.

The proportion of measures owing to aseptic loosening has decreased and the proportion of interventions due to infection has increased by approximately 10%. These changes can probably be partly explained by the fact that the profession is more and more active in treating early established or suspected infections with soft-tissue revision with the aim of saving the implant and avoiding resource demanding and for patients, more burdensome revisions.

This picture is further reinforced by the fact that reoperations of hip prostheses that were initially carried out as hemi-arthroplasty are now reported in an individual database. Hips that initially underwent a hemi-arthroplasty and were revised to a full prosthesis were registered before 2005 in the primary database. If this hip replacement surgery was later revised the operation would have been entered in the Hip Arthroplasty Register's databases.

At the introduction of the hemi-arthroplasty database it was decided that all patients undergoing hemi-arthroplasties remain in this database even after a possible reoperation. Thus, from 2005 there was a reduction in the cohort that could be registered in the primary database for total hip arthroplasties.

Summary: Within the group reoperations, a redistribution is taking place so that minor surgical interventions, above all, wound revision due to infection are becoming more common and the relative proportion of revisions is decreasing.

- **The term reoperation means all forms of further surgery after hip replacement surgery**
- **The term revision, which is a form of reoperation, means an intervention where one or more prosthesis components are exchanged or the whole prosthesis is removed.**

- **The Swedish Hip Arthroplasty Register began registering hemi-arthroplasties on January 1, 2005.**
- **Prior to January 1, 2005 a possible conversion from hemi to total hip replacement was registered as a primary total THR.**
- **After January 1, 2005 reoperated hemi-arthroplasties are always registered in the hemi-arthroplasty database.**
- **A total hip replacement always remains in the THR database, irrespective of type of reoperation.**
- **A hemi-arthroplasty always remains in the hemi-arthroplasty database, irrespective of type of reoperation.**

Number of reoperations per procedure and year

primary THRs performed 1979–2008

Procedure at reoperation	1979-2003	2004	2005	2006	2007	2008	Total	Share
Revision	22,731	1,624	1,601	1,591	1,696	1,680	30,923	85.2%
Major surgical intervention	2,766	169	149	136	141	132	3,493	9.6%
Minor surgical intervention	1,063	181	157	157	166	167	1,891	5.2%
(missing)	4	0	0	0	0	0	4	0.0%
Total	26,564	1,974	1,907	1,884	2,003	1,979	36,311	100%

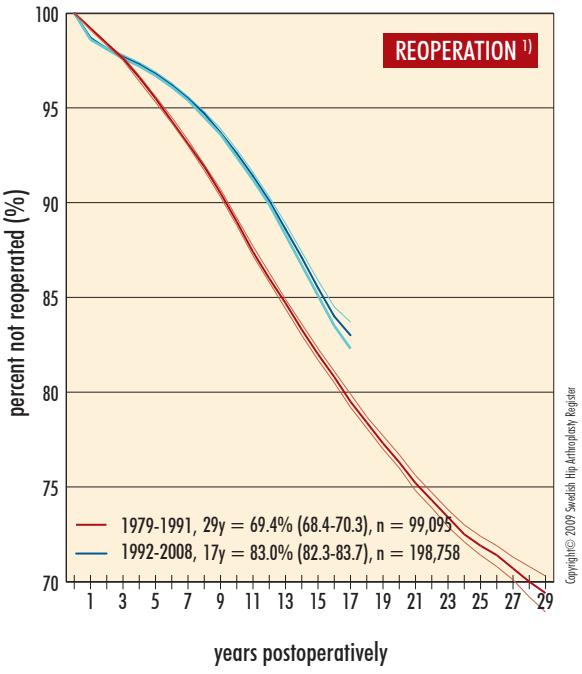
Number of reoperations per reason and year

primary THRs performed 1979–2008

Reason for reoperation	1979-2003	2004	2005	2006	2007	2008	Total	Share
Aseptic loosening	15,992	988	997	1,023	996	981	20,977	57.8%
Dislocation	2,844	320	266	259	300	288	4,277	11.8%
Deep infection	2,429	290	281	287	313	337	3,937	10.8%
Fracture	1,838	173	181	167	204	203	2,766	7.6%
2-stage procedure	1,105	99	98	78	82	73	1,535	4.2%
Technical error	851	17	19	15	37	42	981	2.7%
Miscellaneous	816	37	31	15	32	19	950	2.6%
Implant fracture	373	33	23	23	23	18	493	1.4%
Pain only	281	16	9	16	13	17	352	1.0%
Secondary infection	0	1	1	0	3	0	5	0.0%
(missing)	35	0	1	1	0	1	38	0.1%
Total	26,564	1,974	1,907	1,884	2,003	1,979	36,311	100%

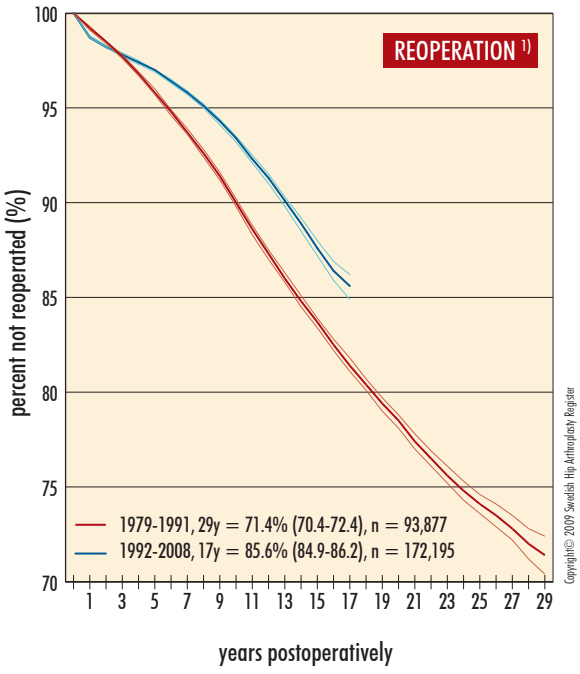
All implants

All diagnoses and all reasons



All cemented implants

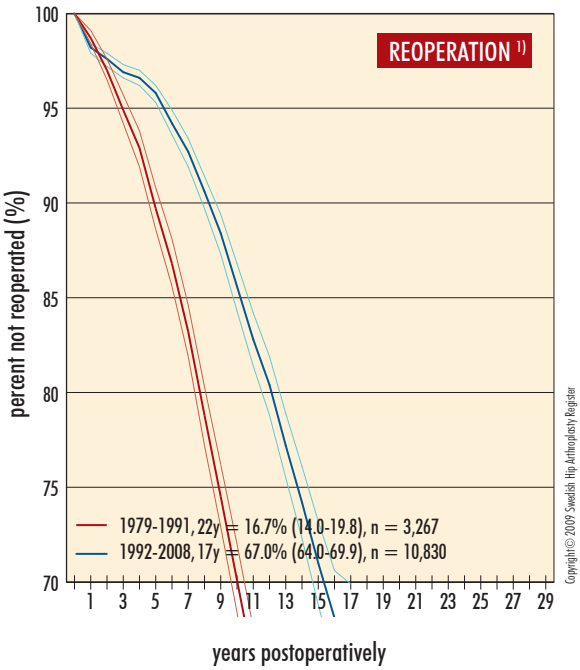
All diagnoses and all reasons



1) Survival statistics according to Kaplan-Meier with reoperation (all form of further surgery, including revision) as end-point definition.

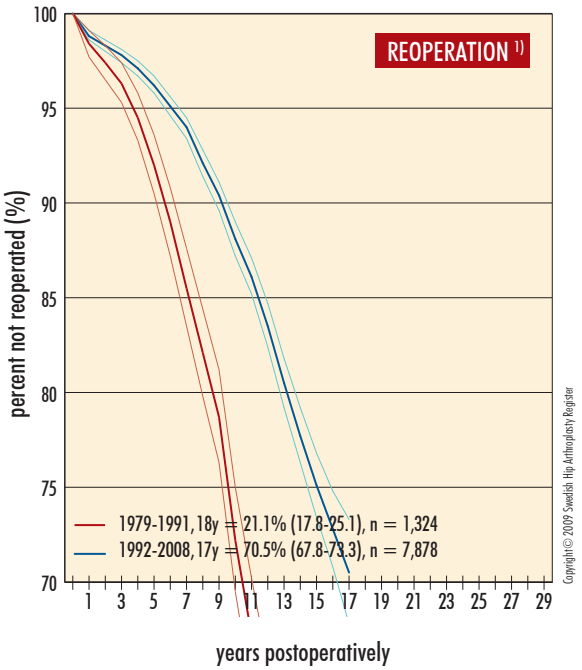
All uncemented implants

All diagnoses and all reasons



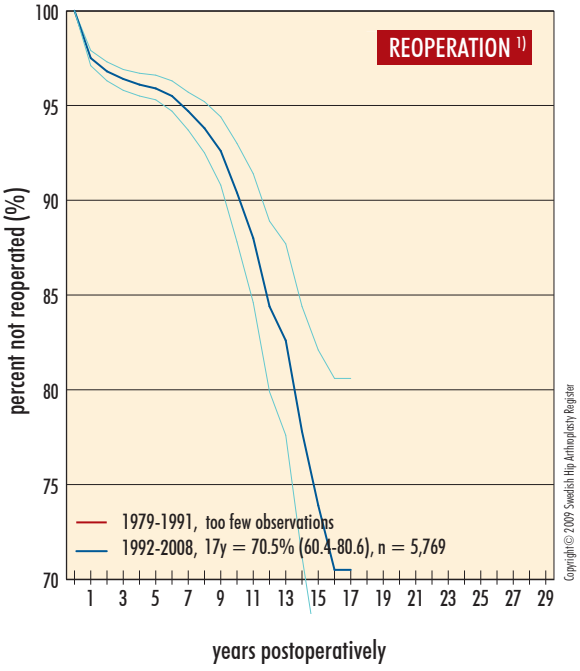
All hybrid implants

All diagnoses and all reasons



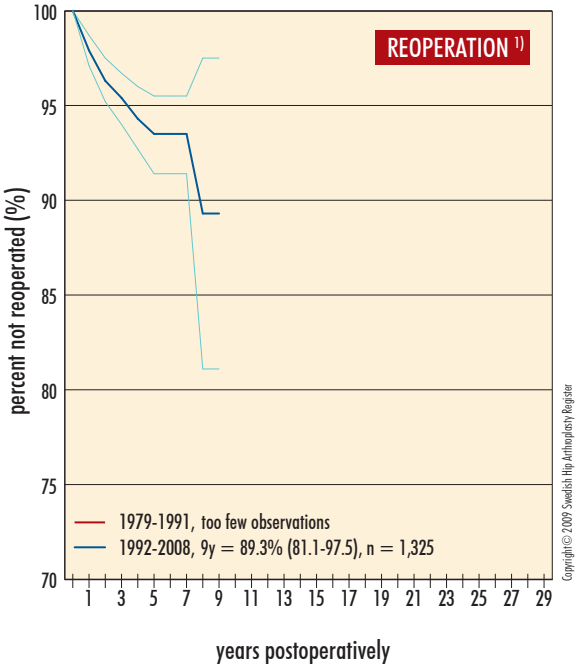
All reversed hybrid implants

All diagnoses and all reasons



All resurfacing implants

All diagnoses and all reasons



1) Survival statistics according to Kaplan-Meier with reoperation (all form of further surgery, including revision) as end-point definition.

Short-term complications – reoperation within 2 years

The definition of failure in traditional survival statistics (Kaplan-Meier) is exchange of some implant component or the removal of the whole prosthesis. Five or ten year survival illustrates long term results with regard primarily to aseptic loosening. Reoperation within 2 years on the other hand, refers to all forms of further surgery (not only intervention in which prosthesis components are exchanged) subsequent to total hip replacement surgery. This variable reflects mainly early and serious complications such as deep infections and revision due to repeated dislocations. This variable is a quicker quality indicator and easier to use in clinical improvement work compared with 10-year survival, which is an important, but slow and to a certain extent, a historical indicator. Prosthesis survival does not always reflect a hospital's contemporary quality with regard to implant surgery. Reoperation within 2 years has been selected by SALAR and the Swedish National Board of Health and Welfare as a national quality indicator for this type of surgery and is included in *Open comparisons* (see page 118).

Definition

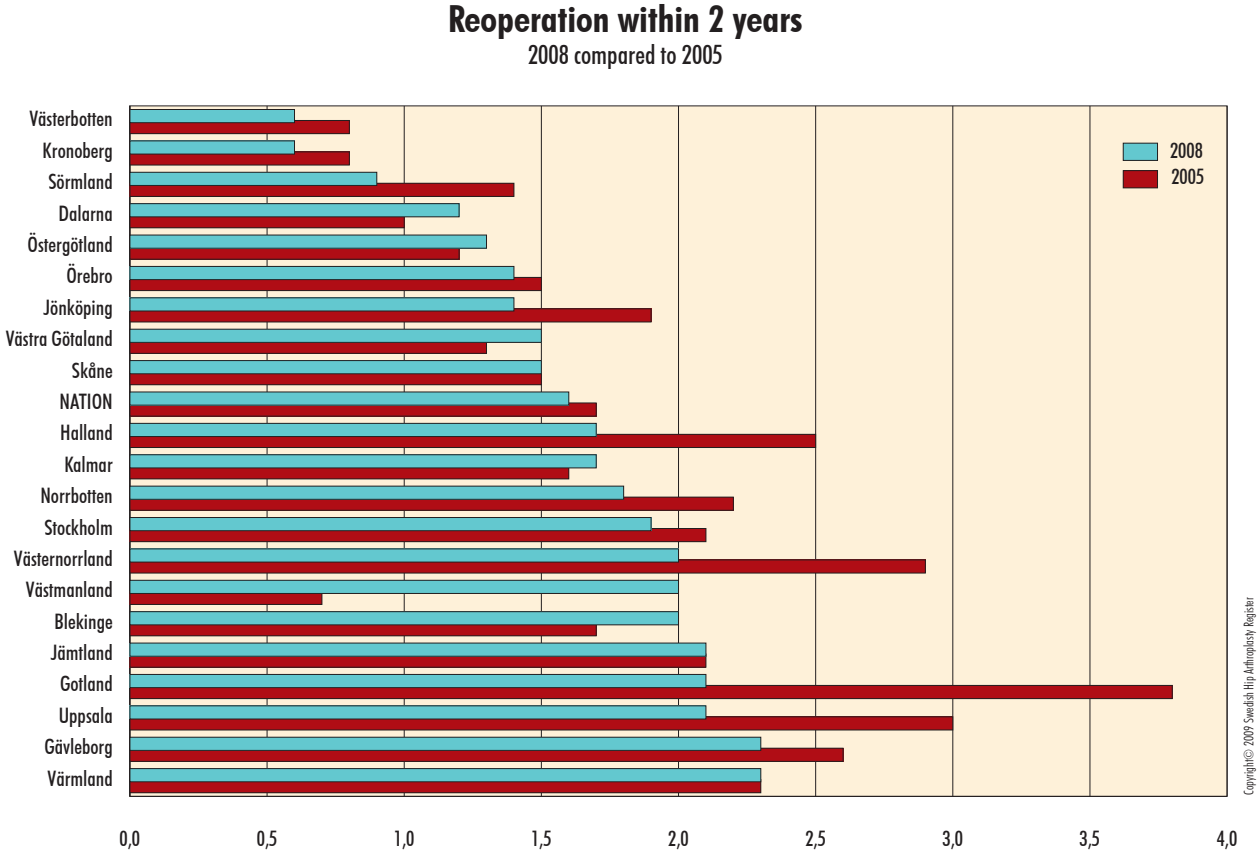
By short-term complication is meant all forms of open surgery within two years of the primary operation. The most recent 4-year period is studied – in this report 2005 and up to and including 2008. The reason we have chosen an observation period of four years is that the complication rates are low. The longer observation period compensates to a certain extent for the risk of a random variability.

Note that the report applies only to complications dealt with surgically. Infections treated with antibiotics and non-surgically treated dislocations are not captured in the register. Patients undergoing repeated surgery for the same complication are indicated as one complication. However, a number of patients undergo reoperation for different reasons (then registered as several complications) within a short time. Patients undergoing reoperation at a hospital other than the primary hospital are still ascribed to the primary clinic.

Results

The results at county council level are indicated in the bar diagram. The national average during the current observation period was 1.6% with a county council spread of 0.6 to 2.3%. The red bars show the same variable 2005 (2002–2005, closed reduction of dislocation is included in the registration up to and including the middle of 2000, which is why the time trend cannot be analysed further back in time). The national average during this earlier period was 1.7% with a greater spread between the county councils at 0.8 to 3.8%, which means that a majority of county councils improved their results.

The result per hospital is indicated in the following table. Hospital type, numbers undergoing primary surgery during the observation period and proportion of reoperations were recorded. The complication rate varies from 0 to 5.1%. Clinics with a value of one standard deviation over the national average are indicated in red. Twelve clinics exceeded this value. Of these five were



of 11 university/regional hospitals, six of 25 central hospitals, none of 35 rural hospitals and one of 10 private hospitals. This shows the different hospital types' varying patient composition and risk profiles. The hospitals reporting the highest reoperation frequency during the observation period had alternately a dominance of infections or dislocations. In previous years the dislocation problem had mainly dominated among the hospitals that had reported high complication figures. The change in this distribution could reflect that several clinics have become more aggressive with regard to early surgical intervention on suspected deep infection.

A number of units report during years 2005–2008 extremely low complication figures, of which two clinics report zero results. That some high production units should not have more than an occasional or even no complications, according to the above definition, for four years, seems unlikely. The reporting of reoperations has previously been burdened by a poorer degree of coverage than the reporting of primary arthroplasties. The current degree of coverage analysis does not include reoperations due to coding problems (see 'Degree of coverage' page 8). The registry management would like each unit to review its routines for reporting of reoperations, which is thus a broader concept than revision – see above.

Discussion

In the interpretation of the results only clinics of the same hospital type should be compared in view of different patient demographics. Clinics treating the most severe cases with greater risks of complication may naturally have a higher frequency. For reasons of space the table does not give the 'case-mix' variables given in other tables and presented graphically in the chapter on follow-up activities. As well as the hospitals' different risk profiles the following must also be taken into account when interpreting these results:

- The complication rates are generally low and a random variability has a large effect on the results. This variable can really only be evaluated over time, i.e. if there are clear trends.

- Clinics with a different treatment approach (non-surgical treatment of e.g. infection and dislocation), i.e. clinics that avoid surgery for these complications are not registered in the database.

- Conversely clinics that are surgically aggressive both with regard to suspected early infection and for first time dislocation with obvious wrongly positioned components, high frequency of early complications.

- If, over time, a clinic has a persistently high proportion of short-term complications, an in-depth analysis should be initiated with a review of indications, routines, surgical technique and possibly choice of implant. Since the study covers patients undergoing surgery over a 4-year period, it may be 1–2 years before a successful improvement is reflected in the results table.

The registry management has avoided ranking the various hospitals according to this parameter. Since complication rates are generally low, a failure to register may seriously affect the ranking of a unit. However, several county councils are seeking to rank and 'accredit' different clinics. The registry management is critical of this development partly because some units do not report all reoperations, and partly because of the problems of interpreting that may arise as above.

Regardless of hospital category and result, the departments should analyse their complications and investigate whether there are systematic shortcomings – so as to optimise results for the individual patient.

When interpreting the variable 'reoperation within 2 years' the following factors must be taken into account:

- **Hospital type.**
- **Patient demography.**
- **The complication rates are generally low and a random variability has a large effect on the results.**
- **This variable can only be evaluated over time, i.e. if there are clear trends.**
- **Note that the report applies only to complications dealt with surgically.**

Reoperation within 2 years per hospital

2005–2008

	Prim. THRs	Patients [1]		Infection		Dislocation		Loosening		Others	
Hospital	number	number	%	number	%	number	%	number	%	number	%
University/Regional Hospitals											
KS/Huddinge	1,031	29	**2.8%**	3	0.3%	12	1.2%	5	0.5%	13	1.3%
KS/Solna	934	33	**3.5%**	18	1.9%	8	0.9%	2	0.2%	13	1.4%
Linköping	225	2	0.9%	0	0.0%	2	0.9%	0	0.0%	0	0.0%
Lund	365	14	**3.8%**	5	1.4%	5	1.4%	0	0.0%	8	2.2%
Malmö	432	7	1.6%	2	0.5%	1	0.2%	1	0.2%	4	0.9%
SU/Mölndal	649	21	**3.2%**	11	1.7%	7	1.1%	0	0.0%	7	1.1%
SU/Sahlgrenska	367	4	1.1%	1	0.3%	1	0.3%	0	0.0%	2	0.5%
SU/Östra	484	10	2.1%	4	0.8%	4	0.8%	1	0.2%	4	0.8%
Umeå	320	3	0.9%	0	0.0%	2	0.6%	0	0.0%	1	0.3%
Uppsala	1,130	33	**2.9%**	9	0.8%	15	1.3%	3	0.3%	13	1.2%
Örebro	720	8	1.1%	5	0.7%	1	0.1%	0	0.0%	3	0.4%
Central Hospitals											
Borås	852	20	2.3%	7	0.8%	10	1.2%	1	0.1%	5	0.6%
Danderyd	1,582	34	2.1%	3	0.2%	11	0.7%	1	0.1%	18	1.1%
Eksjö	772	18	2.3%	10	1.3%	6	0.8%	0	0.0%	4	0.5%
Eskilstuna	360	3	0.8%	0	0.0%	1	0.3%	0	0.0%	2	0.6%
Falun	1,019	11	1.1%	7	0.7%	4	0.4%	0	0.0%	3	0.3%
Gävle	536	23	**4.3%**	8	1.5%	8	1.5%	2	0.4%	7	1.3%
Halmstad	884	21	2.4%	7	0.8%	10	1.1%	1	0.1%	3	0.3%
Helsingborg	267	8	**3.0%**	5	1.9%	1	0.4%	0	0.0%	4	1.5%
Hässleholm-Kristianstad	3,125	37	1.2%	20	0.6%	7	0.2%	5	0.2%	12	0.4%
Jönköping	774	9	1.2%	6	0.8%	3	0.4%	0	0.0%	3	0.4%
Kalmar	756	18	2.4%	12	1.6%	5	0.7%	0	0.0%	3	0.4%
Karlskrona	118	6	**5.1%**	1	0.8%	4	3.4%	1	0.8%	0	0.0%
Karlstad	1,080	29	2.7%	18	1.7%	4	0.4%	1	0.1%	9	0.8%
Norrköping	641	6	0.9%	0	0.0%	2	0.3%	0	0.0%	4	0.6%
S:t Göran	1,577	16	1.0%	2	0.1%	12	0.8%	3	0.2%	2	0.1%
Skövde	557	4	0.7%	0	0.0%	1	0.2%	1	0.2%	2	0.4%
Sunderby (incl. Boden)	313	16	**5.1%**	5	1.6%	11	3.5%	0	0.0%	1	0.3%
Sundsvall	527	24	**4.6%**	17	3.2%	5	0.9%	0	0.0%	5	0.9%
Södersjukhuset	1,571	33	2.1%	26	1.7%	4	0.3%	1	0.1%	8	0.5%
Uddevalla	1,303	24	1.8%	12	0.9%	4	0.3%	2	0.2%	11	0.8%
Varberg	833	10	1.2%	4	0.5%	2	0.2%	1	0.1%	3	0.4%
Västerås	722	16	2.2%	4	0.6%	9	1.2%	0	0.0%	4	0.6%
Växjö	529	2	0.4%	0	0.0%	1	0.2%	0	0.0%	1	0.2%
Ystad	62	3	**4.8%**	0	0.0%	3	4.8%	0	0.0%	0	0.0%
Östersund	797	17	2.1%	3	0.4%	10	1.3%	1	0.1%	5	0.6%
Rural Hospitals											
Alingsås	828	11	1.3%	3	0.4%	6	0.7%	1	0.1%	1	0.1%
Arvika	478	8	1.7%	5	1.0%	0	0.0%	2	0.4%	2	0.4%
Bollnäs	1,023	11	1.1%	4	0.4%	5	0.5%	0	0.0%	2	0.2%
Enköping	745	15	2.0%	5	0.7%	9	1.2%	2	0.3%	2	0.3%
Falköping	946	1	0.1%	1	0.1%	0	0.0%	0	0.0%	0	0.0%
Frölunda Specialistsjukhus	253	4	1.6%	1	0.4%	1	0.4%	0	0.0%	3	1.2%
Gällivare	426	4	0.9%	0	0.0%	3	0.7%	1	0.2%	0	0.0%

Reoperation within 2 years per hospital

2005–2008

	Prim. THRs	Patients [1]		Infection		Dislocation		Loosening		Others	
Hospital	number	number	%	number	%	number	%	number	%	number	%
Hudiksvall	502	13	2.6%	8	1.6%	3	0.6%	0	0.0%	3	0.6%
Karlshamn	691	10	1.4%	1	0.1%	9	1.3%	0	0.0%	1	0.1%
Karlskoga	396	5	1.3%	2	0.5%	0	0.0%	0	0.0%	4	1.0%
Katrineholm	835	5	0.6%	2	0.2%	1	0.1%	0	0.0%	2	0.2%
Kungälv	814	15	1.8%	11	1.4%	1	0.1%	2	0.2%	3	0.4%
Köping	684	12	1.8%	3	0.4%	7	1.0%	2	0.3%	1	0.1%
Lidköping	556	4	0.7%	0	0.0%	3	0.5%	0	0.0%	1	0.2%
Lindesberg	566	11	1.9%	4	0.7%	4	0.7%	0	0.0%	5	0.9%
Ljungby	452	4	0.9%	0	0.0%	1	0.2%	0	0.0%	3	0.7%
Lycksele	985	5	0.5%	5	0.5%	0	0.0%	0	0.0%	3	0.3%
Mora	637	8	1.3%	5	0.8%	2	0.3%	0	0.0%	1	0.2%
Motala	1,606	23	1.4%	7	0.4%	12	0.7%	1	0.1%	9	0.6%
Norrtälje	428	3	0.7%	0	0.0%	2	0.5%	1	0.2%	0	0.0%
Nyköping	600	8	1.3%	1	0.2%	5	0.8%	0	0.0%	3	0.5%
Oskarshamn	884	7	0.8%	5	0.6%	1	0.1%	1	0.1%	1	0.1%
Piteå	1,216	15	1.2%	7	0.6%	3	0.2%	3	0.2%	5	0.4%
Simrishamn	205	1	0.5%	1	0.5%	0	0.0%	0	0.0%	1	0.5%
Skellefteå	405	2	0.5%	2	0.5%	0	0.0%	0	0.0%	1	0.2%
Skene	302	4	1.3%	3	1.0%	1	0.3%	0	0.0%	1	0.3%
Sollefteå	499	7	1.4%	2	0.4%	3	0.6%	0	0.0%	2	0.4%
Södertälje	461	2	0.4%	1	0.2%	1	0.2%	0	0.0%	1	0.2%
Torsby	316	6	1.9%	5	1.6%	0	0.0%	0	0.0%	3	0.9%
Trelleborg	2,309	35	1.5%	12	0.5%	6	0.3%	2	0.1%	20	0.9%
Visby	477	10	2.1%	3	0.6%	3	0.6%	0	0.0%	4	0.8%
Värnamo	575	3	0.5%	1	0.2%	1	0.2%	1	0.2%	0	0.0%
Västervik	424	11	2.6%	8	1.9%	2	0.5%	0	0.0%	3	0.7%
Ängelholm	57	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Örnsköldsvik	694	3	0.4%	1	0.1%	2	0.3%	0	0.0%	0	0.0%
Private Hospitals											
Carlanderska	219	3	1.4%	1	0.5%	1	0.5%	0	0.0%	1	0.5%
Elisabethsjukhuset	582	3	0.5%	1	0.2%	0	0.0%	0	0.0%	2	0.3%
GMC	104	1	1.0%	1	1.0%	1	1.0%	0	0.0%	0	0.0%
Movement	490	7	1.4%	5	1.0%	2	0.4%	0	0.0%	1	0.2%
Nacka Närsjukhus Proxima	119	4	3.4%	1	0.8%	1	0.8%	2	1.7%	1	0.8%
Ortho Center Stockholm	780	18	2.3%	3	0.4%	9	1.2%	3	0.4%	5	0.6%
OrthoCenter IFK-kliniken	112	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ortopediska Huset	1,713	24	1.4%	5	0.3%	14	0.8%	1	0.1%	9	0.5%
Sophiahemmet	926	12	1.3%	3	0.3%	0	0.0%	1	0.1%	9	1.0%
Spenshult	228	3	1.3%	1	0.4%	1	0.4%	0	0.0%	1	0.4%
Nation	56,762	933	1.6%	375	0.7%	322	0.6%	59	0.1%	307	0.5%

1) Refers to number of patients with short-term complications which may differ from the sum of complications since each patient may have more than one type of complication.

Readmission within 30 days

The Swedish Hip Arthroplasty Register has during the year established cooperation with the Centre for Epidemiology (EpC) at the Swedish National Board of Health and Welfare. For this year's *Open comparisons* a new national quality indicator has been created via the National Patient Register: 'Undesirable events following arthroplasty subsequent to hip and knee implant surgery'. The registry has used this analysis (commencing in last year's Annual Report) to carry out a separate analysis for hip replacement surgery alone, presented at county council level.

A number of foreign studies have shown that the number of 'adverse events' (complications) within 30 days of discharge varies between hospitals and that an increase has been seen associated with shorter hospital stays. Also in Sweden the mean care periods during the past 10 years have shortened from approximately 10 days (1998) to 6.2 days (2008). The attempt to shorten care periods has both a productivity and accessibility incentive. However, a possible reduction in costs would disappear directly if readmissions should increase at the same time owing to shorter hospital stays.

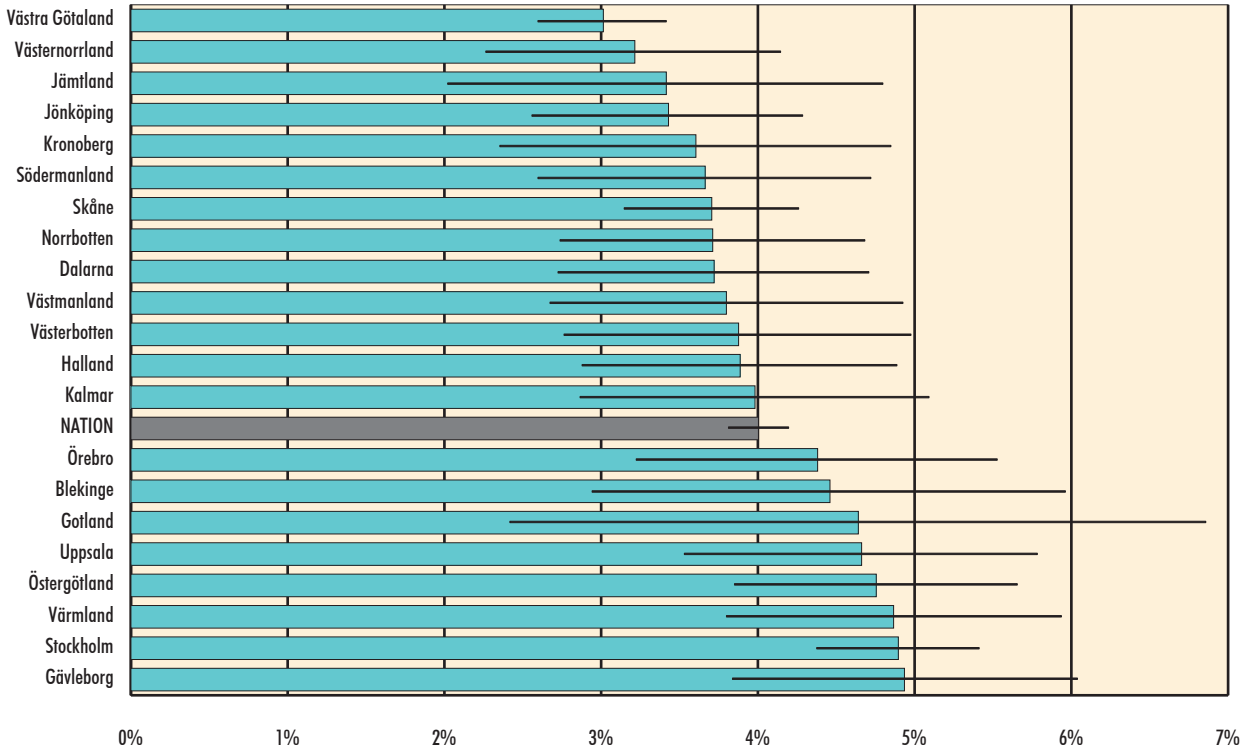
Material and method

All patients undergoing total hip replacement surgery during 2006-2008 (NFB 29, 39, 49 and 99) represent the basic material. 'Adverse events' (complications) comprise all local (associated with hip surgery) and general complications (cardiovascular, pneumonia, stroke, ulcers, urine retention) and death within 30 days. Via the Hip Arthroplasty Register, orthopaedics has a relatively good picture of readmission for prosthetic complications. However, we generally lack knowledge of readmission due to other medical complications.

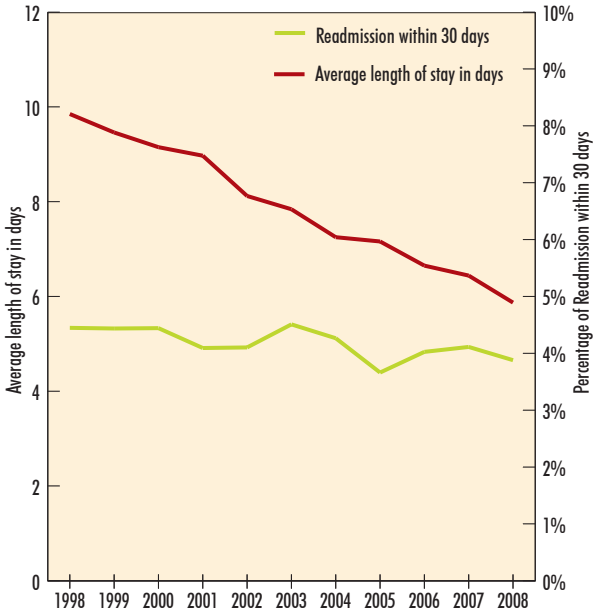
Results

See the bar chart below. The national average lies at 4.0%, i.e. 4 out of 100 patients undergoing surgery are readmitted with some form of complication, or die (some per mil). There is a relatively large spread between the county councils, 3.0–4.9%. In the analysis we found, in discrepancy against other studies, no clear connection between shorter care periods and the frequency of readmission (see figure below). However, the patients who were in need of readmission, had a primary care period that exceeded the average value by 1-2 days (constant during the whole 10 year period). This fact suggests that the population that required readmission within 30 was more severely ill from the start. In an ongoing comprehensive collaboration between EpC and the registry, it is our intention to calculate the comorbidity index in accordance with Charlson on a large number of patients and correlate this with the outcome. This index should be included in all preoperative screening and the analysis may hopefully identify predictors that could be actioned in the preoperative optimisation for this, often elective intervention. An in-depth analysis down at hospital level, in the form of a research project, is planned.

Readmission within 30 days after total hip replacement surgery
2006-2008



The average length of stay vs Percentage of Readmission
within 30 days after THR



Problems

This type of analysis of the Patient Register (PAR) can in the future be of great importance for continued quality development for Swedish hip replacement surgery. In PAR we can capture variables that we do not register in our normal register routine. However, there are a number of sources of error, discussed under the section 'Degree of Coverage' (page 8). The Patient Register has a lower degree of coverage than the Hip Arthroplasty Register (93.3% and 97.6%) and a number of hospital mergers have been carried out with joint reporting to the Patient Register even though the surgery has been carried out at different hospitals. The greatest source of error is probably that many patients have a large number of secondary diagnoses when discharged where the diagnosis most relevant for the care occasion is not always given as the first diagnosis. These factors probably cause the analysis to show values that are somewhat too low.

Revision

Revision is defined as a surgical intervention where the whole prosthesis or parts of it are exchanged or removed. Between 1999 and 2008 the number of revisions increased from 1,407 to 1,680 interventions per year. However, compared with 2007 the number of revisions is somewhat fewer. The increase during the entire period can partly be explained by the fact that the combined cohort of patients who have undergone replacement surgery has become greater and the observation time increases. The increase in the number of revisions has been uneven with a temporary downturn in the number of registrations 2004–2006, probably as an effect of the arrival of the hemi-arthroplasty registry (see reoperations). The clearest change during the 10 year period is that the relative number of isolated cup/liner changes has increased whilst the number of isolated stem changes has decreased. The number of hips that have been treated with definitive extraction has decreased from 98 (7.3%) to 57 (3.5%), which is a positive development.

Against a background of the fact that uncemented fixation is used all the more often for primary THR, the number of uncemented that are revised is also on the increase. Between 1999 and 2003 the increase was barely 7% (from 18.8 to 25.5%), but has since levelled off. In 2008 it amounted to 23.6%. The proportion of uncemented stems that were revised has shown a more constant relative increase, from 10.1% in 1999 to 16.6% in 2007 and 16.2% in 2008.

Since 1999 there has been a continual increase of revisions due to infection (Figure 1). In 1999, 123 revisions were carried out for this reason (7.6% of all). In 2008, 337 revisions were carried out for the same reason (17.0%) which involves more than a doubling also measured in relative measurement. The proportion of revisions due to dislocation in 1999–2003 lay at around 13% and increased to 16.2% in 2004. Since then this cause of revision more regularly represented around 14% of all revisions.

ez-

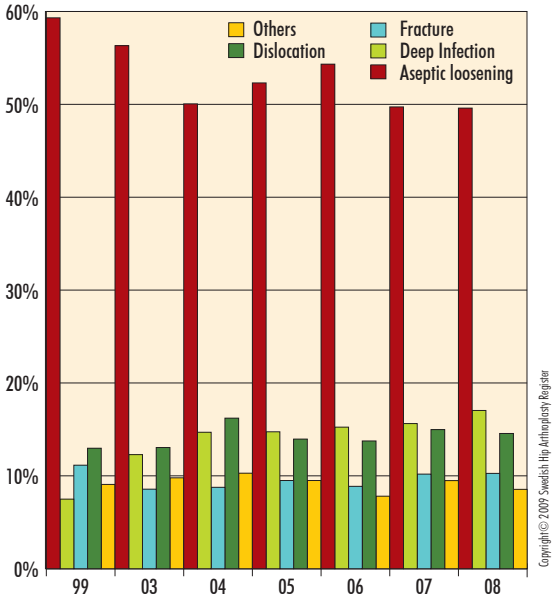


Figure 1. Distribution of reason to revision (all) 1999 and 2003 –2008.

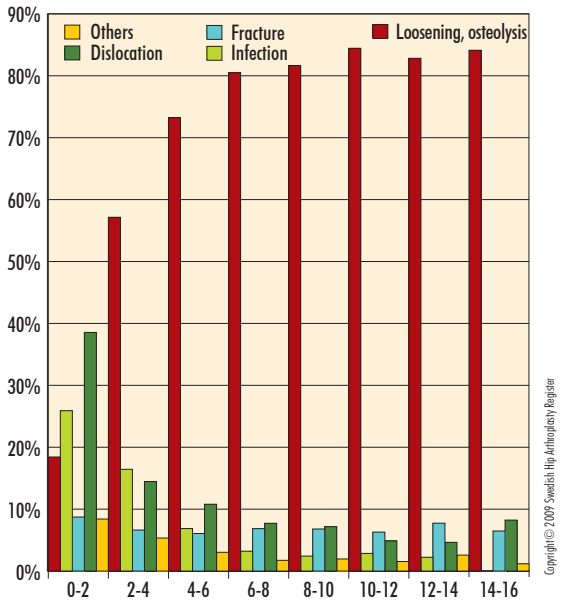


Figure 2. Distribution of reason to first-time revision related to time of primary THR.

The most common causes of revision, loosening, dislocation, fracture and infection show an uneven distribution over time after a primary operation (Figure 2). During the first two years more than every third revision was caused by dislocation problems (38.5%) than after 10 years only to cause every 20th revision. The next most common cause, infection, decreases from 25.9% during the two first postoperative years to 2.9% after 10 years. Loosening and osteolysis increases from 18.4% during the two postoperative years and reaches approximately 80% after six–eight years. Consequently, when assessing outcome in the form of revision, the length of the observation period is of great significance.

Comment: The total number of revisions increases, which cannot be used to assess quality owing to interfering factors. However, several revision operations mean an increased burden on medical care.

Summary: In total the number of revisions has increased. As for reoperations, during the past 10-year period there has been a redistribution of cause of revision. Relatively speaking the proportion of measures due to infection and dislocation has increased and measures due to mechanical loosening and osteolysis have decreased.

Choice of implant

In last year's Annual Report we observed that the use of uncemented components for revision surgery is increasing. This trend also continued during 2008. The choice of implant within the respective fixation type is changing. Within the group cemented cup only one type remains out of the three implants that were most common during the previous 3-year period. This is Lubinus all plastic, which during 2008 was used in 23.8% of cases where the cup was fixed with cement. In second place came Contemporary Hooded Duration (22.3%) and the ZCA XLPE (13.3%) cup.

When using uncemented fixation cups made of trabecular metal have gained ground. Different variations of these cups began to be used for revision in 2006. Now they are two of the three most used (TMT revision – 16.4% and TMT 15.5%) and are surpassed only by Trilogy HA (34.9%).

During 2008 the Exeter stem was the most used for cemented fixation (45.7%), followed by Lubinus SPII (28.3%) and CPT CoCr (11.6%).

Modular stems completely dominate with regard to uncemented fixation and in 2008 were used in 87% of cases. Most used is MP (41.3%) followed by Wagner SL (revision stem lateral) and Revitan (proximal cylindrical) with the same user frequency (each 12.7% of cases).

Prophylactic antibiotic treatment

In the environmental and technical profile are registered a series of antibiotic prophylaxis and choice of antibiotics. This data is collected aggregated by clinic and therefore contains a certain measure of uncertainty. Routines cannot always be followed depending upon allergy problems or other reasons. In addition, there is a lack of control with regard to whether prescribed antibiotics are actually administered to the patient. Against a background of the total size of the patient cohort and that there are only a few previous similar evaluations we consider that analysis of this material may be of value and to a certain extent also constitute one of several bases for compilation of future recommendations.

The analysis builds upon operations where there is information about age, gender, diagnosis, side, bilaterality, incision, choice of fixation, cement with or without antibiotics, number of days' of treatment, dose and clinical group in the register. With regard to the variable incision, it corresponds to the hospital aggregated data up until 1998 and is since individual related. The number of treatment days, dose as well as type of cement (here classified as cemented, without or with addition of antibiotics) like choice of antibiotics, has mainly been based upon hospital aggregated data.

In almost all cases, beta-lactam resistant penicillin or antibiotics of cephalosporin type (99.5%) have been given parentally. The analysis was therefore limited to these two types of antibiotic equivalent to 197,234 operations (95.1% penicillin, 4.9% cephalosporin). The dose of parenteral treatment is indicated in grams, which is why this factor is evaluated separately. Continued treatment with peroral antibiotics has been stated in 29,270 cases where all except for a hundred have been given beta-lactam resistant penicillin. The majority of patients were given parenteral antibiotics for one twenty-four hour period (89.6%). Beta-lactam resistant penicillin has been given in doses up to eight grams and antibiotics of the cephalosporin type in doses of up to six grams (table 2).

We find that the risk of revision due to infection is not affected by the length of parenteral + possible peroral treatment with the antibiotic prophylaxis. Choice of cephalosporin means a reduction in risk of approximately 37% (RR=0.63 0.45-0.89, p=0.009). Use of cement with antibiotic supplement reduces the risk compared with cement without antibiotics (RR=0.75 0.630.90, p=0.002). The lowest relative proportion of infections (0.4%) is

Beta-lactam resistent pc. g	*n = 187 501*	%
1.0 - 2.5		9.5
3.0		40.5
4.0		25.8
5.0 - 6.5		19.7
8.0		4.4
Cephalosporin g	***n = 9733***	**%**
1.5 – 3.0		30.4
4.0 – 4.5		50.9
5.0 – 6.0		18.7

Table 2. Percentage of distrubition of total parenteral dose of antibiotics. Dose in gram.

to be found in the groups given 5.0–6.5 grams of penicillin and 5.0–6.0 grams of antibiotics of the cephalosporin type. However, by adjusting for co-variation in two separate Cox regression models, one for each type of antibiotic, we do not find any certain connection between dose and risk of revision due to infection.

The risk of revision due to loosening is affected in another way. Antibiotic treatment for one day reduces the risk (RR 0.90 0.85–0.96, p=0.001) compared with treatment for two or more days. The risk also increases if bone cement with antibiotics supplement has not been used (RR 1.26 1.16–1.37, p<0.00001).

The significance of the dose when using beta-lactam resistant penicillin was compared to a total dose of four grams as reference. Total dose under three grams increases the risk (RR=1.23 1.10-1,38, p=0.0003), whilst doses of 5–6.5 and eight reduces it (RR=0.77 0.68–0.87, p<0.0001; 0.77=0.61–0.97, p=0.03). The corresponding analysis of cephalosporin preparation shows no connection between dose and risk of revision due to loosening and osteolysis.

Comment: Several of these demonstrated connections have been shown previously. Our analysis mainly concerns two substances: Cloxacillin and Cefuroxime that are used in more than 95% of cases. The finding that antibiotics of cephalosporin reduce the risk is expected against a background of their broader spectra. This positive effect must be weighed against the risks that increased use of broad-spectrum antibiotics involves.

The reason that at least certain antibiotics reduce the risk of revision due to loosening is unknown. However, it is highly likely that many cases classified as mechanical loosening actually are due to infection with a low virulent agent. The diagnosis is not made on the basis that the testing was insufficient or absent or that during cultivation low pathogens or low virulent bacteria are not searched for if this issue is missing.

Summary: We find that antibiotic prophylaxis for a day is sufficient. Despite antibiotics of the cephalosporin type involving lower risk of infection, these should mainly be used in selected cases in order to reduce the risk of resistance development. The daily dose of beta-lactam resistant penicillin (cloxacillin) should exceed four grams in order to reduce the risk of future revision due to loosening.

Notes

Number of revisions per diagnosis and number of previous revisions

primary THRs1979-2008

Diagnosis at primary THR	0		1		2		>2		Total	Share
Primary osteoarthritis	17,841	73.7%	2,894	70.2%	551	65.9%	153	62.7%	21,439	72.9%
Fracture	2,180	9.0%	353	8.6%	61	7.3%	11	4.5%	2,605	8.9%
Inflammatory arthritis	1,914	7.9%	395	9.6%	105	12.6%	33	13.5%	2,447	8.3%
Childhood disease	1,214	5.0%	293	7.1%	67	8.0%	30	12.3%	1,604	5.5%
Idiopathic femoral head necrosis	508	2.1%	85	2.1%	23	2.8%	4	1.6%	620	2.1%
Secondary arthritis after trauma	206	0.9%	60	1.5%	18	2.2%	13	5.3%	297	1.0%
Secundary osteoarthritis	86	0.4%	10	0.2%	3	0.4%	0	0.0%	99	0.3%
Tumor	43	0.2%	8	0.2%	4	0.5%	0	0.0%	55	0.2%
(missing)	207	0.9%	24	0.6%	4	0.5%	0	0.0%	235	0.8%
Total	24,199	100%	4,122	100%	836	100%	244	100%	29,401	100%

Number of revisions per reason and number of previous revisions

primary THRs 1979-2008

Reason for revision	0		1		2		>2		Total	Share
Aseptic loosening	17,845	73.7%	2,528	61.3%	458	54.8%	101	41.4%	20,932	71.2%
Dislocation	2,009	8.3%	575	13.9%	146	17.5%	68	27.9%	2,798	9.5%
Deep infection	1,803	7.5%	499	12.1%	117	14.0%	51	20.9%	2,470	8.4%
Fracture	1,515	6.3%	336	8.2%	70	8.4%	12	4.9%	1,933	6.6%
Technical error	519	2.1%	86	2.1%	21	2.5%	3	1.2%	629	2.1%
Implant fracture	355	1.5%	69	1.7%	17	2.0%	7	2.9%	448	1.5%
Pain only	89	0.4%	17	0.4%	4	0.5%	2	0.8%	112	0.4%
Miscellaneous	64	0.3%	11	0.3%	2	0.2%	0	0.0%	77	0.3%
Secondary infection	0	0.0%	1	0.0%	1	0.1%	0	0.0%	2	0.0%
Total	24,199	100%	4,122	100%	836	100%	244	100%	29,401	100%

Number of revisions per year of revision and number of previous revisions

primary THRs 1979-2008

Year of revision	0		1		2		>2		Total	Share
1979-2003	18,059	74.6%	2,896	70.3%	531	63.5%	135	55.3%	21,621	73.5%
2004	1,193	4.9%	268	6.5%	51	6.1%	18	7.4%	1,530	5.2%
2005	1,174	4.9%	250	6.1%	63	7.5%	24	9.8%	1,511	5.1%
2006	1,236	5.1%	204	4.9%	55	6.6%	19	7.8%	1,514	5.1%
2007	1,275	5.3%	261	6.3%	58	6.9%	22	9.0%	1,616	5.5%
2008	1,262	5.2%	243	5.9%	78	9.3%	26	10.7%	1,609	5.5%
Total	24,199	100%	4,122	100%	836	100%	244	100%	29,401	100%

Number of revisions per reason and year of revision

only the first revision, primary THRs 1979–2008

Reason for revision	1979-2003	204	2005	2006	2007	2008	Total	Share
Aseptic loosening	13,716	809	828	869	824	799	17,845	73.7%
Dislocation	1,197	170	134	147	178	183	2,009	8.3%
Deep infection	1,345	81	85	82	108	102	1,803	7.5%
Fracture	980	95	94	106	117	123	1,515	6.3%
Technical error	446	10	8	7	19	29	519	2.1%
Implant fracture	277	16	17	15	14	16	355	1.5%
Pain only	59	5	3	7	7	8	89	0.4%
Miscellaneous	39	7	5	3	8	2	64	0.3%
Total	18,059	1,193	1,174	1,236	1,275	1,262	24,199	100%

Number of revisions per type of fixation at primary THR and year of revision

only the first revision, primary THRs 1979–2008

Type of fixation at primary THR	1979-2003	204	2005	2006	2007	2008	Total	Share
Cemented	15,184	942	922	921	952	945	19,866	82.1%
Uncemented	1,559	109	93	139	145	136	2,181	9.0%
Hybrid	717	109	116	121	115	97	1,275	5.3%
Reversed hybrid	92	19	20	31	38	56	256	1.1%
Resurfacing implant	8	3	7	7	10	16	51	0.2%
(missing)	499	11	16	17	15	12	570	2.4%
Total	18,059	1,193	1,174	1,236	1,275	1,262	24,199	100%

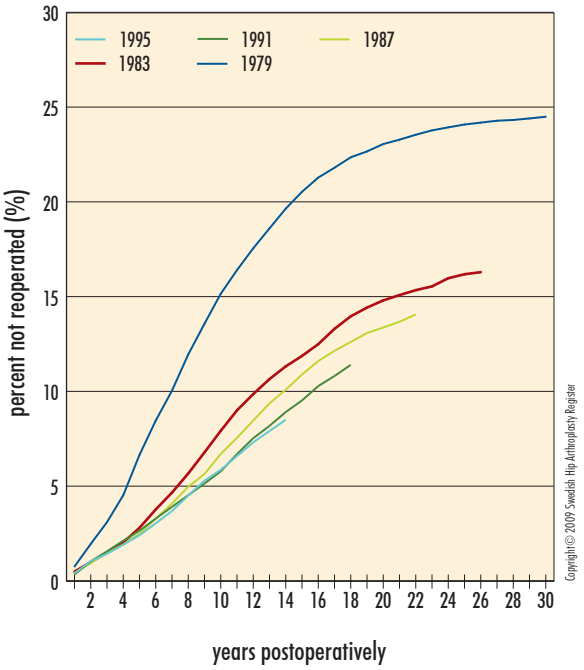
Number of revisions per reason and time to revision

only the first revision, primary THRs 1979-2008

Reason for revision	0-3 years		4-6 years		7-10 years		> 10 years		Total	Share
Aseptic loosening	2,810	43.2%	3,593	81.7%	5,174	86.1%	6,268	86.0%	17,845	73.7%
Dislocation	1,312	20.2%	231	5.3%	207	3.4%	259	3.6%	2,009	8.3%
Deep infection	1,335	20.5%	215	4.9%	153	2.5%	100	1.4%	1,803	7.5%
Fracture	415	6.4%	240	5.5%	343	5.7%	517	7.1%	1,515	6.3%
Technical error	464	7.1%	26	0.6%	17	0.3%	12	0.2%	519	2.1%
Implant fracture	56	0.9%	74	1.7%	108	1.8%	117	1.6%	355	1.5%
Pain only	67	1.0%	11	0.3%	4	0.1%	7	0.1%	89	0.4%
Miscellaneous	41	0.6%	9	0.2%	5	0.1%	9	0.1%	64	0.3%
Total	6,500	100%	4,399	100%	6,011	100%	7,289	100%	24,199	100%

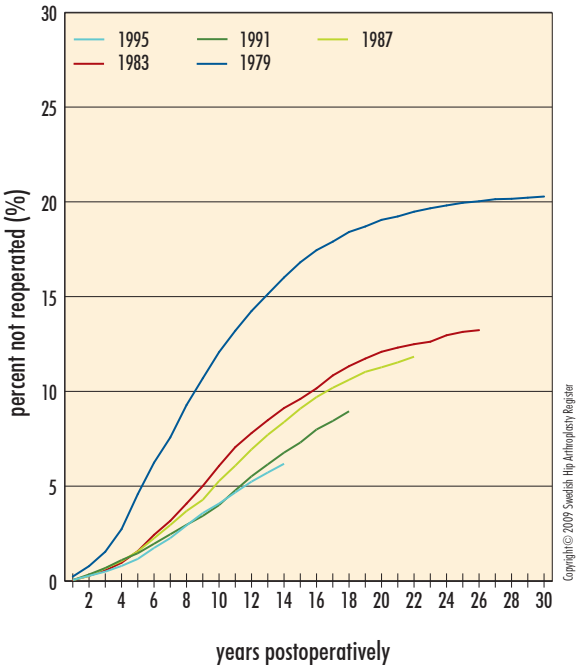
All diagnoses and all reasons

cumulative frequency of revision



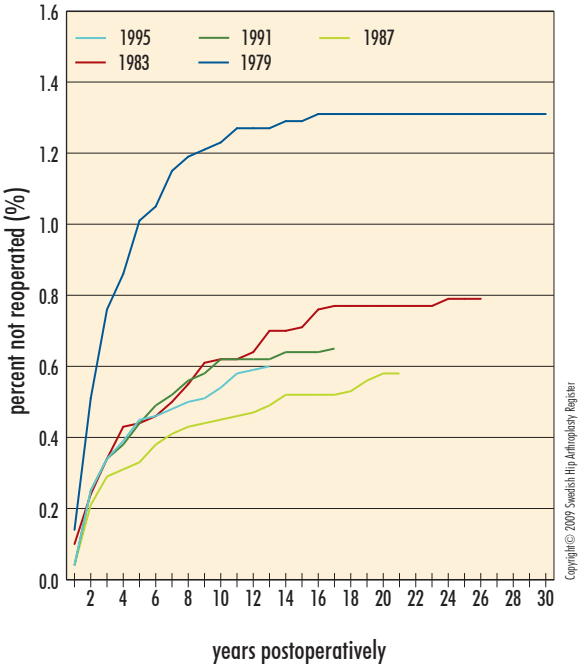
Aseptic loosening

cumulative frequency of revision



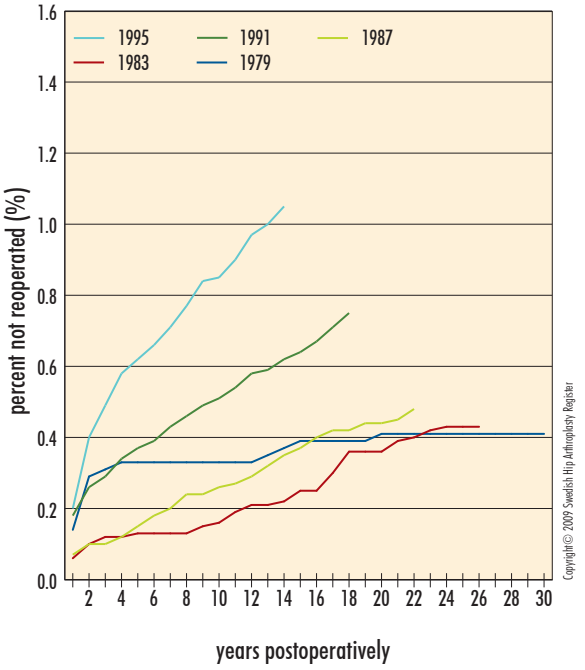
Deep infection

cumulative frequency of revision



Dislocation

cumulative frequency of revision



Implant survival as quality indicator

With estimating implant survival the result must always be referred to the hospital that carried out the primary operation even if the patient has been revised at another hospital. For the country as a whole this is an important quality measurement of several interacting factors. Since 1979, 10-year survival measured as a risk in order to avoid reoperation has gradually improved. Initially the rate of improvement was high. During later periods and as the proportion that were not revised approaches the 100% level the rate of improvement for natural reasons, levels out.

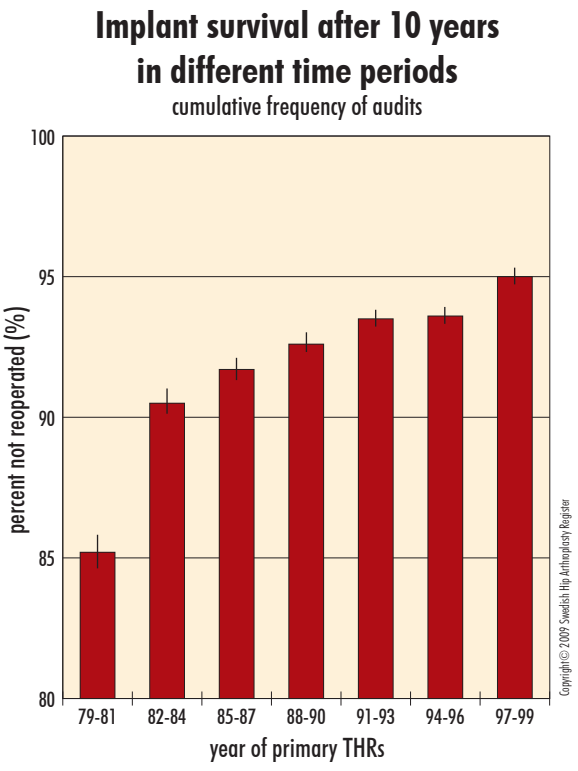
The background to the initial increase up to the early 1990s is with the greatest probability a gradual improvement of the cementing technique, something that we previously demonstrated in the majority of registry reports. Knowledge of optimal cementing techniques spread relatively quickly partly through extensive work from the profession and industry in the form of an active course policy and partly through continual feedback to the profession of data from the register.

During the past decades there has been extensive development in implant design. This has e.g. applied to new types of surface treatment, increased range of sizes, shape adaptation to different anatomical conditions, new types of material and a pronounced tendency to replace mono-block prostheses with modular parts, which during the operation are joined together into a final hip prosthesis. The effect of this development has been more ambiguous. Many implants have shown to have a significantly poorer implant survival than already established whilst other innovations, e.g. surface of uncemented prostheses and ability to maintain a biological fixation has meant an improvement in the survival of these prostheses. Among Swedish orthopaedic surgeons there is a great awareness of the problem of new implants. Furthermore, a clinical evaluation takes a long time as revisions due to implant related problems often do not reveal themselves until after 5–10 years' observation period. Experiences from less successful implant changes, especially during the 1980s and early 1990s have meant that Sweden, as a country became one of the most conservative countries with regard to the introduction of new prostheses. This attitude is generally positive, but also involves certain negative effects. The introduction of new technology with documented positive effect can be unnecessarily long. In order to counteract this problem we have initiated collaboration between the Nordic countries This involves the possibility to form an overall picture of a greater variation of not only patient demographics and surgical technique but also the possibility to increase the observation basis for different less commonly occurring and newly introduced implants.

As part of the clinical improvements we also publish a 10-year survival per clinic. These figures provide a certain insight into the quality of the operations that are carried out but should be regarded with certain caution. On the whole, in order to deem that a clinic performs better or worse than the average, requires that the statistically calculated confidence intervals do not overlap. Should this be the case the difference may be determined at random. Another factor is also the effects of clinical mergers. There are several examples where a smaller clinic has merged with a larger clinic, where several clinics have merged or where patients who are to undergo hip surgery are moved from one or several clinics to a central operations clinic for hip replacement surgery. Such examples are Bollnäs in Hälsingland, Hässleholm in Skåne and Mölndal in Göteborg. The clinic at which a certain hip replacement surgery was carried out 10 years previously may therefore, on evaluation, be totally different in character and even have stopped carrying out hip arthroplasties.

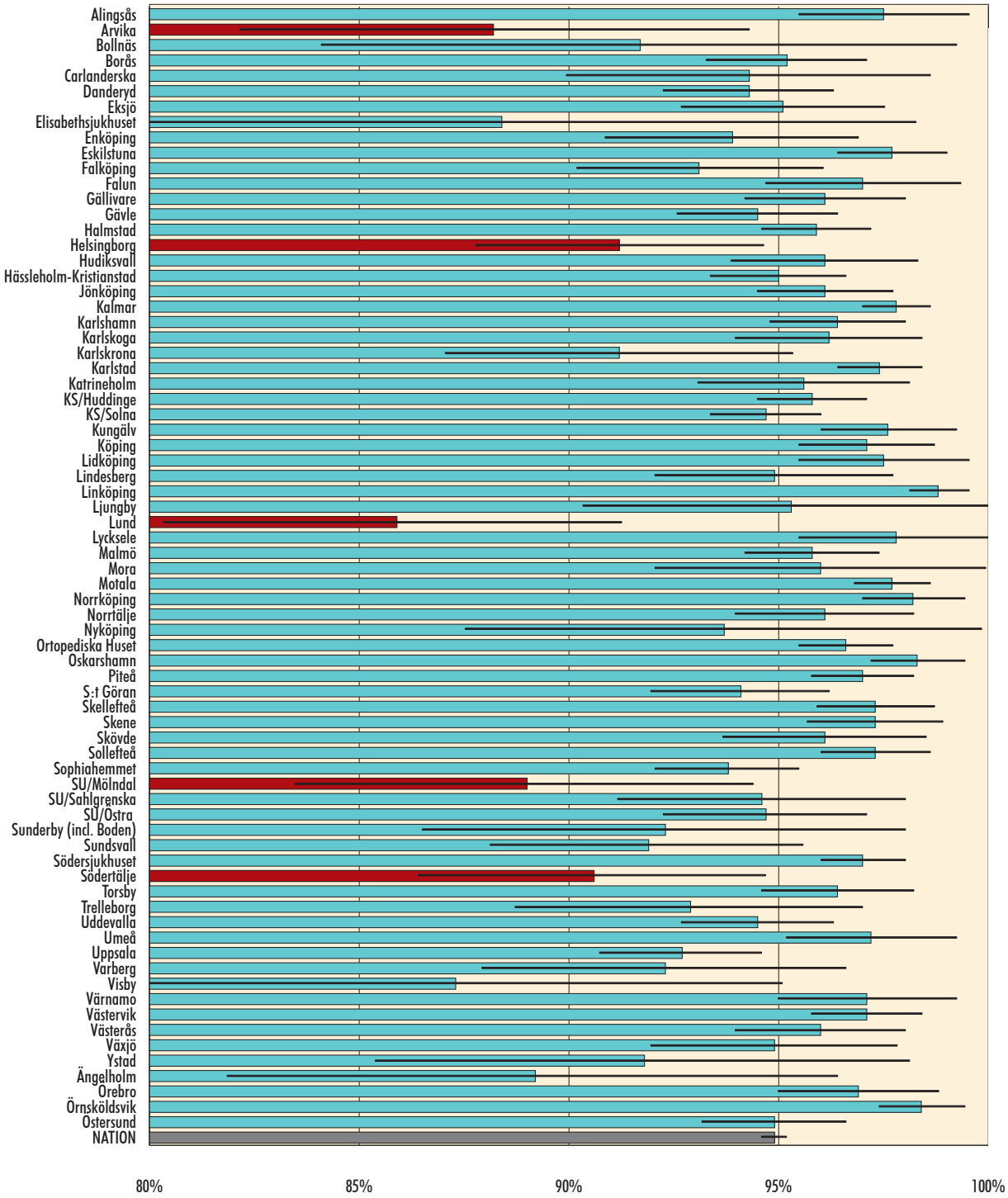
On evaluation of the factors that affected an outcome beyond the expected, several factors should be taken into consideration. One such important factor is patient selection. Hospitals with cutting-edge expertise often carry out surgery on younger patients who, in addition, often due to anatomical conditions, have poorer prerequisites for optimal positioning and anchoring of the prosthesis. Other factors that affect the outcome are choice of implant and quality of the surgical technique and process that existed at the time of the operation in question. The degree of systematic follow-up and attitudes to surgical intervention before reoperation also affect the prevalence of the number of interventions that will be carried out.

Summary: Implant survival measured as absence of revision within a 10 year period has gradually improved since 1979, when the Swedish Hip Arthroplasty Register started. The risk of the patient needing to undergo a further operation and regardless of whether or not the implant is exchanged, currently lies at 95% seen in a national perspective. The variation between different hospitals has decreased throughout the years and now lies at about 12%. This variation can probably be explained by different patient selection, varying surgical techniques and implant choices as well as indications with regard to reoperation. In comparisons between hospitals it is important to realise that this measurement of outcome does not fully reflect the current activities but that the operations are carried out over a 10-year period.



Implant survival after 10 years

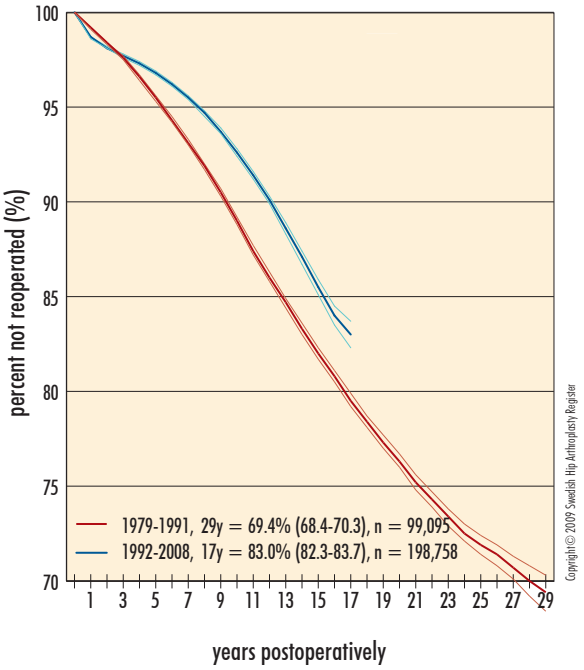
each bar represents a hospital, primary operation 1999–2008



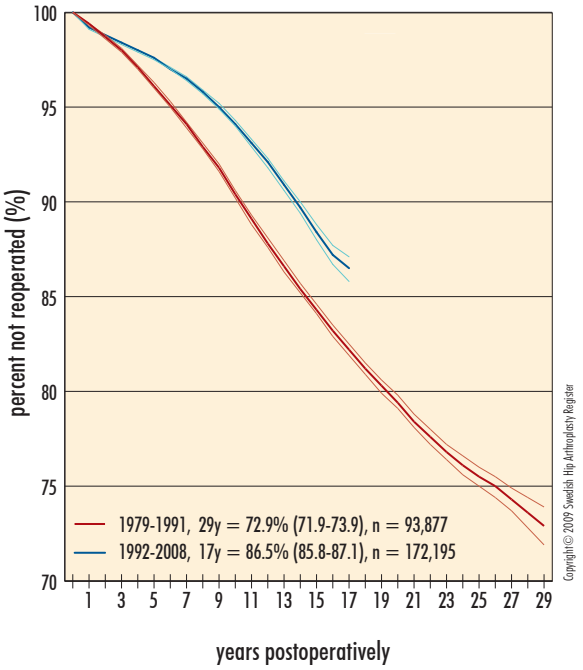
Implant survival after 10 years by department. Grey bar indicates national average. Red bars represent departments whose upper confidence interval is below the national lower competence interval, i.e. departments which with 95% probability have poorer implant survival after 10 years than the average for the country. The primary operations were conducted during the most recent 10-year period.

In all survival analyses according to Kaplan-Meier the analysis should come to an end when the number of patients 'at risk' is less than 10.

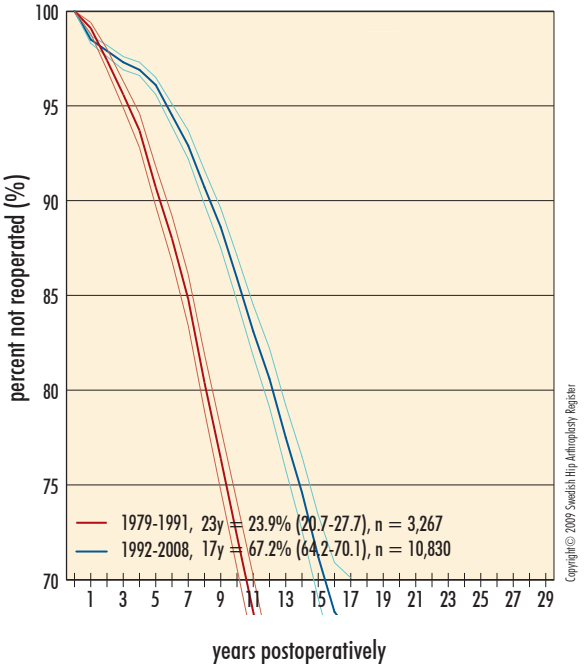
All implants
all diagnoses and all reasons for revision



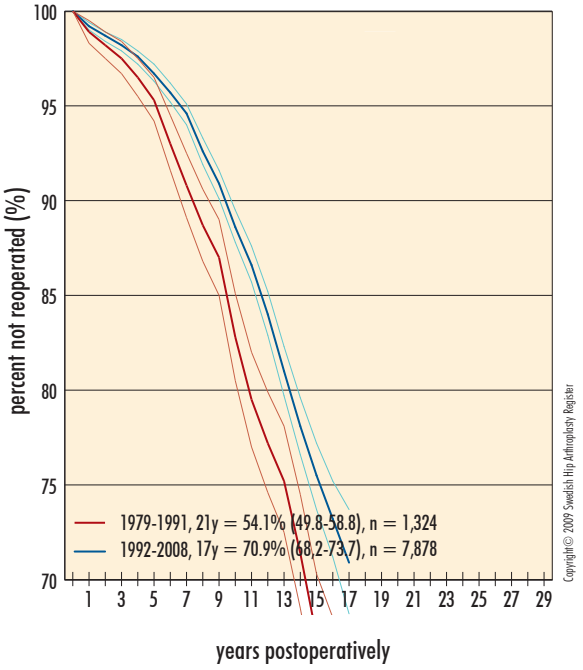
All cemented implants
all diagnoses and all reasons for revision



All uncemented implants
all diagnoses and all reasons for revision

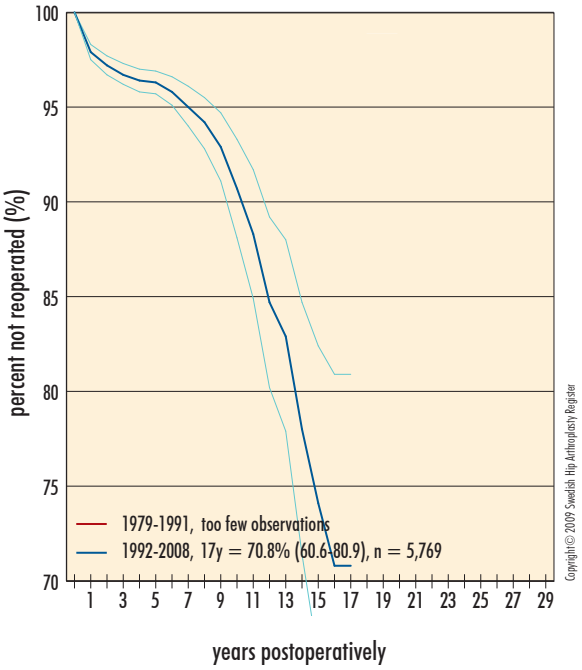


All hybrid implants
all diagnoses and all reasons for revision



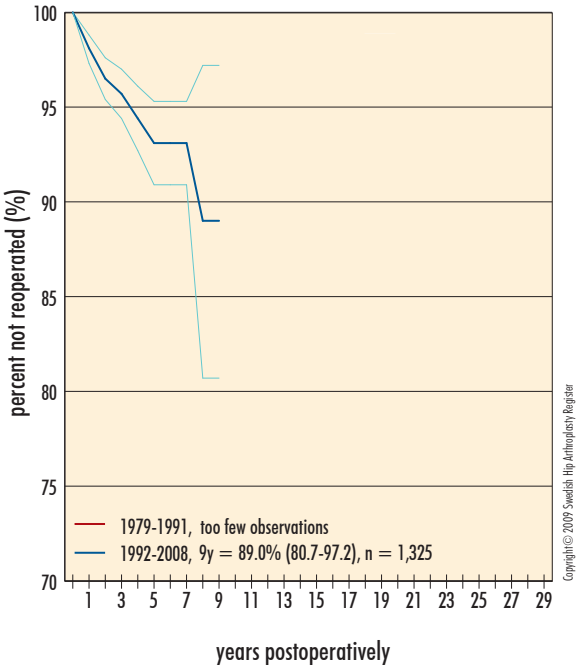
All reversed hybrid implants

all diagnoses and all reasons for revision



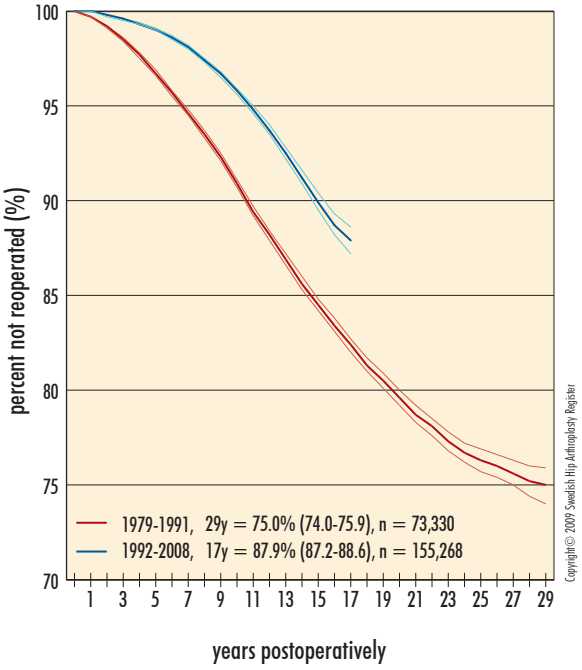
All resurfacing implants

all diagnoses and all reasons for revision



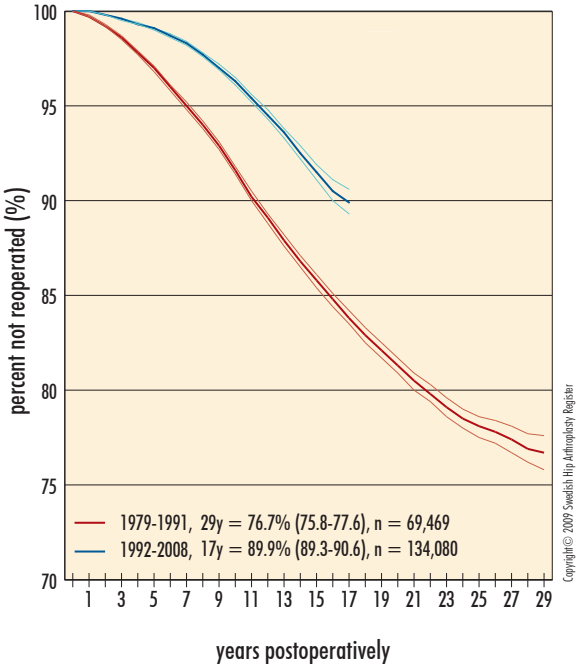
All implants

primary osteoarthritis and aseptic loosening

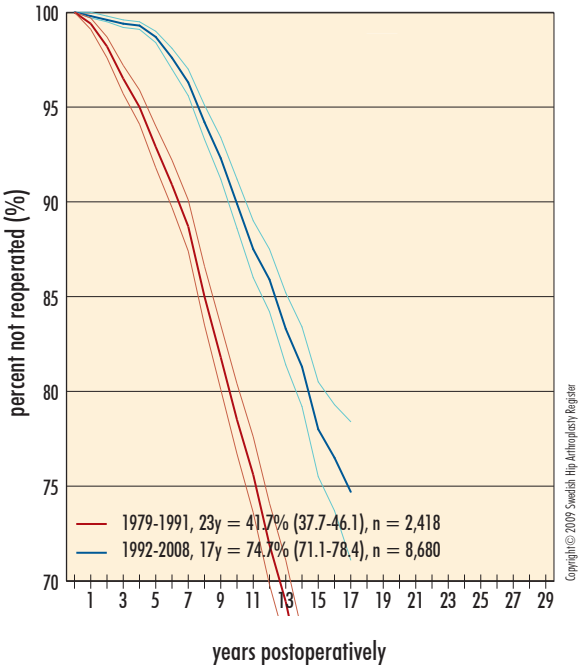


All cemented implants

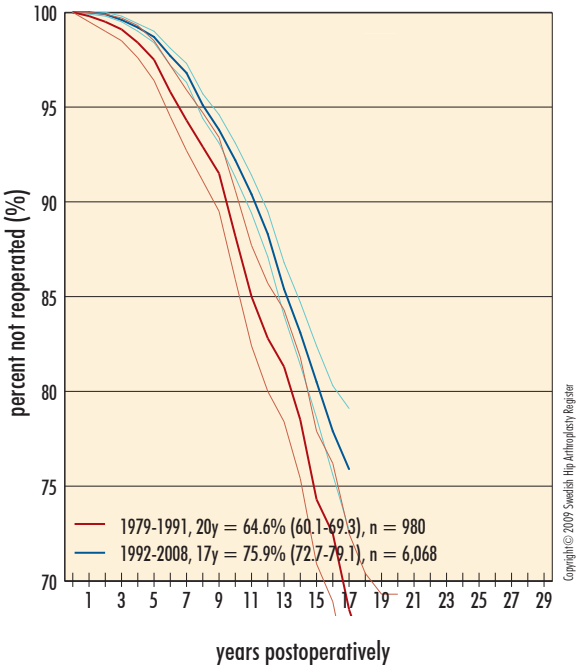
primary osteoarthritis and aseptic loosening



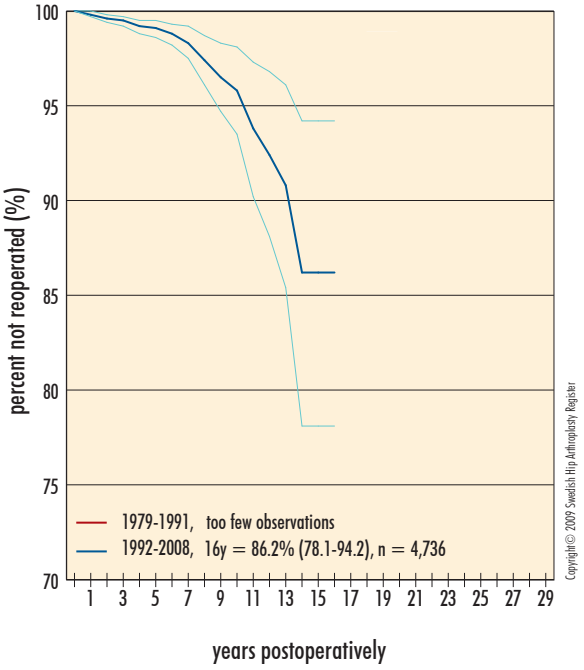
All uncemented implants
primary osteoarthritis and aseptic loosening



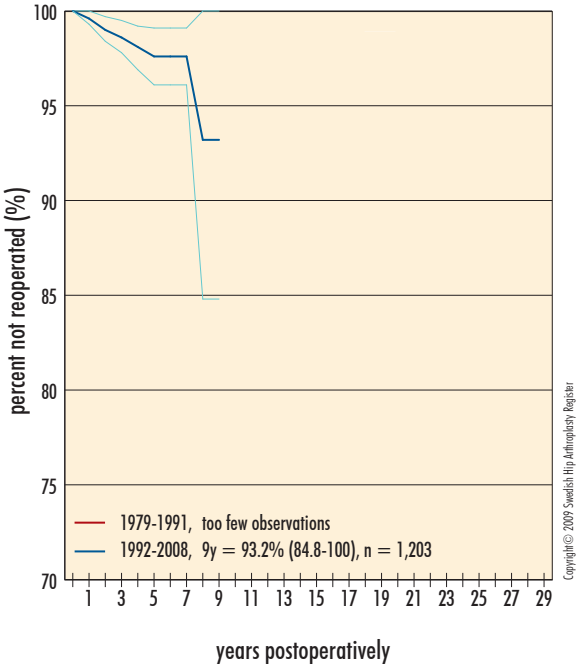
All hybrid implants
primary osteoarthritis and aseptic loosening



All reversed hybrid implants
primary osteoarthritis and aseptic loosening

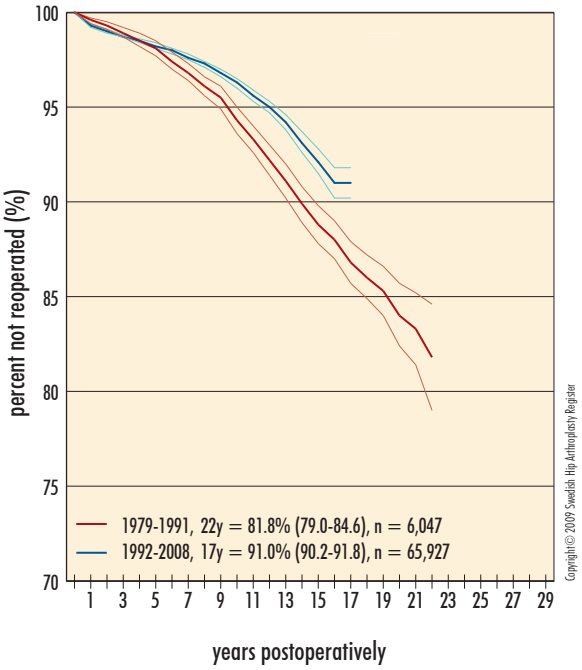


All resurfacing implants
primary osteoarthritis and aseptic loosening



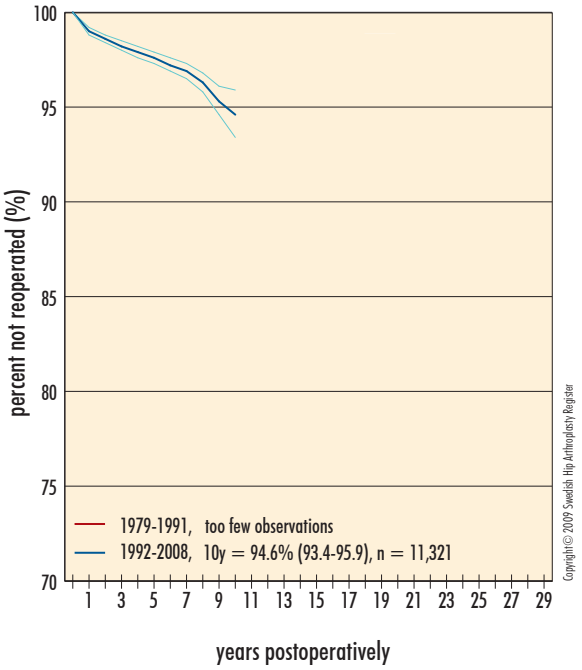
Lubinus SP II

all diagnoses and all reasons for revision



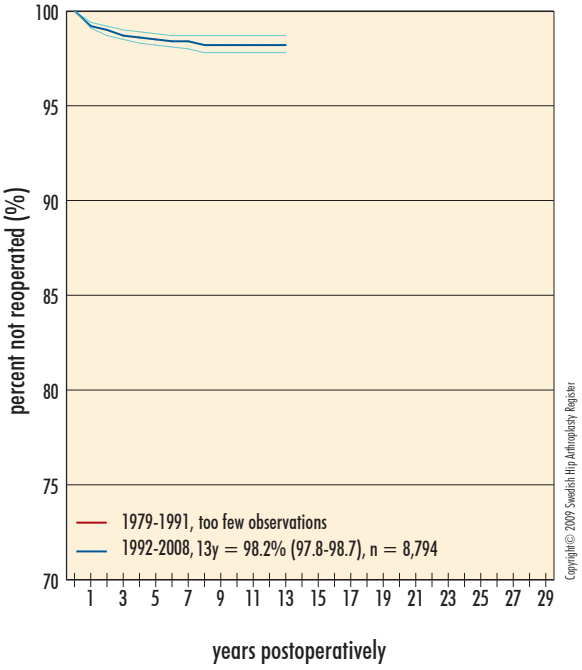
Exeter Duration (Exeter Polished)

all diagnoses and all reasons for revision



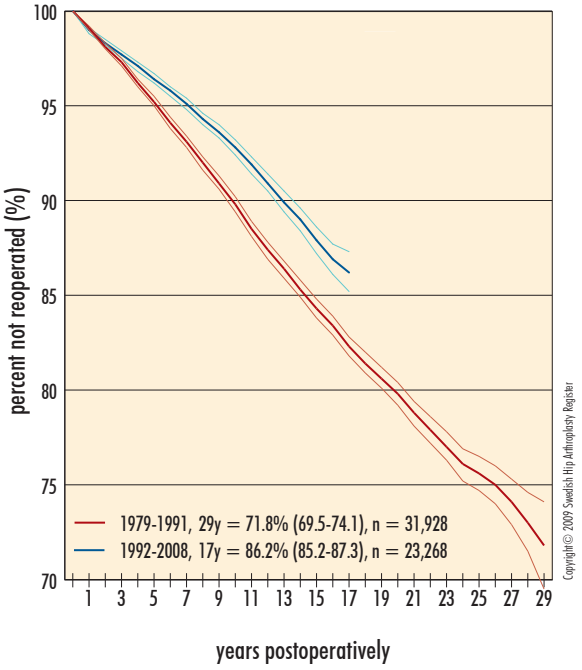
Charnley Elite (Exeter Polished)

all diagnoses and all reasons for revision



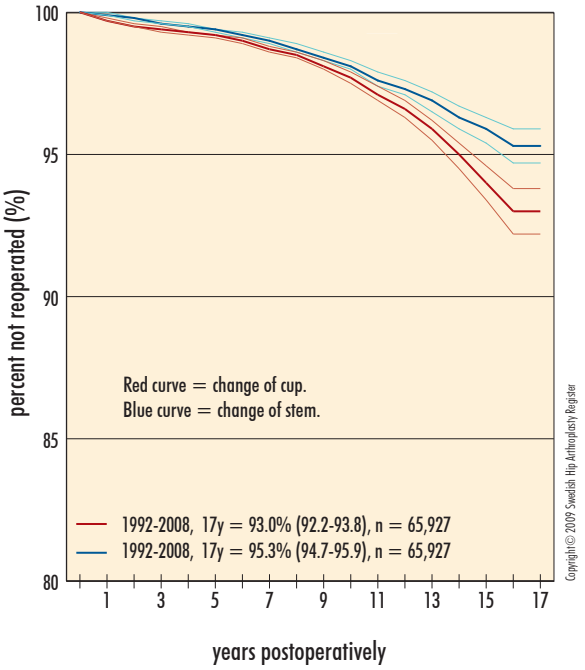
Charnley

all diagnoses and all reasons for revision



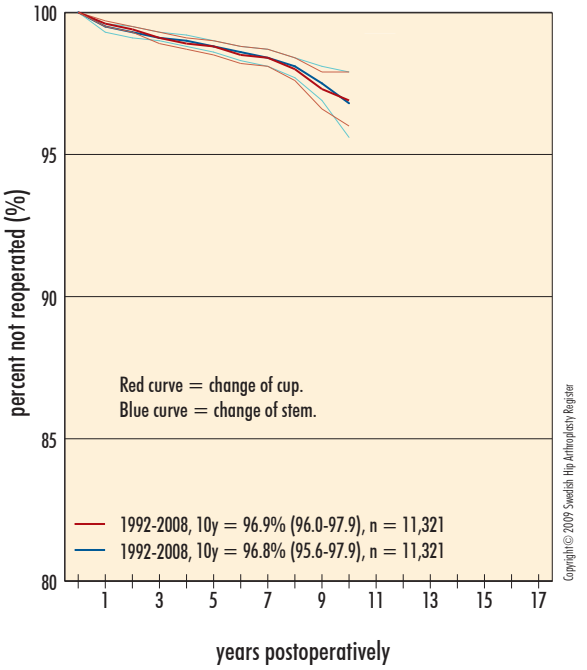
Lubinus SP II

cup-/stemrevision – all diagnoses and all reasons for revision



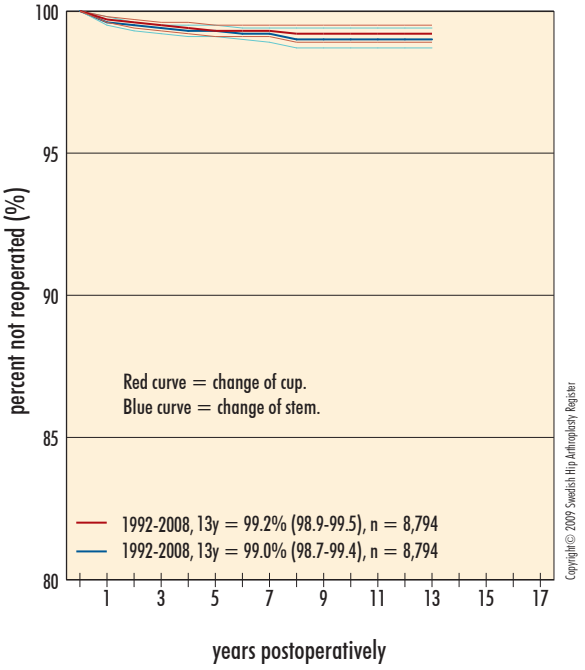
Exeter Duration (Exeter Polished)

cup-/stemrevision – all diagnoses and all reasons for revision



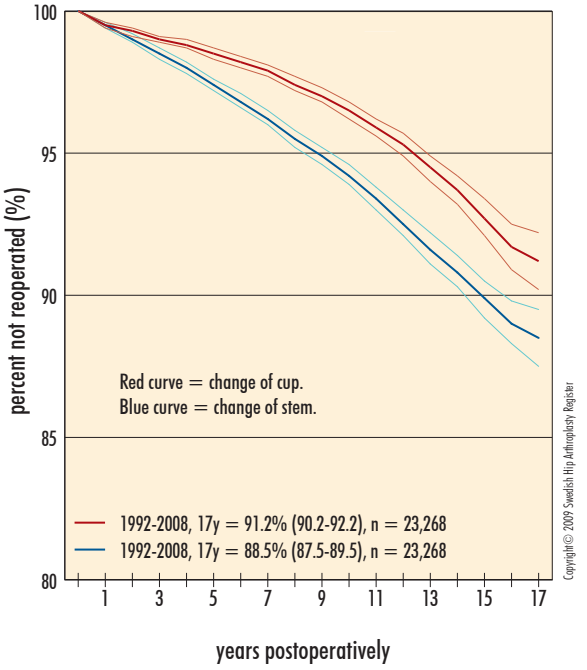
Charnley Elite (Exeter Polished)

cup-/stemrevision – all diagnoses and all reasons for revision



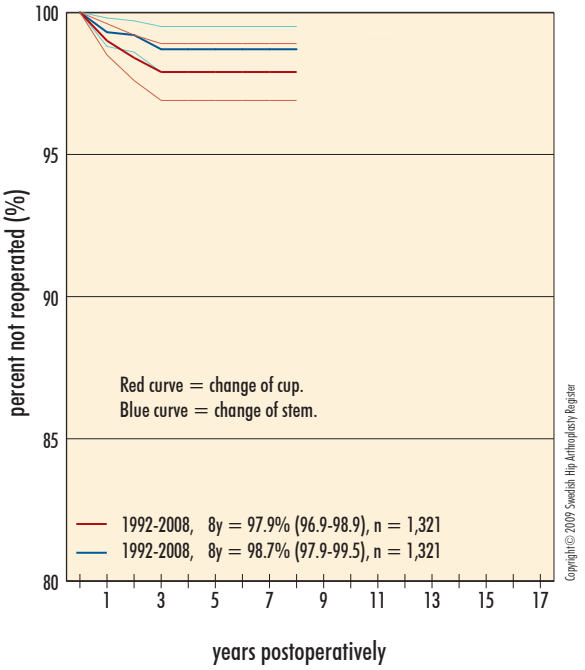
Charnley

cup-/stemrevision – all diagnoses and all reasons for revision



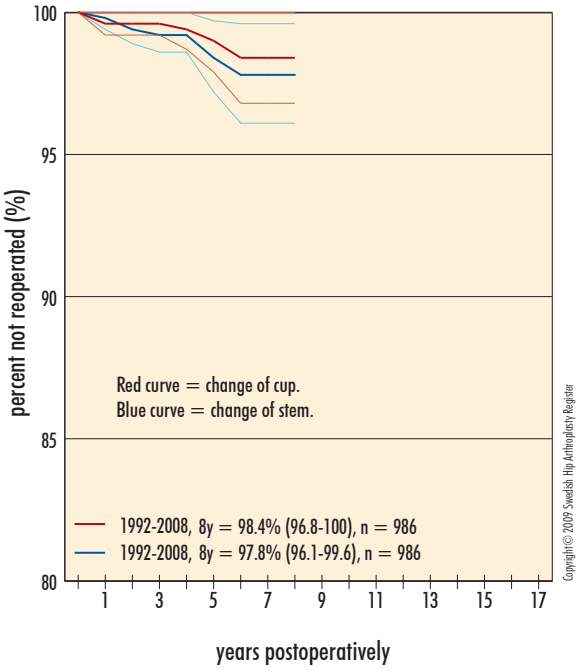
Trilogy HA (CLS Spotorno)

cup-/stemrevision – all diagnoses and all reasons for revision



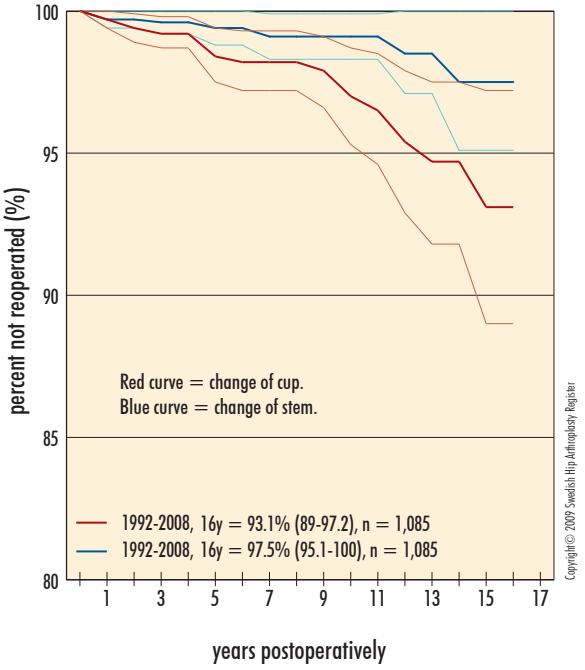
Allofit (CLS Spotorno)

cup-/stemrevision – all diagnoses and all reasons for revision



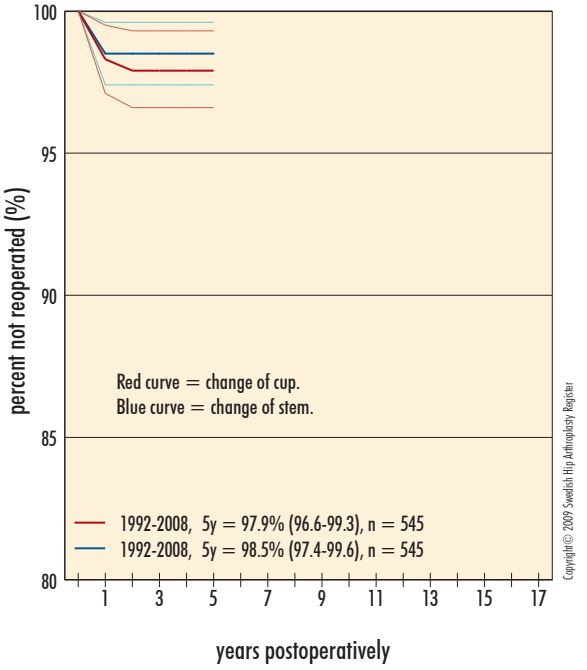
CLS Spotorno

cup-/stemrevision – all diagnoses and all reasons for revision



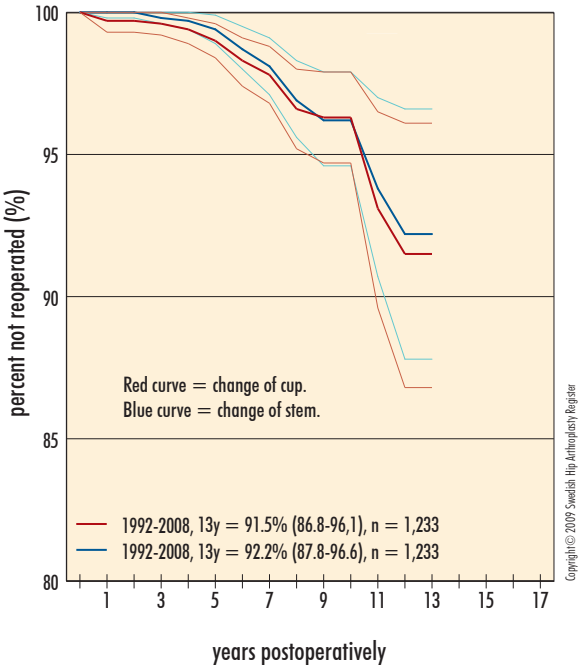
Trident HA (Accolade)

cup-/stemrevision – all diagnoses and all reasons for revision



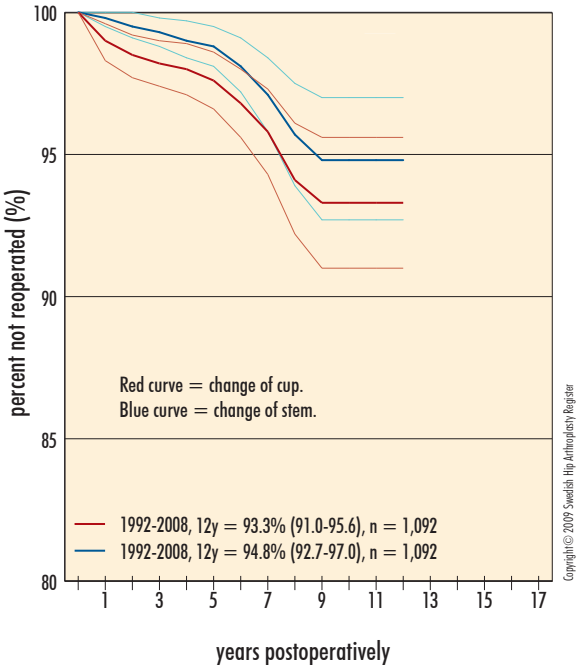
Trilogy HA (Spectron EF Primary)

cup-/stemrevision – all diagnoses and all reasons for revision



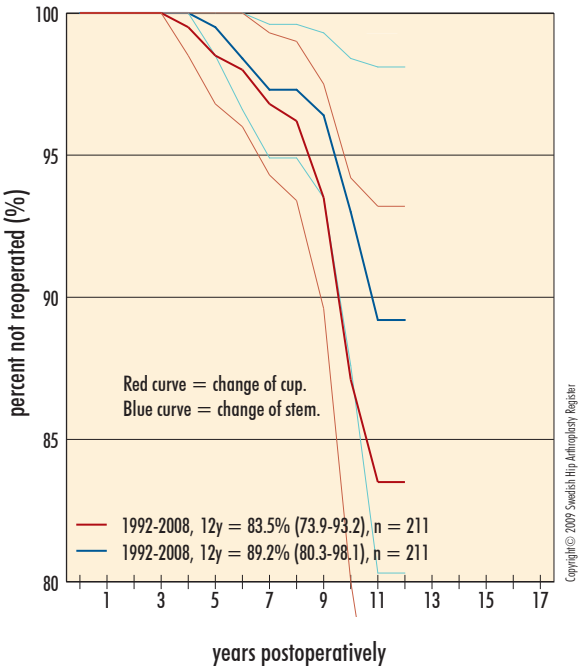
Trilogy HA (Lubinus SP II)

cup-/stemrevision – all diagnoses and all reasons for revision



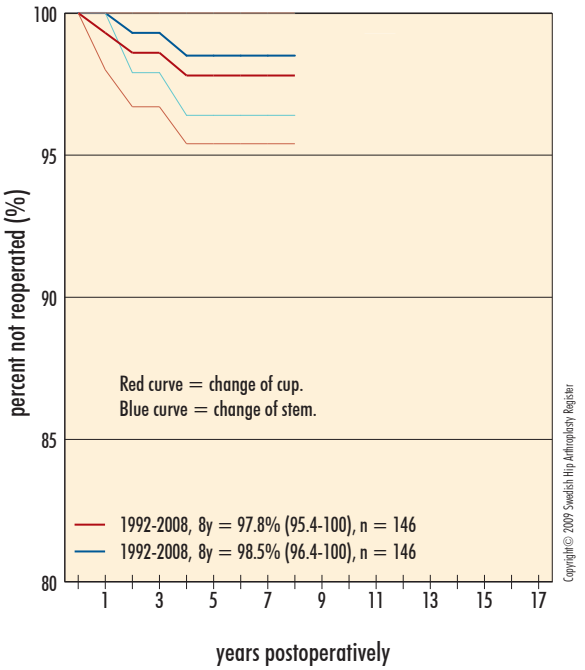
ABG II HA (Lubinus SP II)

cup-/stemrevision – all diagnoses and all reasons for revision



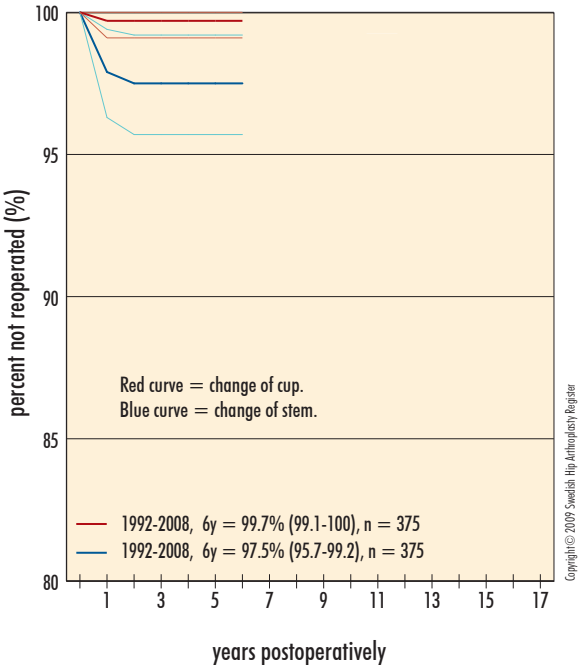
TOP Pressfit HA (Lubinus SP II)

cup-/stemrevision – all diagnoses and all reasons for revision



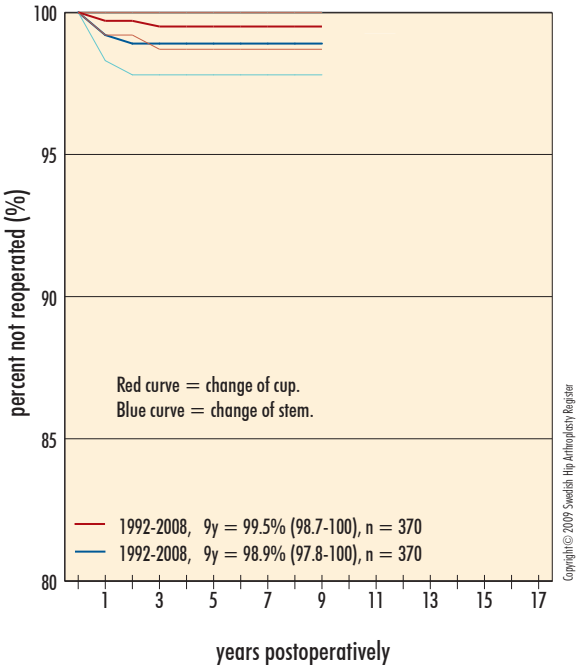
Charnley Elite (CLS Spotorno)

cup-/stemrevision – all diagnoses and all reasons for revision



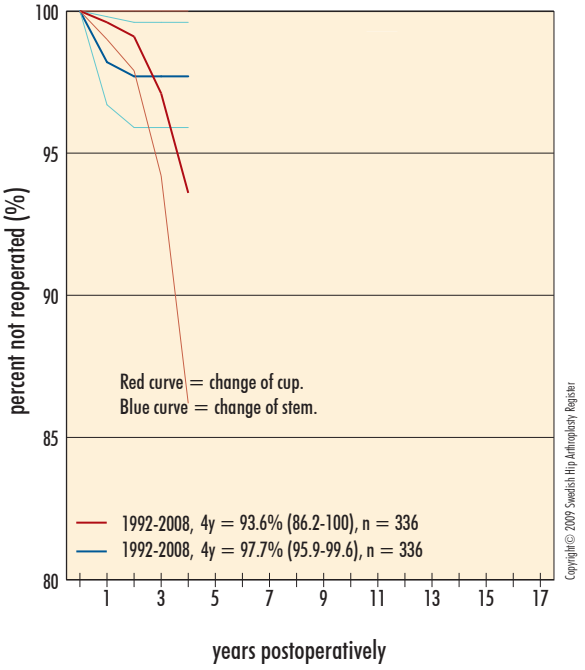
Charnley Elite (ABG)

cup-/stemrevision – all diagnoses and all reasons for revision



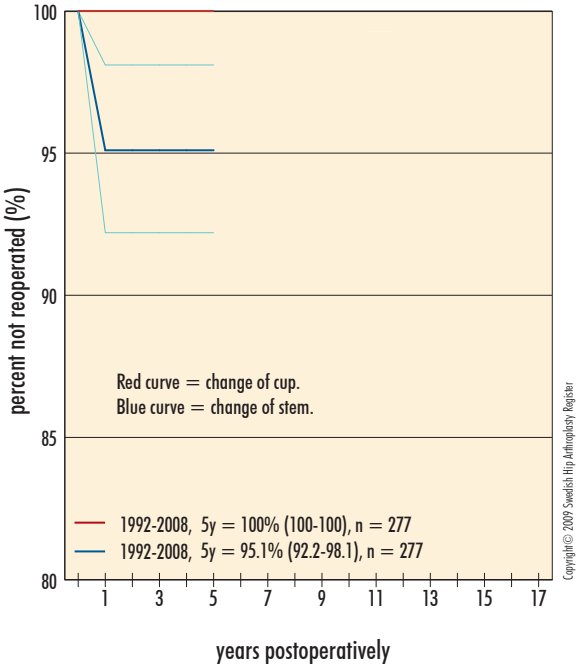
Contemporary H.D. (ABG II HA)

cup-/stemrevision – all diagnoses and all reasons for revision



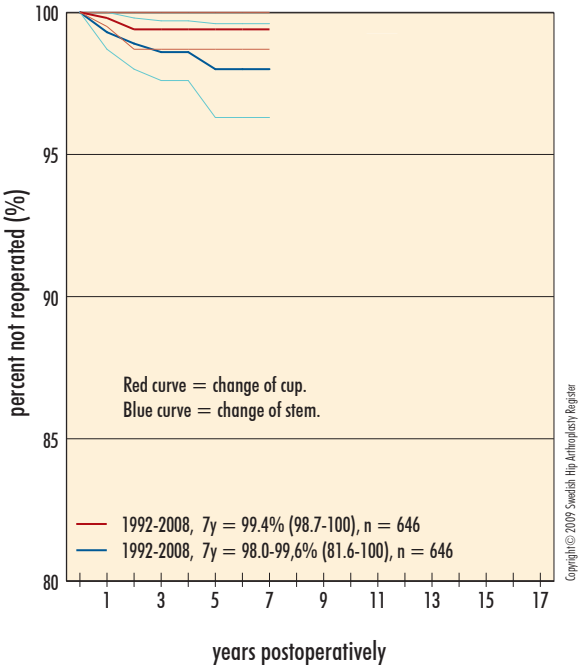
Charnley Elite (Corail)

cup-/stemrevision – all diagnoses and all reasons for revision



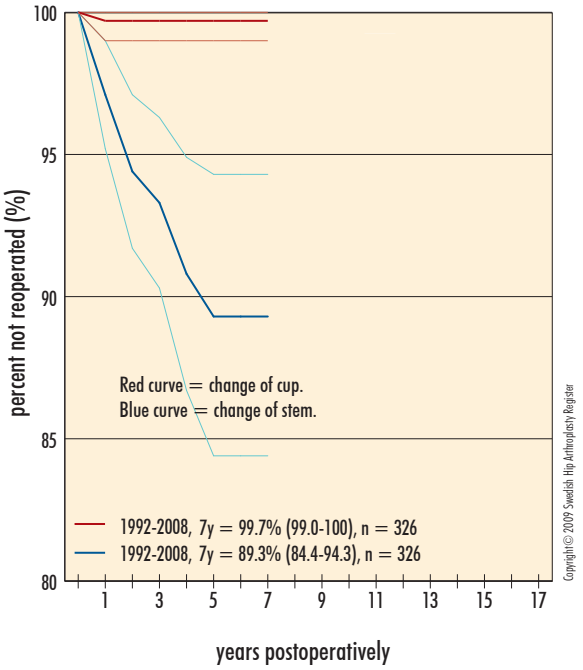
BHR

cup-/stemrevision – all diagnoses and all reasons for revision



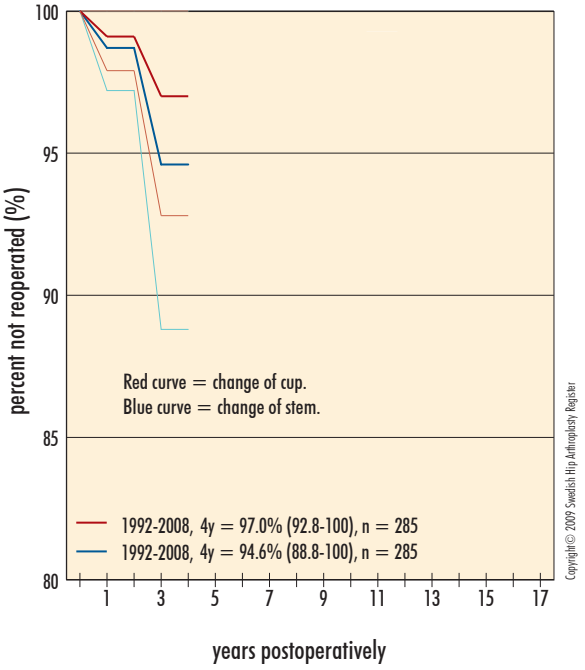
Durom

cup-/stemrevision – all diagnoses and all reasons for revision



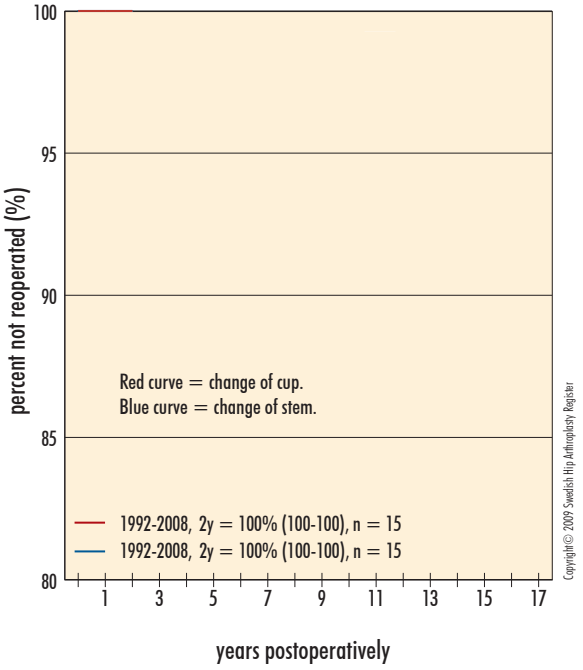
ASR

cup-/stemrevision – all diagnoses and all reasons for revision

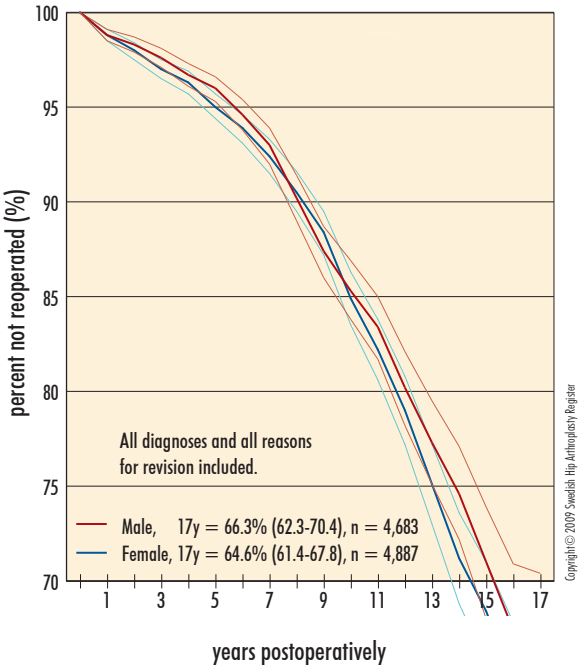


Adept

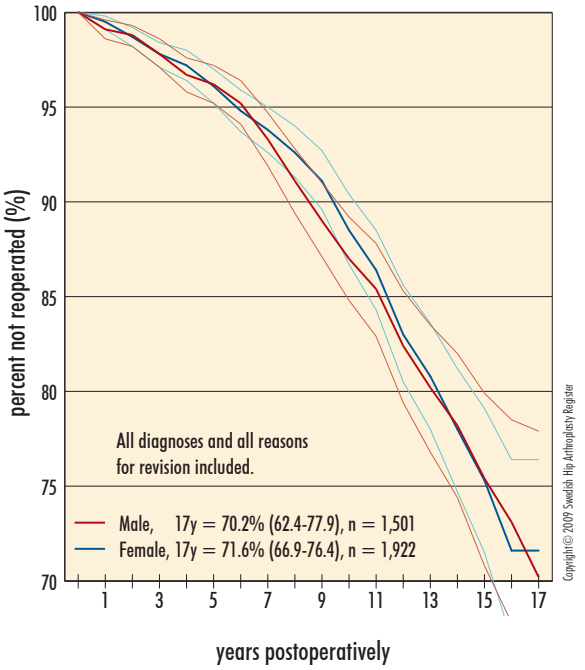
cup-/stemrevision – all diagnoses and all reasons for revision



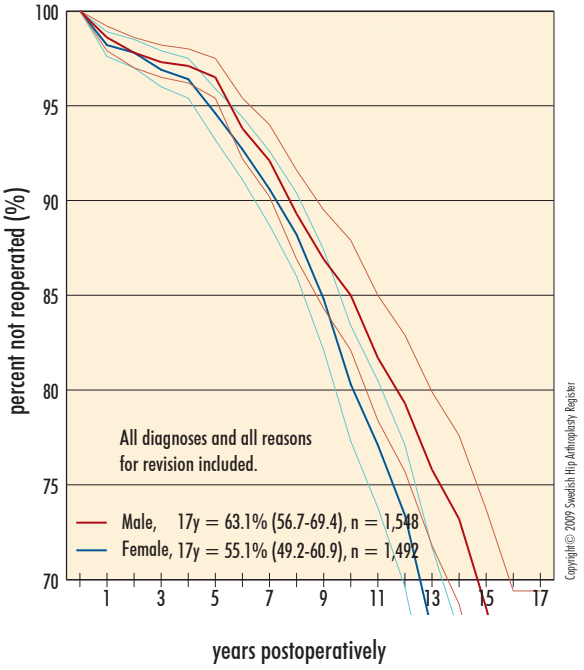
Younger than 50 years
all observations



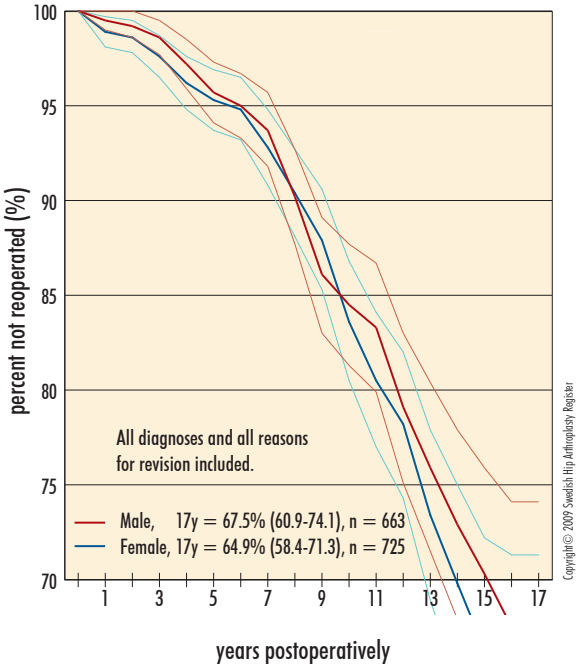
Younger than 50 years
cemented implants



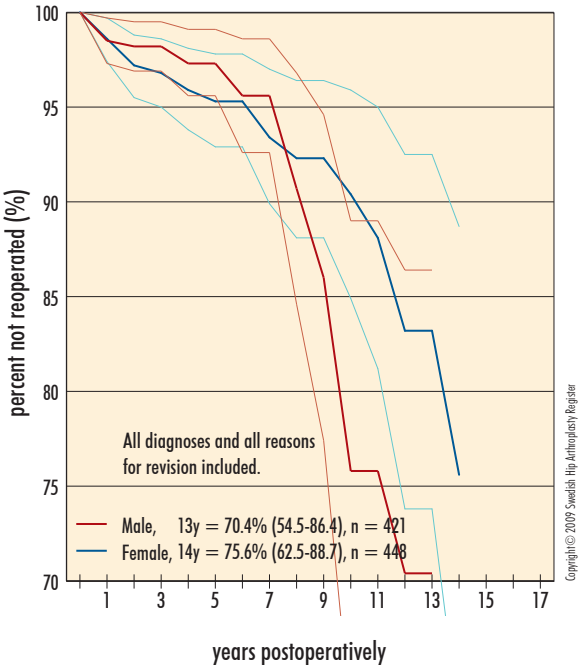
Younger than 50 years
uncemented implants



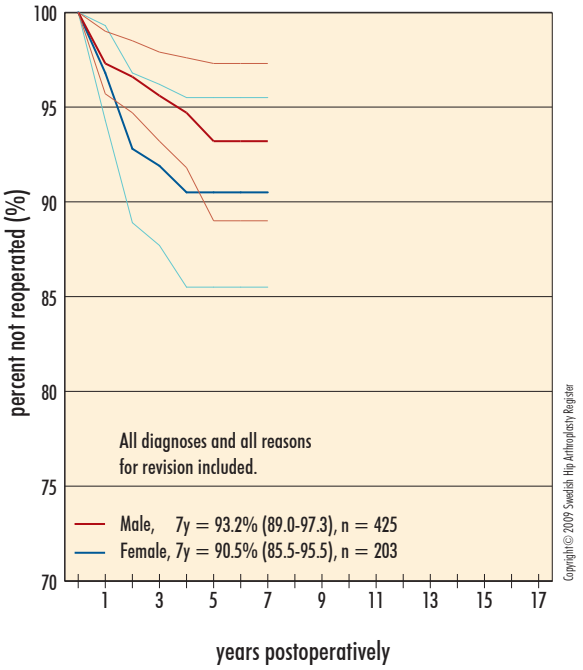
Younger than 50 years
hybrid implants



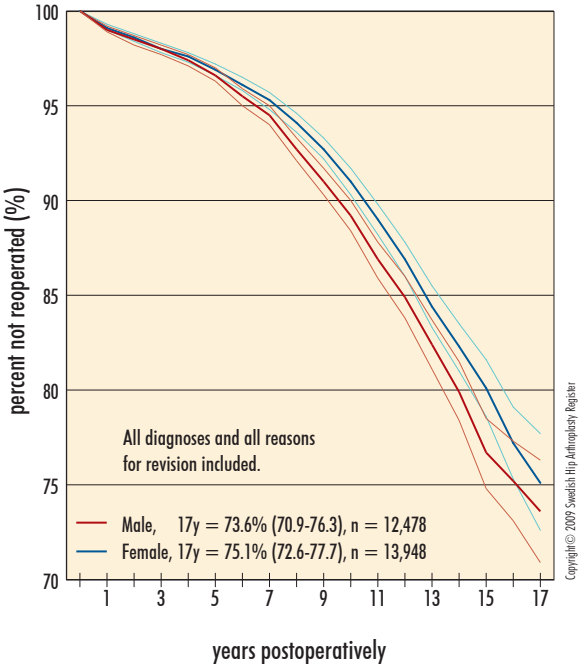
Younger than 50 years
reversed hybrid implants



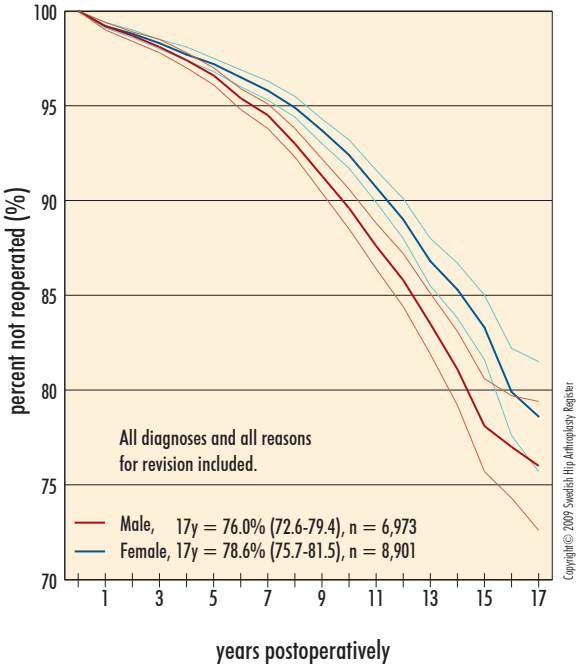
Younger than 50 years
resurfacing implants



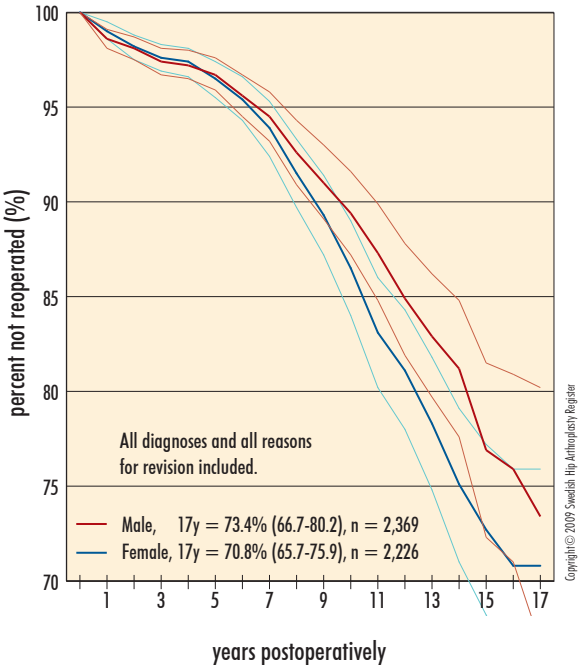
Between 50 and 59 years
all observations



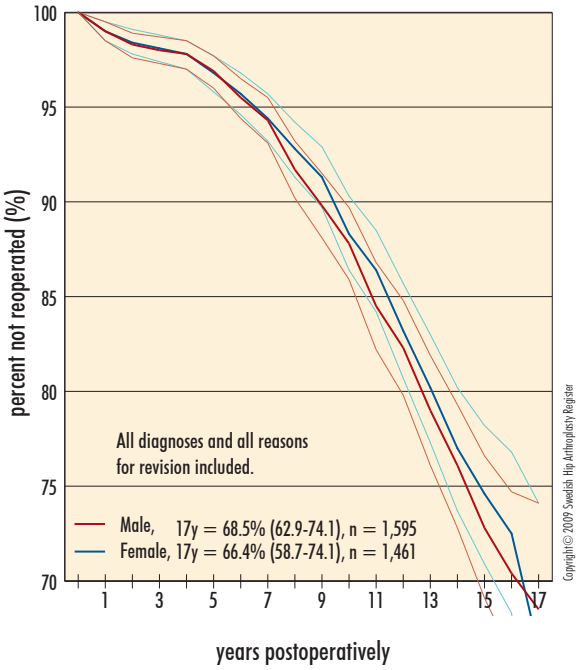
Between 50 and 59 years
cemented implants



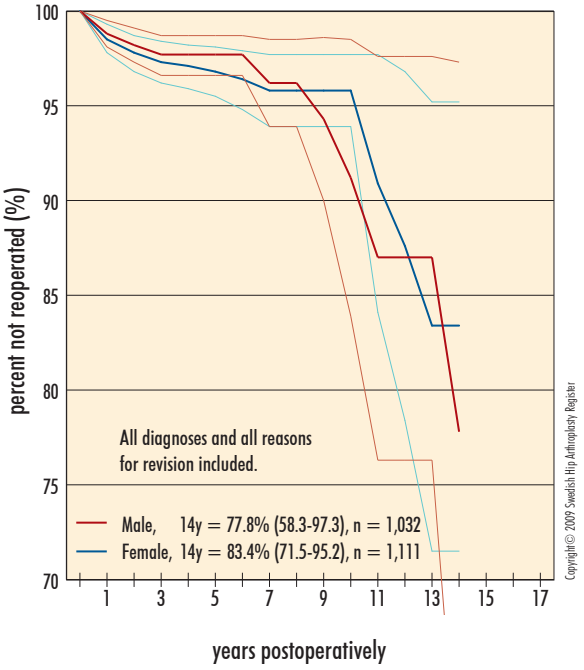
Between 50 and 59 years
uncemented implants



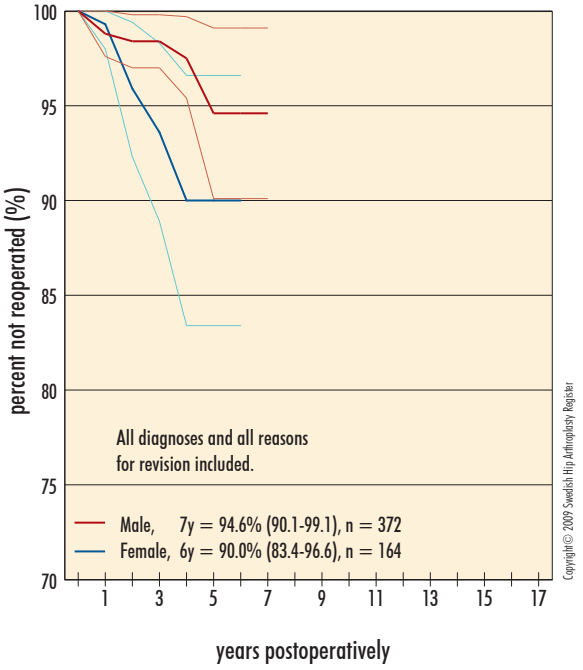
Between 50 and 59 years
hybrid implants



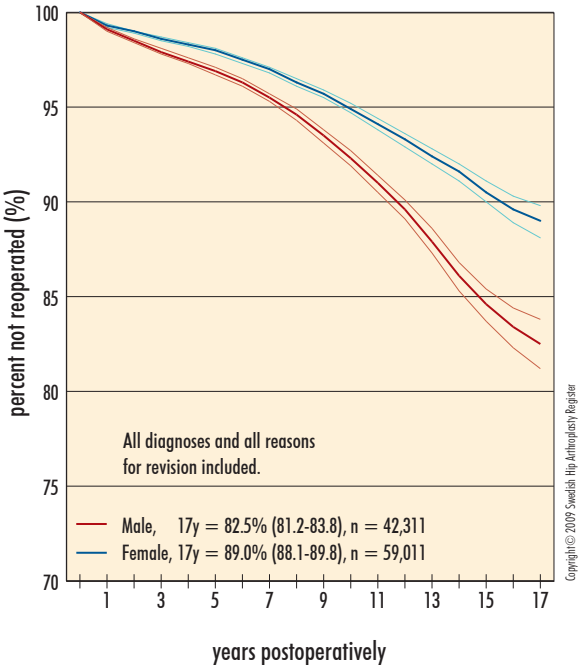
Between 50 and 59 years
reversed hybrid implants



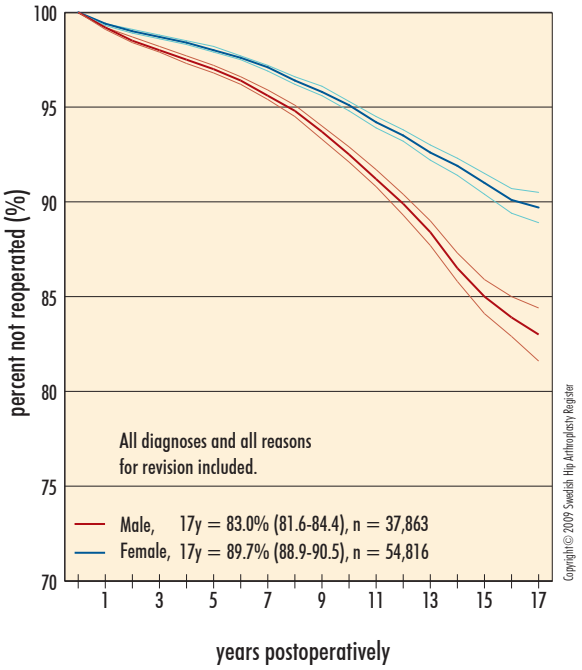
Between 50 and 59 years
resurfacing implants



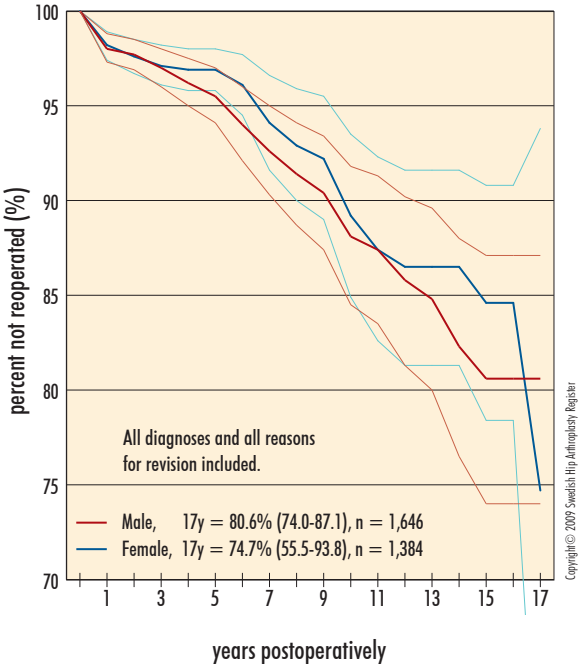
Between 60 and 75 years
all observations



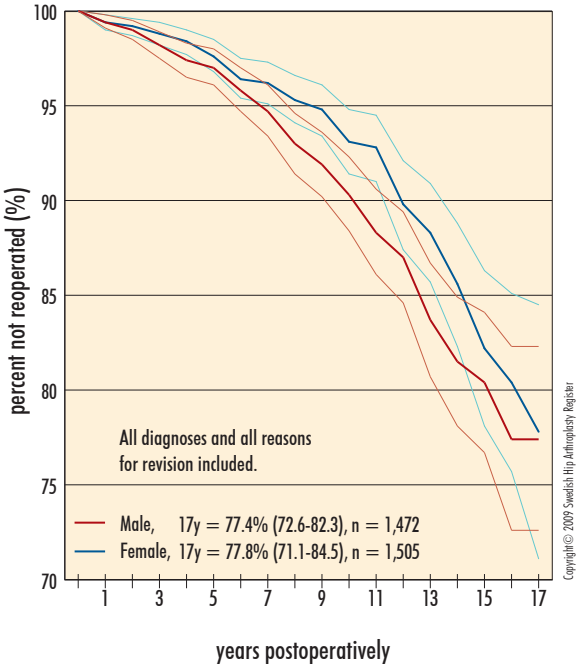
Between 60 and 75 years
cemented implants



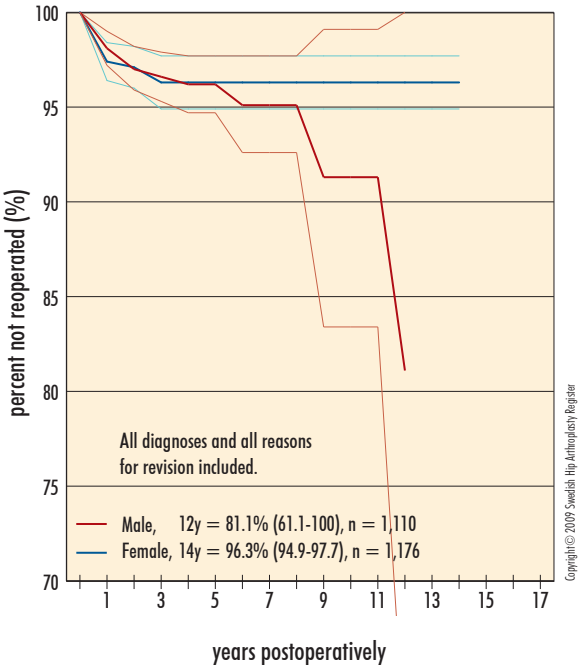
Between 60 and 75 years
uncemented implants



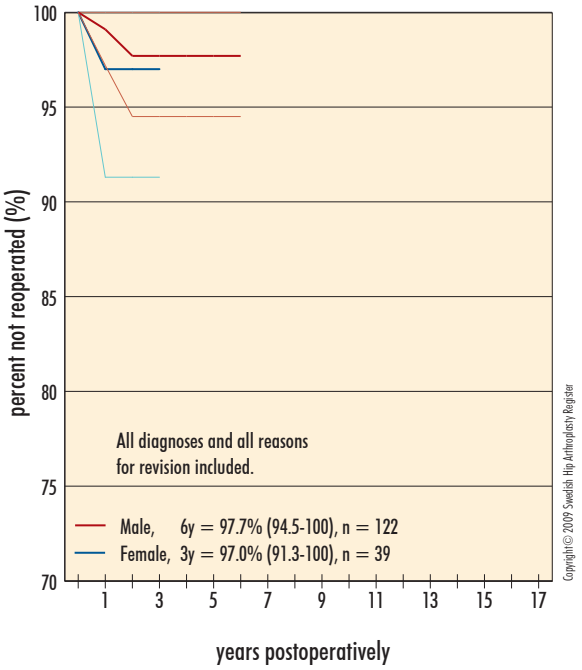
Between 60 and 75 years
hybrid implants



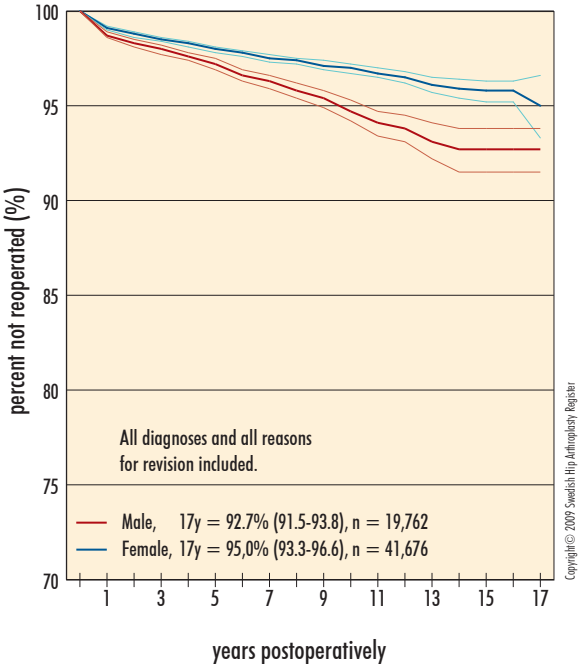
Between 60 and 75 years
reversed hybrid implants



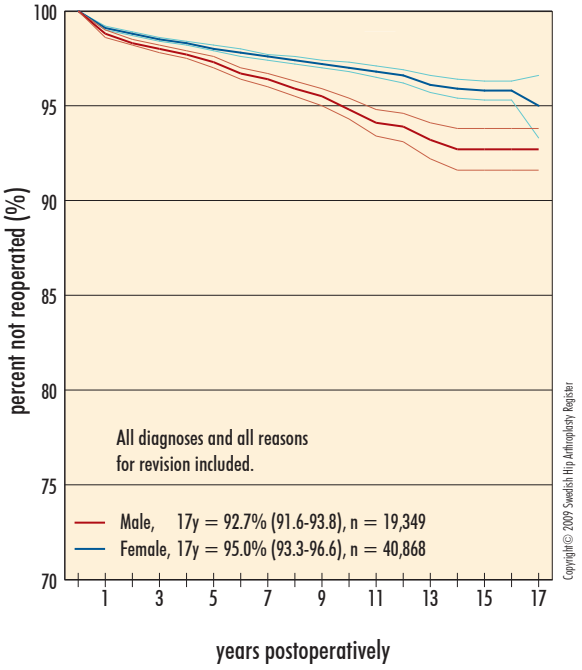
Between 60 and 75 years
resurfacing implants



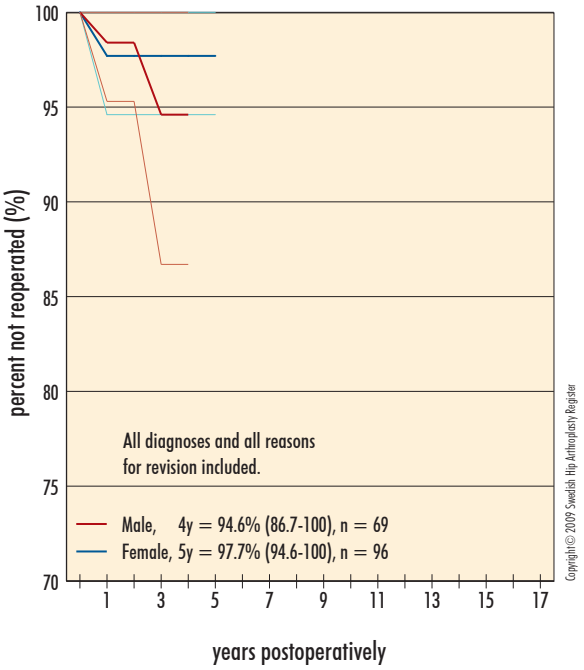
Older than 75 years
all observations



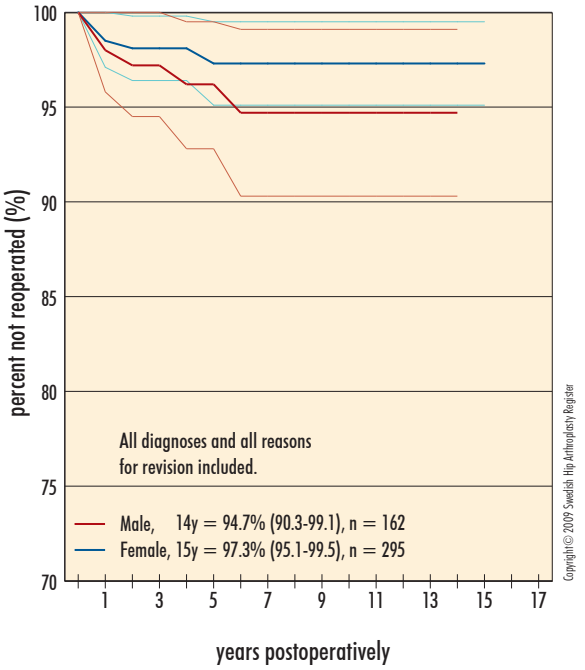
Older than 75 years
cemented implants



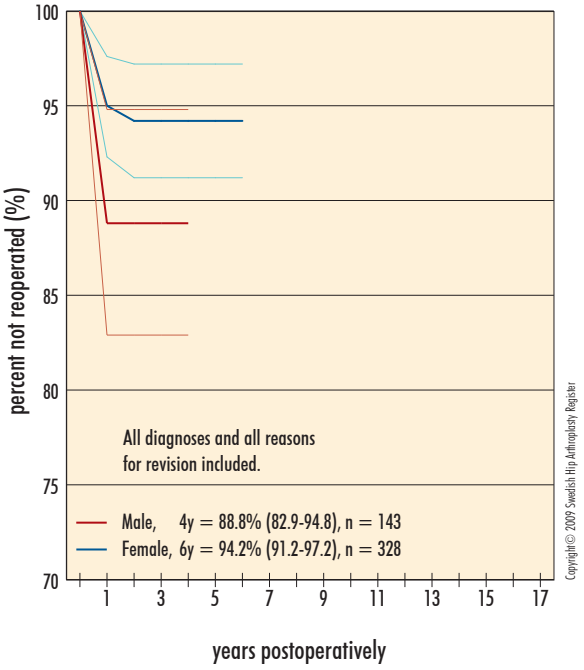
Older than 75 years
uncemented implants



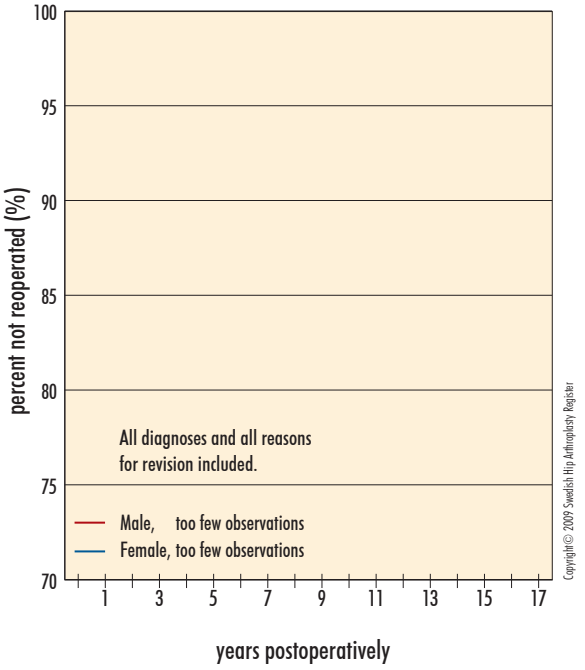
Older than 75 years
hybrid implants



Older than 75 years
reversed hybrid implants



Older than 75 years
resurfacing implants



Implant survival per type

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	≥= 60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
ABG HA (ABG cem)	1992–1998	241	64.8%	87.1%	63.1%	98.2%	±1.8%	92.7%	±4.0%
ABG HA (ABG uncem)	1992–1998	280	83.1%	5.7%	53.2%	97.1%	±2.0%	80.7%	±4.6%
ABG HA (Charnley)	1992–1998	50	82.0%	26.0%	50.0%	92.0%	±7.5%	79.7%	±11.2%
ABG HA (Definition)	1997–1998	24	95.8%	58.3%	58.3%	91.7%	±9.7%	77.2%	±17.7%
ABG HA (Exeter Polished)	1992–1998	55	79.6%	27.3%	58.2%	98.1%	±2.8%	94.0%	±6.3%
ABG HA (Lubinus SP II)	1992–1998	335	80.3%	40.6%	48.7%	96.9%	±1.9%	85.8%	±3.9%
ABG II HA (ABG HA)	1999–2002	18	72.2%	16.7%	66.7%	76.8%	±20.0%		
ABG II HA (ABG II HA)	2003–2007	78	67.9%	11.5%	50.0%	96.1%	±4.1%		
ABG II HA (ABG uncem)	1993–2006	198	80.3%	7.6%	41.9%	97.4%	±2.3%	92.2%	±6.3%
ABG II HA (Definition)	1998–2001	13	84.6%	53.8%	46.2%	91.7%	±12.0%		
ABG II HA (Exeter Polished)	1997–2005	67	80.6%	16.4%	43.3%	97.0%	±3.6%	86.5%	±9.6%
ABG II HA (Lubinus SP II)	1997–2006	211	81.5%	32.2%	48.8%	97.5%	±2.1%	85.8%	±7.2%
ABG II HA (Meridian)	1998–2004	114	66.7%	27.2%	47.4%	97.3%	±2.8%	97.3%	±2.8%
ABG II HA (Optima)	1999–2000	14	92.9%	21.4%	42.9%	92.9%	±10.3%		
ABG II HA (Scan Hip II Collar)	2000–2001	12	75.0%	66.7%	58.3%	91.7%	±12.0%		
ABG II Hole HA for ceramic-ceramic (ABG II HA)	2002–2007	72	86.1%	22.2%	50.0%	95.8%	±4.4%		
Allofit (CLS Spotorno)	2001–2008	986	91.5%	37.1%	48.1%	97.7%	±1.4%		
Allofit (Lubinus SP II)	2002–2007	21	100.0%	4.8%	42.9%	100.0%	±0.0%		
Allofit (MS30 Polished)	1998–2008	85	49.4%	17.6%	51.8%	90.1%	±7.0%	87.6%	±8.3%
Allofit (Wagner Cone Prosthesis)	2002–2008	35	51.4%	25.7%	57.1%	100.0%	±0.0%		
Anatomic (Exeter Polished)	1992–1993	22	77.3%	45.5%	40.9%	100.0%	±0.0%	95.2%	±7.0%
Anatomic (Lubinus SP II)	1992–1993	23	69.6%	43.5%	47.8%	95.7%	±6.4%	90.6%	±10.9%
AstraTech (AstraTech)	1992–1998	27	96.3%	55.6%	44.4%	73.3%	±17.0%	38.6%	±18.7%
AstraTech (Hip Cylinder Fixture)	2001–2002	20	95.0%	40.0%	50.0%	95.0%	±7.3%		
BHR Acetabular Cup (BHR Femoral Head)	1999–2008	646	94.1%	9.8%	33.6%	96.8%	±2.0%		
Bicon-plus (SL plus Stem uncem)	1997–2001	30	70.0%	0.0%	56.7%	96.7%	±4.9%	96.7%	±4.9%
Biomet Müller (Bi-Metric cem)	1992–1996	1,097	81.3%	90.0%	59.2%	96.2%	±1.2%	90.5%	±2.0%
Biomet Müller (Bi-Metric HA lat)	2003–2008	187	94.7%	66.8%	38.5%	97.9%	±2.3%		
Biomet Müller (Bi-Metric HA uncem)	1993–2008	199	95.0%	34.7%	61.3%	98.4%	±1.6%	97.5%	±2.5%
Biomet Müller (Bi-Metric uncem)	1992–2002	32	68.2%	15.6%	68.8%	96.7%	±4.9%	82.4%	±14.0%
Biomet Müller (CPT (CoCr))	2003–2008	488	76.0%	99.0%	72.5%	95.0%	±3.0%		
Biomet Müller (CPT (steel))	1997–2004	950	94.6%	94.3%	67.9%	96.2%	±1.3%	94.9%	±1.8%
Biomet Müller (RX90-S)	1994–2001	1,450	76.9%	88.1%	61.5%	97.8%	±0.8%	94.3%	±1.4%
Biomet Müller (Stanmore mod)	1997–2002	94	95.7%	90.4%	62.8%	98.9%	±1.6%	96.5%	±4.4%
Biomex HA (Bi-Metric HA uncem)	1999–2001	35	80.0%	5.7%	40.0%	100.0%	±0.0%	80.7%	±23.4%
Biomex HA (Lubinus SP II)	2000–2004	107	81.3%	8.4%	59.8%	100.0%	±0.0%		
Biomex HA (Spectron EF Primary)	1998–1999	14	92.9%	14.3%	50.0%	100.0%	±0.0%	100.0%	±0.0%
Biomex HA (Stanmore mod)	1999–2001	30	93.3%	36.7%	40.0%	100.0%	±0.0%		
Biomex titan (Bi-Metric uncem)	1997–1998	11	100.0%	27.3%	45.5%	100.0%	±0.0%	100.0%	±0.0%
Cenator (Bi-Metric cem)	1993–1999	293	70.9%	46.8%	48.8%	97.1%	±2.0%	90.1%	±3.7%
Cenator (Cenator)	1993–2000	1,251	58.8%	95.3%	67.1%	92.9%	±1.6%	85.2%	±2.4%
Cenator (Charnley Elite Plus)	1996–2000	320	84.0%	78.8%	60.3%	96.7%	±2.0%	93.5%	±3.0%
Cenator (Exeter Polished)	1997–2003	661	84.6%	78.2%	53.3%	99.5%	±0.5%	98.6%	±1.1%
Cenator (Lubinus SP II)	1997–2000	64	51.6%	76.6%	59.4%	94.3%	±6.0%	79.4%	±19.4%
Cenator (Wagner Cone Prosthesis)	1994–2000	56	61.8%	10.7%	71.4%	96.4%	±4.3%	92.7%	±6.9%
Charnley (ABG II HA)	2004–2008	234	96.2%	25.6%	52.1%	97.8%	±2.0%		

(continued on next page.)

Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Charnley (ABG uncem)	1996–2003	26	88.5%	19.2%	46.2%	96.2%	±5.6%	88.8%	±13.4%
Charnley (Bi-Metric cem)	1992–1998	58	48.3%	43.1%	51.7%	96.1%	±4.6%	89.7%	±8.5%
Charnley (Bi-Metric HA uncem)	1998–2002	11	100.0%	18.2%	100.0%	100.0%	±0.0%		
Charnley (CAD)	1992–1996	225	79.8%	89.8%	72.4%	97.2%	±2.2%	95.4%	±3.0%
Charnley (Cenator)	1993–1998	23	34.8%	95.7%	65.2%	85.6%	±14.8%		
Charnley (Charnley Elite Plus)	1994–2003	1,409	69.5%	77.3%	65.6%	96.5%	±1.0%	91.0%	±1.8%
Charnley (Charnley)	1992–2008	23,268	79.0%	89.2%	65.4%	96.4%	±0.3%	92.8%	±0.4%
Charnley (CPT (steel))	1996–2004	193	72.5%	80.3%	65.8%	98.4%	±1.7%	94.0%	±5.4%
Charnley (C-stem)	2001–2003	70	85.7%	70.0%	65.7%	97.1%	±3.5%		
Charnley (Definition)	1997–2002	33	87.9%	60.6%	48.5%	90.3%	±10.1%	75.2%	±17.8%
Charnley (Exeter Polished)	1992–2008	2,490	79.6%	87.1%	67.9%	97.8%	±0.6%	96.5%	±1.3%
Charnley (Lubinus SP II)	1992–2007	342	83.0%	85.4%	60.5%	97.5%	±1.7%	94.1%	±2.9%
Charnley (Müller Straight)	1992–1998	104	87.5%	96.2%	47.1%	96.9%	±3.3%	95.7%	±4.1%
Charnley (Omnifit)	1992–1999	23	81.8%	26.1%	52.2%	87.0%	±13.4%	82.1%	±15.9%
Charnley (PCA E-series Textured)	1992–1996	129	82.8%	72.9%	56.6%	96.8%	±3.1%	83.7%	±6.9%
Charnley (Relience)	1997–1999	16	93.8%	93.8%	81.3%	100.0%	±0.0%		
Charnley (Spectron EF Primary)	1997–2002	40	87.5%	85.0%	50.0%	100.0%	±0.0%	96.2%	±5.5%
Charnley (Wagner Cone Prosthesis)	1994–2007	27	7.4%	37.0%	85.2%	96.2%	±5.5%		
Charnley Elite (ABG II HA)	2003–2008	198	91.9%	34.3%	40.4%	96.2%	±3.4%		
Charnley Elite (ABG uncem)	1994–2005	370	90.5%	22.2%	45.4%	97.8%	±1.5%		
Charnley Elite (Bi-Metric HA lat)	2003–2008	87	96.6%	48.3%	27.6%	100.0%	±0.0%		
Charnley Elite (Bi-Metric HA uncem)	1998–2008	152	92.1%	36.2%	57.2%	96.3%	±3.3%	89.1%	±12.3%
Charnley Elite (Charnley Elite Plus)	1992–2002	947	67.9%	88.9%	62.9%	94.8%	±1.5%	88.6%	±2.9%
Charnley Elite (Charnley)	1992–2001	340	60.9%	86.5%	63.2%	95.7%	±2.4%	88.7%	±4.0%
Charnley Elite (CLS Spotorno)	2002–2008	375	83.5%	50.9%	48.3%	97.2%	±1.9%		
Charnley Elite (Corail Stem)	1999–2008	277	70.8%	72.6%	56.7%	94.1%	±3.5%		
Charnley Elite (CPT (CoCr))	2004–2008	64	26.6%	79.7%	73.4%	98.1%	±2.8%		
Charnley Elite (CPT (steel))	1997–2003	115	73.0%	85.2%	68.7%	93.7%	±4.6%	92.1%	±5.4%
Charnley Elite (C-stem)	2001–2007	62	69.4%	93.5%	72.6%	100.0%	±0.0%		
Charnley Elite (Definition)	1999–2001	11	54.5%	54.5%	63.6%	90.9%	±13.0%		
Charnley Elite (Exeter Polished)	1996–2008	8,794	72.5%	90.6%	65.8%	98.5%	±0.3%	98.2%	±0.5%
Charnley Elite (Lubinus SP II)	1992–2008	1,280	83.1%	83.1%	63.2%	98.2%	±0.9%	94.1%	±3.0%
Charnley Elite (Meridian)	2000–2006	36	47.2%	25.0%	44.4%	97.2%	±4.0%		
Charnley Elite (Müller Straight)	1999–2008	306	82.4%	97.7%	58.8%	99.2%	±1.0%	99.2%	±1.0%
Charnley Elite (Omnifit)	1994–1999	12	75.0%	50.0%	50.0%	100.0%	±0.0%	83.3%	±18.9%
Charnley Elite (PCA E-series Textured)	1992–1997	214	81.0%	80.8%	58.4%	96.9%	±2.4%	88.4%	±4.8%
Charnley Elite (Relience)	1998–2000	17	70.6%	76.5%	41.2%	93.8%	±9.0%		
Charnley Elite (SL plus Stem uncem)	2000–2002	11	100.0%	54.5%	36.4%	100.0%	±0.0%		
Charnley Elite (Spectron EF Primary)	1998–2008	368	91.6%	89.1%	52.4%	97.3%	±1.8%	96.4%	±2.5%
CLS Spotorno (CLS Spotorno)	1992–2008	1,085	90.7%	33.9%	44.7%	98.0%	±1.0%	96.3%	±1.8%
CLS Spotorno (Spectron EF)	1993–1995	20	85.0%	60.0%	50.0%	95.0%	±7.3%	89.4%	±12.3%
Contemporary (Exeter Polished)	1994–2006	334	87.7%	88.0%	51.2%	96.2%	±2.1%	90.7%	±3.6%
Contemporary (Lubinus SP II)	1994–2001	102	66.7%	75.5%	79.4%	94.8%	±4.5%	89.0%	±6.5%
Contemporary (PCA E-series Textured)	1992–1995	36	83.3%	86.1%	75.0%	97.2%	±4.0%	97.2%	±4.0%
Contemporary Hooded Duration (CLS Spotorno)	2003–2008	112	58.9%	0.9%	46.4%	100.0%	±0.0%		
Contemporary Hooded Duration (Exeter Polished)	2000–2008	4,761	87.7%	89.1%	59.0%	98.0%	±0.5%		

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Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Contemporary Hooded Duration (Lubinus SP II)	2003–2008	85	84.7%	94.1%	62.4%	97.4%	±3.1%		
Duralock (uncem.) (CLS Spotorno)	1993–2000	23	78.3%	4.3%	43.5%	100.0%	±0.0%	93.8%	±9.0%
Duralock (uncem.) (Spectron EF Primary)	1995–2000	115	87.0%	52.2%	61.7%	97.4%	±2.8%	91.0%	±5.7%
Duralock (uncem.) (Spectron EF)	1993–1995	52	78.8%	80.8%	71.2%	96.1%	±4.6%	87.9%	±9.1%
Durom (Durom)	2002–2008	326	88.0%	12.3%	34.4%	89.3%	±4.9%		
Exced (Lubinus SP II)	2002–2004	19	94.7%	42.1%	31.6%	100.0%	±0.0%		
Exced (Spectron EF Primary)	2002–2004	13	100.0%	61.5%	23.1%	100.0%	±0.0%		
Exeter Duration (Exeter Polished)	1999–2008	11,321	83.9%	85.2%	59.3%	97.6%	±0.3%	94.6%	±1.3%
Exeter Duration (Lubinus SP II)	1999–2008	781	78.4%	82.8%	61.7%	99.5%	±0.5%	96.9%	±2.9%
Exeter Duration (Omnifit)	1999–2006	35	74.3%	0.0%	34.3%	97.1%	±4.2%		
Exeter Metal-backed (Exeter Polished)	1992–1994	588	76.7%	94.6%	55.8%	98.7%	±1.0%	95.2%	±2.0%
Exeter All-Poly (Exeter Polished)	1992–2006	6,451	73.8%	86.7%	60.7%	97.0%	±0.4%	92.2%	±0.8%
Exeter All-Poly (Lubinus SP II)	1992–2002	201	79.9%	76.1%	65.2%	96.7%	±2.6%	89.7%	±4.7%
Exeter Polished (Exeter Polished)	1992–1995	669	73.1%	88.9%	57.5%	95.9%	±1.5%	92.5%	±2.3%
FAL (Lubinus SP II)	1999–2008	4,926	80.1%	88.0%	63.7%	98.4%	±0.4%	98.1%	±0.5%
FAL (SL plus Stem uncem)	2002–2008	44	79.5%	40.9%	65.9%	97.6%	±3.6%		
Harris-Galante I (Anatomic Precoat)	1994–1996	11	81.8%	18.2%	45.5%	90.9%	±13.0%		
Harris-Galante I (Charnley)	1992–1996	48	83.3%	47.9%	31.3%	95.8%	±5.0%	82.7%	±10.9%
Harris-Galante I (Lubinus SP II)	1992–1997	73	78.9%	19.2%	37.0%	97.2%	±3.3%	91.3%	±6.6%
Harris-Galante I (Scan Hip Collar)	1992–1992	11	100.0%	0.0%	9.1%	100.0%	±0.0%	100.0%	±0.0%
Harris-Galante I (Spectron EF)	1992–1992	28	77.8%	57.1%	46.4%	100.0%	±0.0%	96.0%	±5.9%
Harris-Galante II (Anatomic HA HG-IV)	1992–1993	14	46.2%	7.1%	50.0%	100.0%	±0.0%	100.0%	±0.0%
Harris-Galante II (Anatomic Precoat)	1994–1996	15	86.7%	33.3%	26.7%	100.0%	±0.0%	80.0%	±20.1%
Harris-Galante II (Anatomic)	1992–1993	20	66.7%	35.0%	45.0%	94.4%	±8.0%	88.9%	±12.8%
Harris-Galante II (Charnley)	1992–1996	144	85.3%	27.8%	50.7%	93.0%	±4.2%	85.6%	±5.9%
Harris-Galante II (Lubinus SP II)	1992–1997	248	76.5%	28.2%	46.8%	95.1%	±2.7%	84.9%	±4.5%
Harris-Galante II (Optima)	1993–1998	40	95.0%	40.0%	50.0%	97.4%	±3.8%	89.3%	±9.9%
Harris-Galante II (Spectron EF Primary)	1996–1998	16	87.5%	62.5%	56.3%	93.8%	±9.0%	79.3%	±20.8%
Harris-Galante II (Spectron EF)	1992–1996	172	86.6%	54.7%	51.2%	96.4%	±2.8%	88.1%	±5.0%
Harris-Galante II (Ti-Fit)	1992–1993	11	10.0%	18.2%	100.0%	100.0%	±0.0%		
Harris-Galante II/HATCP (Charnley)	1996–1996	12	66.7%	41.7%	41.7%	100.0%	±0.0%	91.7%	±12.0%
Harris-Galante II/HATCP (Lubinus SP II)	1992–1994	25	60.0%	32.0%	36.0%	100.0%	±0.0%	82.6%	±15.5%
Harris-Galante II/HATCP (Spectron EF)	1995–1996	21	61.9%	52.4%	42.9%	94.7%	±7.6%	82.3%	±18.0%
HGPII/HATCP (HG III) (Anatomic HA/HATCP (HG V))	1992–1994	28	75.0%	3.6%	64.3%	100.0%	±0.0%	84.6%	±13.9%
HGPII/HATCP (HG III) (Impact modular)	1994–1994	17	100.0%	17.6%	52.9%	100.0%	±0.0%	68.8%	±22.8%
HGPII/HATCP (HG III) (Spectron EF Primary)	1997–1999	25	88.0%	60.0%	64.0%	95.8%	±6.1%	76.7%	±18.1%
HGPII/HATCP (HG III) (Spectron EF)	1992–1995	93	58.3%	48.4%	60.2%	100.0%	±0.0%	96.6%	±3.6%
HGPII/HATCP (HG III) (Ti-Fit)	1992–1995	14	30.8%	21.4%	78.6%	78.6%	±21.4%		
Inter-op cup (CLS Spotorno)	1999–2001	58	86.2%	22.4%	37.9%	96.6%	±4.0%		
Inter-op cup (Wagner Cone Prosthesis)	1999–2001	27	66.7%	11.1%	59.3%	88.9%	±11.5%		
ITH (ITH)	1992–1997	313	62.3%	95.5%	71.9%	98.5%	±1.5%	96.4%	±2.6%
Landos (Landos)	1993–1998	53	94.3%	26.4%	43.4%	98.1%	±2.9%	98.1%	±2.9%
LINK Pressfit (Lubinus SP II)	1996–2000	61	65.5%	8.2%	34.4%	100.0%	±0.0%	91.2%	±7.4%
Lubinus All-Poly (ABG uncem)	1995–2007	61	93.4%	27.9%	47.5%	90.6%	±9.9%	90.6%	±9.9%
Lubinus All-Poly (Bi-Metric HA lat)	2004–2008	181	93.4%	17.7%	51.9%	97.2%	±2.8%		
Lubinus All-Poly (CPT (steel))	1992–2005	28	76.0%	92.9%	50.0%	95.9%	±6.0%	95.9%	±6.0%

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Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Lubinus All-Poly (Exeter Polished)	1992–2008	63	74.6%	71.4%	54.0%	94.0%	±6.4%	86.5%	±11.9%
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)	1992–2008	65,927	80.1%	89.4%	59.4%	98.2%	±0.2%	96.3%	±0.3%
Lubinus All-Poly (Lubinus SPII PMMA coatad)	1998–2000	26	88.5%	73.1%	65.4%	100.0%	±0.0%	86.2%	±14.2%
Lubinus All-Poly (Scan Hip II Collar)	1997–2002	29	75.9%	89.7%	75.9%	100.0%	±0.0%	100.0%	±0.0%
Lubinus All-Poly (Scan Hip Collar)	1992–1998	28	92.9%	82.1%	46.4%	96.2%	±5.5%	96.2%	±5.5%
M2a (Bi-Metric HA lat)	2003–2008	153	81.7%	7.8%	28.1%	97.0%	±3.0%		
Mallory-Head cem (Lubinus SP II)	1993–1998	46	82.6%	6.5%	60.9%	100.0%	±0.0%	97.5%	±3.7%
Mallory-Head cem (PCA)	1992–1998	13	69.2%	0.0%	38.5%	100.0%	±0.0%	92.3%	±11.1%
Mallory-Head uncem (Lubinus SP II)	1993–2008	108	80.6%	12.0%	52.8%	97.1%	±3.1%	92.5%	±6.0%
Mallory-Head uncem (PCA)	1992–1996	18	83.3%	0.0%	61.1%	94.3%	±8.3%	88.4%	±13.4%
Müller Metasul (MS30 Unpolished)	1999–2001	44	97.7%	68.2%	56.8%	100.0%	±0.0%	100.0%	±0.0%
Müller Metasul Inlay (MS30 Unpolished)	1995–1998	14	78.6%	57.1%	50.0%	100.0%	±0.0%	100.0%	±0.0%
Müller All-Poly (BiMetric cem)	1992–1994	64	94.6%	89.1%	67.2%	98.4%	±2.3%	95.8%	±5.0%
Müller All-Poly (CLS Spotorno)	1993–2005	16	37.5%	6.3%	81.3%	93.8%	±9.0%		
Müller All-Poly (Lubinus SP II)	1993–2007	36	44.4%	100.0%	66.7%	100.0%	±0.0%	100.0%	±0.0%
Müller All-Poly (MS30 Unpolished)	1992–2001	113	59.5%	74.3%	52.2%	93.0%	±5.0%	91.7%	±5.6%
Müller All-Poly (MS30 Polished)	1995–2008	40	63.2%	100.0%	85.0%	94.4%	±8.0%		
Müller All-Poly (Müller Straight)	1992–2008	1,840	74.9%	93.2%	61.9%	97.5%	±0.8%	96.6%	±1.0%
Müller All-Poly (RX90-S)	1994–1995	20	85.0%	90.0%	90.0%	100.0%	±0.0%	100.0%	±0.0%
Müller All-Poly (Straight-stem standard)	1996–2008	294	94.9%	88.1%	73.1%	97.0%	±2.7%	94.8%	±3.9%
Omnifit (Exeter Polished)	1994–1995	19	44.4%	42.1%	63.2%	89.5%	±12.1%	83.1%	±17.3%
Omnifit (Lubinus SP II)	1992–1995	172	81.3%	29.1%	52.9%	95.9%	±3.0%	77.5%	±6.4%
Omnifit (Omnifit)	1992–1996	323	67.3%	12.4%	53.6%	91.5%	±3.0%	65.6%	±5.3%
Opera (Spectron EF Primary)	1999–2002	23	95.7%	65.2%	30.4%	95.5%	±6.6%		
OPTICUP (ABG II HA)	2002–2004	25	100.0%	32.0%	52.0%	92.0%	±9.3%		
OPTICUP (ABG uncem)	1996–2003	17	88.2%	17.6%	47.1%	88.2%	±13.5%		
OPTICUP (Charnley Elite Plus)	1998–2002	19	5.3%	0.0%	78.9%	94.7%	±7.6%		
OPTICUP (Lubinus SP II)	1995–2008	696	54.8%	84.8%	63.6%	97.9%	±1.1%	92.5%	±2.9%
OPTICUP (MS30 Polished)	1997–2007	37	35.1%	67.6%	70.3%	97.3%	±4.0%		
OPTICUP (NOVA Scan Hip)	1993–2000	156	65.8%	75.6%	54.5%	91.0%	±4.7%	72.8%	±7.8%
OPTICUP (Optima)	1993–2000	757	74.1%	87.3%	60.0%	96.6%	±1.4%	88.6%	±2.6%
OPTICUP (Scan Hip II Collar)	1996–2006	1,983	76.7%	82.7%	60.9%	96.7%	±0.8%	89.2%	±2.1%
OPTICUP (Scan Hip Collar)	1995–1996	82	80.2%	84.1%	58.5%	97.0%	±3.5%	91.8%	±7.0%
OPTICUP (Spectron EF Primary)	1996–1999	19	63.2%	100.0%	68.4%	100.0%	±0.0%		
OPTICUP (Spectron EF)	1994–1996	14	85.7%	100.0%	50.0%	100.0%	±0.0%		
Optifix (Charnley)	1992–1993	30	90.0%	46.7%	40.0%	93.1%	±8.0%	93.1%	±8.0%
Optifix (Lubinus SP II)	1992–1996	33	84.8%	12.1%	54.5%	100.0%	±0.0%	96.4%	±5.3%
Optifix (Spectron EF)	1992–1993	21	85.7%	66.7%	57.1%	89.9%	±11.6%	89.9%	±11.6%
Optifix (Ti-Fit)	1992–1993	30	82.8%	16.7%	66.7%	100.0%	±0.0%	81.1%	±15.0%
PCA (Exeter Polished)	1992–1996	41	41.5%	26.8%	48.8%	92.5%	±7.8%	84.5%	±11.4%
PCA (Lubinus SP II)	1992–1993	23	59.1%	17.4%	39.1%	95.3%	±6.8%	95.3%	±6.8%
PCA (PCA)	1992–1994	69	72.7%	23.2%	42.0%	95.6%	±4.6%	84.7%	±8.8%
PCA E-series (Exeter Polished)	1995–1997	29	82.8%	37.9%	41.4%	100.0%	±0.0%	100.0%	±0.0%
PCA E-series HA (PCA E-series HA)	1992–1994	50	61.7%	8.0%	40.0%	94.0%	±6.3%	87.4%	±9.5%
Precision Hip (Precision Hip)	1994–1997	26	76.9%	96.2%	61.5%	100.0%	±0.0%	93.3%	±9.6%

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Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Press-Fit cup (CLS Spotorno)	1999–2008	122	40.2%	4.1%	55.7%	92.8%	±6.3%		
Reflection (ABG uncem)	2000–2005	15	100.0%	6.7%	26.7%	93.3%	±9.6%		
Reflection (ITH)	1992–1993	19	94.1%	100.0%	68.4%	93.5%	±9.4%		
Reflection (Lubinus SP II)	1997–2008	72	69.0%	80.6%	63.9%	100.0%	±0.0%	94.9%	±7.5%
Reflection (Spectron EF Primary)	1996–2008	7,392	75.3%	92.1%	65.5%	97.6%	±0.4%	91.8%	±1.3%
Reflection (Spectron EF)	1992–1996	890	69.5%	97.9%	66.5%	98.6%	±0.8%	95.9%	±1.5%
Reflection (Spectron Revision)	1998–2008	108	6.5%	94.4%	68.5%	95.4%	±4.6%		
Reflection (Stanmore mod)	1999–2008	30	56.7%	100.0%	70.0%	100.0%	±0.0%		
Reflection HA (Bi-Metric cem)	1997–1997	17	70.6%	47.1%	29.4%	100.0%	±0.0%	82.0%	±18.3%
Reflection HA (Lubinus SP II)	1995–2008	201	87.5%	19.4%	43.3%	95.4%	±3.1%	92.2%	±4.8%
Reflection HA (Spectron EF Primary)	1996–2000	102	81.2%	23.5%	44.1%	91.9%	±5.4%	78.8%	±8.3%
Reflection HA (Spectron EF)	1995–1996	24	91.7%	29.2%	58.3%	100.0%	±0.0%	100.0%	±0.0%
Reflection Metal-backed (Lubinus SP II)	1996–1999	14	57.1%	0.0%	57.1%	85.7%	±16.3%		
Reflection Metal-backed (Scan Hip II Collar)	1997–2001	15	60.0%	0.0%	60.0%	100.0%	±0.0%	93.1%	±10.0%
Romanus (Bi-Metric cem)	1992–1998	354	83.7%	31.1%	47.5%	95.9%	±2.1%	86.2%	±3.7%
Romanus (Bi-Metric HA uncem)	1992–1999	139	84.9%	17.3%	54.0%	99.3%	±1.0%	91.7%	±4.7%
Romanus (Bi-Metric uncem)	1992–1997	247	75.3%	11.7%	50.6%	96.7%	±2.3%	86.3%	±4.4%
Romanus (Charnley)	1992–1998	27	74.1%	11.1%	48.1%	100.0%	±0.0%	96.2%	±5.6%
Romanus (Lubinus SP II)	1992–1996	86	70.6%	19.8%	30.2%	98.8%	±1.8%	90.0%	±6.5%
Romanus (RX90-S)	1994–2000	180	90.6%	39.4%	52.2%	96.1%	±2.9%	85.6%	±5.3%
Romanus (Scan Hip Collar)	1992–1995	14	61.5%	28.6%	28.6%	100.0%	±0.0%		
Romanus HA (Bi-Metric cem)	1992–1997	16	53.3%	37.5%	75.0%	87.5%	±14.4%	50.0%	±24.5%
Romanus HA (Bi-Metric HA uncem)	1992–2005	270	72.9%	10.7%	59.6%	95.9%	±2.4%	89.7%	±3.9%
Romanus HA (Bi-Metric uncem)	1992–1999	72	66.7%	9.7%	55.6%	94.4%	±5.3%	81.5%	±9.1%
Romanus HA (Charnley)	1993–2001	12	58.3%	16.7%	66.7%	100.0%	±0.0%		
Romanus HA (Lubinus SP II)	1992–1999	22	90.9%	13.6%	40.9%	95.1%	±7.1%	85.1%	±15.2%
Romanus HA (RX90-S)	1994–2000	19	89.5%	31.6%	57.9%	94.4%	±8.0%	76.0%	±20.7%
Scan Hip Cup (CAD)	1992–1999	19	50.0%	78.9%	73.7%	94.4%	±8.0%		
Scan Hip Cup (CPT (steel))	1993–1998	31	83.9%	77.4%	54.8%	96.3%	±5.4%	96.3%	±5.4%
Scan Hip Cup (Lubinus IP)	1992–1994	31	83.9%	80.6%	96.8%	100.0%	±0.0%	95.7%	±6.4%
Scan Hip Cup (Lubinus SP II)	1992–2007	92	61.4%	84.8%	75.0%	95.3%	±4.4%	87.5%	±7.8%
Scan Hip Cup (Optima)	1993–2001	508	71.2%	89.8%	67.3%	98.5%	±1.1%	94.2%	±2.4%
Scan Hip Cup (Scan Hip II Collar)	1996–2001	206	77.3%	89.8%	63.1%	96.8%	±2.5%	89.9%	±5.0%
Scan Hip Cup (Scan Hip Collar)	1992–2000	2,884	72.7%	88.9%	61.9%	97.8%	±0.6%	91.9%	±1.2%
Scan Hip Cup (Scan Hip Collarless)	1992–1999	140	77.2%	92.1%	65.0%	98.5%	±1.8%	91.0%	±5.7%
Secur-Fit (Lubinus SP II)	1996–1998	42	64.3%	21.4%	57.1%	92.6%	±7.7%	72.6%	±13.8%
Secur-Fit (Omnifit)	1996–1999	115	73.9%	2.6%	51.3%	90.1%	±5.6%	75.4%	±8.1%
SHP (Lubinus SP II)	1994–2007	617	80.7%	88.0%	54.9%	99.2%	±0.8%	96.8%	±1.7%
SHP (RX90-S)	1994–1995	21	90.5%	90.5%	38.1%	100.0%	±0.0%	92.6%	±10.7%
SHP (SHP)	1994–1996	21	85.7%	71.4%	66.7%	95.2%	±7.0%	89.8%	±11.9%
SL Ti cup (CLS Spotorno)	1999–2008	103	87.4%	51.5%	26.2%	98.0%	±2.4%	96.0%	±4.4%
SL Ti cup (Wagner Cone Prosthesis)	1999–2008	19	36.8%	21.1%	63.2%	100.0%	±0.0%		
SLS (CLS Spotorno)	1992–1998	66	83.1%	33.3%	33.3%	96.9%	±3.6%	93.7%	±6.0%
SLS (Lubinus SP II)	1995–1998	12	75.0%	75.0%	50.0%	100.0%	±0.0%	100.0%	±0.0%
Spectron Metal-backed (Spectron EF)	1992–1993	113	82.1%	98.2%	61.9%	99.1%	±1.3%	99.1%	±1.3%
Spectron (Spectron EF Primary)	1997–1997	21	85.7%	76.2%	66.7%	100.0%	±0.0%	93.9%	±8.8%

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Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60 years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Spectron (Spectron EF)	1992–1996	26	78.9%	96.2%	76.9%	100.0%	±0.0%	100.0%	±0.0%
Spectron-Boneloc C+S (SS) (Spectron-Boneloc C+S (SS))	1993–1993	14	100.0%	100.0%	85.7%	92.3%	±11.1%		
Stanmore (Stanmore mod)	1994–2007	636	50.0%	92.0%	70.8%	98.3%	±1.1%	97.6%	±1.5%
Stanmore (Stanmore)	1992–1998	105	89.3%	96.2%	70.5%	96.8%	±3.4%	89.8%	±6.8%
TOP Pressfit HA (CFP Stem HA)	2000–2008	135	88.1%	39.3%	48.9%	90.3%	±9.7%		
TOP Pressfit HA (Lubinus SP II)	2000–2008	146	83.6%	30.8%	40.4%	97.8%	±2.3%		
TOP Pressfit HA (Spectron EF Primary)	2000–2004	29	93.1%	17.2%	24.1%	100.0%	±0.0%		
Trident HA (Accolade)	2004–2008	545	81.7%	63.7%	57.2%	96.8%	±1.7%		
Trident HA (Meridian)	2003–2007	61	68.9%	50.8%	47.5%	96.6%	±4.0%		
Trilogy (Bi-Metric HA uncem)	1999–2003	14	92.9%	0.0%	71.4%	100.0%	±0.0%		
Trilogy (Charnley Elite Plus)	1999–2002	23	91.3%	17.4%	17.4%	100.0%	±0.0%		
Trilogy (CLS Spotorno)	1998–2008	559	80.7%	41.5%	47.9%	95.9%	±2.1%	94.3%	±3.6%
Trilogy (Exeter Polished)	1999–2007	22	68.2%	31.8%	36.4%	100.0%	±0.0%	100.0%	±0.0%
Trilogy (Lubinus SP II)	1996–2008	72	87.5%	34.7%	37.5%	98.6%	±2.1%	98.6%	±2.1%
Trilogy (SL plus Stem uncem)	1997–2006	135	70.4%	11.1%	35.6%	100.0%	±0.0%	98.3%	±2.5%
Trilogy (Spectron EF Primary)	1999–2002	28	82.1%	39.3%	39.3%	96.4%	±5.3%	92.2%	±9.1%
Trilogy (Wagner Cone Prosthesis)	1998–2008	238	52.5%	23.9%	64.7%	95.5%	±3.0%	91.3%	±5.4%
Trilogy HA (Anatomic HA/HATCP (HG V))	1994–1999	57	80.7%	22.8%	43.9%	94.7%	±5.6%	91.0%	±7.5%
Trilogy HA (Anatomic Option)	1995–1998	30	83.3%	36.7%	56.7%	93.1%	±8.0%	79.2%	±14.9%
Trilogy HA (Anatomic Precoat)	1996–1996	13	92.3%	69.2%	38.5%	92.3%	±11.1%		
Trilogy HA (Bi-Metric HA lat)	2003–2008	101	88.1%	34.7%	32.7%	98.8%	±1.8%		
Trilogy HA (Bi-Metric HA uncem)	1998–2008	195	85.1%	10.8%	50.8%	98.4%	±1.6%		
Trilogy HA (Charnley)	1996–2005	17	64.7%	52.9%	52.9%	100.0%	±0.0%	100.0%	±0.0%
Trilogy HA (CLS Spotorno)	2000–2008	1,321	83.0%	34.0%	45.6%	96.8%	±1.2%		
Trilogy HA (Epoch HA)	1994–2007	60	85.0%	18.3%	28.3%	96.7%	±4.0%	96.7%	±4.0%
Trilogy HA (Exeter Polished)	1995–2008	70	57.1%	35.7%	44.3%	100.0%	±0.0%	100.0%	±0.0%
Trilogy HA (Lubinus SP II)	1995–2008	1,092	81.0%	53.1%	50.9%	97.1%	±1.1%	92.8%	±2.3%
Trilogy HA (Omnifit)	1996–2005	37	75.0%	21.6%	35.1%	94.6%	±6.4%	94.6%	±6.4%
Trilogy HA (Optima)	1995–1999	95	94.7%	47.4%	37.9%	96.8%	±3.4%	92.3%	±5.5%
Trilogy HA (Scan Hip II Collar)	2000–2001	15	100.0%	53.3%	40.0%	100.0%	±0.0%		
Trilogy HA (Spectron EF Primary)	1996–2008	1,233	75.6%	58.0%	57.1%	98.6%	±0.7%	95.4%	±1.8%
Trilogy HA (Spectron EF)	1995–2002	14	92.9%	57.1%	35.7%	92.6%	±10.7%		
Trilogy HA (Stanmore mod)	2001–2008	96	94.8%	67.7%	40.6%	100.0%	±0.0%		
Trilogy HA (Wagner Cone Prosthesis)	1997–2008	63	42.9%	23.8%	55.6%	97.8%	±3.2%		
Trilogy HA (Versys Stem)	1999–2006	257	75.1%	13.6%	45.9%	99.2%	±1.0%		
Universal - Anatomica (Bi-Metric cem)	1992–1993	14	76.9%	0.0%	42.9%	100.0%	±0.0%	85.7%	±16.3%
Weber (MS30 Unpolished)	1998–1999	12	91.7%	100.0%	50.0%	100.0%	±0.0%		
Weber (Spectron EF Primary)	1998–1999	11	100.0%	27.3%	36.4%	100.0%	±0.0%	100.0%	±0.0%
Weber all-poly cup (CLS Spotorno)	2001–2007	28	67.9%	35.7%	60.7%	100.0%	±0.0%		
Weber all-poly cup (MS30 Unpolished)	2000–2006	17	88.2%	70.6%	58.8%	100.0%	±0.0%		
Weber all-poly cup (MS30 Polished)	1999–2008	441	91.8%	88.7%	60.1%	99.5%	±0.6%	96.7%	±3.8%
Weber all-poly cup (Spectron EF Primary)	2000–2001	17	94.1%	41.2%	52.9%	100.0%	±0.0%		
Weber all-poly cup (Straight-stem standard)	1999–2008	1,162	99.4%	91.2%	65.9%	98.0%	±1.0%	97.8%	±1.0%
Weber cup Durasul (Spectron EF Primary)	1998–2002	33	90.9%	30.3%	57.6%	100.0%	±0.0%		
Weber poly Metasul cup (CLS Spotorno)	2000–2007	59	79.7%	0.0%	42.4%	100.0%	±0.0%		
Weber poly Metasul cup (MS30 Polished)	1999–2006	100	73.0%	16.0%	52.0%	95.8%	±4.0%		

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Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2008

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
ZCA (CPT (CoCr))	2003–2007	383	78.1%	98.7%	71.8%	97.7%	±1.6%		
ZCA (CPT (steel))	1993–2005	114	80.0%	85.1%	62.3%	94.5%	±4.3%	92.7%	±5.5%
ZCA (Lubinus SP II)	1993–2005	35	74.3%	74.3%	57.1%	100.0%	±0.0%	96.7%	±4.8%
ZCA (Spectron EF Primary)	2000–2007	62	67.7%	96.8%	58.1%	96.7%	±4.0%		
ZCA (Stanmore mod)	2000–2008	249	75.5%	97.2%	64.3%	98.0%	±2.0%		

1) Refers to first and last observed operation year.

2) Refers to number of primary operations during period using conditions given in table heading.

3) Refers to proportion of primary operations carried out for primary osteoarthritis.

4) Refers to proportion of primary operations in age group 60 years or older (age on primary operation).

5) Refers to proportion of women.

Certain units lack sufficient primary operations during the period to give a 10-year value for implant survival. For the 10-year value to be calculated the longest observed time between primary operation and revision must be at least 10 years. Owing to adaptation to Open comparisons, this year only the value where at least 10 patients 'at risk' remain, is shown. Units with lower production may therefore lack values for this reason. Only implants where the 5-year value can be calculated are included in the table.

Implant survival per hospital

all diagnoses, all reasons for revision and all types of implants, 1999–2008

Hospital	Period [1]	Number [2]	OA [3]	≥=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
University/Regional Hospitals									
KS/Huddinge	1999–2008	2,070	62.3%	70.4%	61.1%	96.9%	±0.9%	95.8%	±1.3%
KS/Solna	1999–2008	2,422	65.5%	72.9%	62.0%	96.1%	±0.9%	94.7%	±1.3%
Linköping	1999–2008	1,296	60.7%	76.5%	62.1%	99.1%	±0.6%	98.8%	±0.7%
Lund	1999–2008	992	37.1%	67.6%	62.1%	95.0%	±1.6%	85.9%	±5.4%
Malmö	1999–2008	1,375	35.3%	77.2%	70.5%	97.5%	±0.9%	95.8%	±1.6%
SU/Mölndal	1999–2008	1,404	67.2%	79.1%	64.0%	96.0%	±1.3%	89.0%	±5.4%
SU/Sahlgrenska	1999–2008	1,552	61.8%	62.5%	61.3%	98.5%	±0.6%	94.6%	±3.4%
SU/Östra	1999–2008	1,290	76.0%	81.9%	63.4%	97.9%	±0.9%	94.7%	±2.4%
Umeå	1999–2008	780	69.7%	63.6%	59.5%	98.1%	±1.1%	97.2%	±2.0%
Uppsala	1999–2008	2,661	48.9%	71.6%	61.4%	95.9%	±1.0%	92.7%	±1.9%
Örebro	1999–2008	1,719	76.2%	77.4%	59.0%	99.0%	±0.5%	96.9%	±1.9%
Central Hospitals									
Borås	1999–2008	1,842	66.9%	79.6%	58.2%	96.9%	±0.9%	95.2%	±1.9%
Danderyd	1999–2008	3,527	87.3%	85.1%	66.6%	96.4%	±0.7%	94.3%	±2.0%
Eksjö	1999–2008	1,784	91.3%	85.1%	54.9%	98.3%	±0.7%	95.1%	±2.4%
Eskilstuna	1999–2008	973	52.8%	83.5%	60.4%	98.6%	±0.9%	97.7%	±1.3%
Falun	1999–2008	2,449	84.9%	80.2%	57.0%	98.8%	±0.5%	97.0%	±2.3%
Gävle	1999–2008	1,740	69.5%	78.6%	59.4%	96.9%	±0.9%	94.5%	±1.9%
Halmstad	1999–2008	2,055	75.6%	81.7%	58.0%	97.3%	±0.8%	95.9%	±1.3%
Helsingborg	1999–2008	1,092	73.0%	84.0%	62.2%	97.3%	±1.0%	91.2%	±3.4%
Hässleholm-Kristianstad	1999–2008	5,796	91.0%	83.9%	56.1%	97.9%	±0.5%	95.0%	±1.6%
Jönköping	1999–2008	1,837	82.1%	83.6%	60.2%	97.8%	±0.8%	96.1%	±1.6%
Kalmar	1999–2008	1,900	70.5%	83.9%	59.7%	98.1%	±0.7%	97.8%	±0.8%
Karlskrona	1999–2008	469	56.9%	82.3%	64.2%	96.3%	±1.9%	91.2%	±4.1%
Karlstad	1999–2008	1,989	67.6%	81.8%	63.9%	97.8%	±0.8%	97.4%	±1.0%
Norrköping	1999–2008	1,932	66.4%	83.0%	60.1%	99.0%	±0.5%	98.2%	±1.2%
S:t Göran	1999–2008	4,455	84.0%	79.9%	65.1%	96.5%	±0.6%	94.1%	±2.1%
Skövde	1999–2008	1,444	69.0%	78.6%	55.5%	98.3%	±0.8%	96.1%	±2.4%
Sunderby (incl. Boden)	1999–2008	1,056	63.0%	82.5%	65.2%	96.0%	±1.3%	92.3%	±5.7%
Sundsvall	1999–2008	1,593	83.9%	78.7%	60.6%	96.2%	±1.1%	91.9%	±3.7%
Södersjukhuset	1999–2008	3,085	61.1%	83.0%	67.9%	97.9%	±0.6%	97.0%	±1.0%
Uddevalla	1999–2008	2,780	67.8%	83.8%	62.8%	97.0%	±0.8%	94.5%	±1.8%
Varberg	1999–2008	1,953	87.2%	84.8%	58.7%	97.9%	±0.8%	92.3%	±4.3%
Västerås	1999–2008	1,355	63.2%	78.8%	58.8%	97.9%	±0.9%	96.0%	±2.0%
Växjö	1999–2008	1,117	81.9%	83.8%	59.6%	97.7%	±1.2%	94.9%	±2.9%
Ystad	1999–2008	719	81.2%	88.2%	56.9%	96.7%	±1.4%	91.8%	±6.3%
Östersund	1999–2008	1,643	81.8%	81.3%	57.5%	96.9%	±1.0%	94.9%	±1.7%
Rural Hospitals									
Alingsås	1999–2008	1,490	94.0%	84.9%	59.1%	98.7%	±0.7%	97.5%	±2.0%
Arvika	1999–2008	773	88.7%	84.6%	58.3%	95.1%	±2.3%	88.2%	±6.0%
Bollnäs	1999–2008	1,923	91.9%	84.7%	58.2%	97.9%	±0.9%	91.7%	±7.5%
Enköping	1999–2008	1,473	94.8%	92.9%	61.2%	97.6%	±1.0%	93.9%	±3.0%
Falköping	1999–2008	2,044	89.9%	84.4%	56.0%	97.4%	±0.9%	93.1%	±2.9%
Frölunda Specialistsjukhus	2002–2008	349	99.1%	87.7%	68.5%	96.6%	±2.4%		
Gällivare	1999–2008	986	80.0%	86.8%	59.1%	97.3%	±1.3%	96.1%	±1.9%

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Implant survival per hospital (cont.)

all diagnoses, all reasons for revision and all types of implants, 1999–2008

Hospital	Period [1]	Number [2]	OA [3]	≥=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Hudiksvall	1999–2008	1,363	75.0%	85.0%	59.9%	97.4%	±1.0%	96.1%	±2.2%
Karlshamn	1999–2008	1,484	95.1%	80.3%	56.9%	97.6%	±0.9%	96.4%	±1.6%
Karlskoga	1999–2008	1,144	90.1%	86.3%	62.0%	98.2%	±0.8%	96.2%	±2.2%
Katrineholm	1999–2008	1,821	92.9%	80.4%	56.1%	98.8%	±0.7%	95.6%	±2.5%
Kungälv	1999–2008	1,847	87.1%	86.6%	61.3%	99.1%	±0.4%	97.6%	±1.6%
Köping	1999–2008	1,889	95.9%	84.8%	55.6%	98.7%	±0.6%	97.1%	±1.6%
Lidköping	1999–2008	1,273	88.1%	83.8%	50.4%	98.9%	±0.7%	97.5%	±2.0%
Lindesberg	1999–2008	1,293	86.9%	86.2%	57.2%	98.4%	±0.8%	94.9%	±2.8%
Ljungby	1999–2008	1,126	86.1%	80.4%	54.0%	98.6%	±0.8%	95.3%	±4.9%
Lycksele	1999–2008	1,929	91.4%	86.0%	60.4%	99.3%	±0.4%	97.8%	±2.3%
Mora	1999–2008	1,498	87.7%	84.9%	58.3%	99.2%	±0.5%	96.0%	±3.9%
Motala	1999–2008	2,532	87.0%	83.0%	58.9%	97.9%	±0.8%	97.7%	±0.9%
Norrtälje	1999–2008	1,000	80.7%	86.7%	56.8%	97.1%	±1.2%	96.1%	±2.1%
Nyköping	1999–2008	1,274	82.4%	83.4%	57.6%	97.7%	±0.9%	93.7%	±6.1%
Oskarshamn	1999–2008	1,522	92.6%	85.0%	56.2%	98.9%	±0.6%	98.3%	±1.1%
Piteå	1999–2008	1,740	92.4%	80.4%	56.0%	97.3%	±1.1%	97.0%	±1.2%
Skellefteå	1999–2008	1,196	81.2%	81.5%	60.3%	98.4%	±0.8%	97.3%	±1.4%
Skene	1999–2008	764	96.5%	83.4%	50.8%	98.1%	±1.1%	97.3%	±1.6%
Sollefteå	1999–2008	1,122	90.1%	83.8%	58.8%	97.9%	±1.0%	97.3%	±1.3%
Södertälje	1999–2008	1,209	84.7%	84.1%	60.3%	98.4%	±0.9%	90.6%	±4.1%
Torsby	1999–2008	841	86.9%	86.3%	55.2%	97.7%	±1.3%	96.4%	±1.8%
Trelleborg	1999–2008	3,378	87.0%	82.0%	59.7%	97.2%	±0.8%	92.9%	±4.1%
Visby	1999–2008	942	83.4%	79.9%	55.6%	96.2%	±1.5%	87.3%	±7.8%
Värnamo	1999–2008	1,218	86.1%	83.2%	57.8%	98.9%	±0.6%	97.1%	±2.1%
Västervik	1999–2008	1,096	83.6%	83.9%	55.9%	97.7%	±1.1%	97.1%	±1.3%
Ängelholm	1999–2008	948	79.7%	81.1%	60.3%	98.4%	±0.9%	89.2%	±7.2%
Örnsköldsvik	1999–2008	1,332	87.0%	82.4%	61.6%	98.7%	±0.8%	98.4%	±1.0%
Private Hospitals									
Carlanderska	1999–2008	571	95.6%	71.5%	51.0%	98.4%	±1.3%	94.3%	±4.3%
Elisabethsjukhuset	1999–2008	905	87.8%	77.7%	60.8%	98.2%	±1.4%	88.4%	±9.8%
Movement	2003–2008	504	97.8%	81.0%	54.6%	87.5%	±15.0%		
Nacka Närsjukhus Proxima AB	2004–2008	120	98.3%	72.5%	51.7%				
OrthoCenter IFK-kliniken	2007–2008	112	92.9%	58.9%	36.6%				
Ortho Center Stockholm	2000–2008	1,221	96.1%	79.4%	57.0%	97.3%	±1.2%		
Ortopediska Huset	1999–2008	2,610	99.1%	78.9%	63.5%	97.0%	±1.0%	96.6%	±1.1%
Sophiahemmet	1999–2008	2,233	99.1%	73.4%	54.1%	96.8%	±0.9%	93.8%	±1.7%
Spenshult	2007–2008	228	83.3%	74.6%	57.5%				

1) Refers to first and last observed operation year.

2) Refers to number of primary operations during period using conditions given in table heading.

3) Refers to proportion of primary operations carried out for primary osteoarthritis.

4) Refers to proportion of primary operations in age group 60 years or older (age on primary operation).

5) Refers to proportion of women.

Certain units lack sufficient primary operations during the period to give a 10-year value for implant survival. For the 10-year value to be calculated the longest observed time between primary operation and revision must be at least 10 years. Owing to adaptation to Open comparisons, this year only the value where at least 10 patients 'at risk' remain, is shown. Units with lower production may therefore lack values for this reason. Only implants where the 5-year value can be calculated are included in the table.

Follow-up model for patient-reported outcome

The result after arthroplasty surgery has historically and in the main, nationally as well as internationally, been reported as implant survival. This result variable is still important to report with regard to surgical/technical long-term results. The main indications for hip replacement surgery are, however, subjectively experienced pain and low health-related quality of life. For this reason it is important to measure these variables prospectively in the course of the illness, i.e. both before and after surgery. For several years there has been increased focus on patient-reported outcome measure (PROM) both within analysis of activities and within clinical research.

Hip Follow-up Model after 7 years

The Swedish Hip Arthroplasty Register began including patient-reported variables via the so-called Hip Follow-up Model starting on January 1, 2002 in Region Västra Götaland. Since then the routine has gradually been introduced in more county councils/regions. On December 31, 2008, 77 hospitals had joined (77 of 79 active units). Two hospitals; Landskrona and Kalix have ceased their activities but registered previously in the Hip Follow-up Model). Only Linköping and Sophiahemmet in Stockholm have so far refrained from being part of this national follow-up routine. A variable (gained health-related quality of life after surgery) from the Hip Follow-up Model's database has been selected as national quality indicator in the report by the Swedish National Board of Health and Welfare and SALAR: *Open comparisons*.

One problem is that some hospitals in Skåne have chosen their own IT solution with regard to data capture on patient-report outcome. This means increased manual work for the registry coordinators as well as a lack of validation of indata and that 'on line' results cannot be reported from these hospitals.

Summary of logistics and method

All patients answer a preoperative questionnaire with 10 questions (Charnley category, pain VAS and EQ-5D). The same form with a supplementary question about satisfaction (VAS) is sent to the patient after one year. The procedure is repeated after 6 and 10 years.

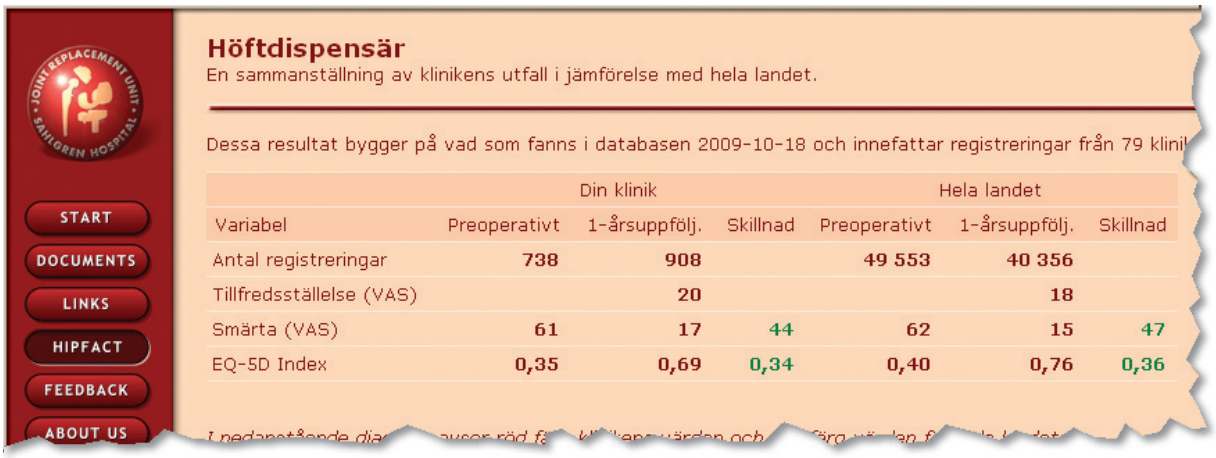
Overall aims

- Include the patient-reported outcome in the registry.
- Increase the sensitivity of the registry analysis.
- Create a possibility for the hospitals to work with improving activities with the starting point from the patient's needs and reported outcome.
- Create a methodologically satisfactory health-economic instrument for cost effectiveness analysis and resource allocation.
- Reduce the number of routine repeat visits after hip replacement surgery.

Results

On October 18, 2009 the preoperative database (77+2 units) contained 49,553 patients. The one year follow-up contained 40,356 and the six year follow-up contained 2,276 patients. The national average for the entry variables varied somewhat over the years when we were collecting data. The variation between hospitals, however, is remarkably large. See table below!

The causes of this variability are multifaceted: patient demography including socio-economic parameters, gender distribution, age distribution, differing indications for surgery, accessibility and the hospital's expertise are factors that can have an influence on these individual based variables. In order to be able to carry out a more in-depth analysis an ongoing joint operation is under way with SCB and the Patient Registry at the Swedish National Board of Health and Welfare. The aim of this collaboration is to be able to include socio-economic variables such as country of birth and education as well as medical co-morbidity at individual level. We know from other studies that these variables have great significance for patient-reported outcomes and a national comparison will be more relevant and fair if we have access to these parameters.



Follow-up after 6 years

The Hip Follow-up Model started in Region Västra Götaland (VGR) in 2002, which is why 2008 was the first year that the 6-year follow-up form was distributed to patients in the prospective follow-up. In addition, the planned 6-year follow-up with x-ray then started (see below!)

In 2002 surgery was carried out on 1,823 hips in the VGR. 1,649 1-year follow-ups are registered (90%). At the 6-year follow-ups during 2008, 1,264 replies had have been registered. During the observation year, 368 patients had died and 40 had been revised, i.e. 89% of the patients who had originally undergone primary operations in 2002 could be followed with patient-reported outcome in six years.

For current averages see table below. Preoperatively during 2002 patients on average had a EQ-5D-index of 0.38 and a pain VAS of 60. The outcome after six years is holding its own compared with the 1-year result apart from a reduction of EQ-5D index from 0.75 till 0.71. This reduction to the second decimal can be fully explained by the fact that the patients in question are now five years older – EQ-5D-index in a normal population reduces slowly with age.

Time	EQ-5D-index	EQ-5D- gain	Pain-VAS	Satisf.-VAS
Preoperative	0.38	–	60	–
1 years	0.75	0.37	15	19
6 years	0.71	0.33	16	19

Patient reported outcome in Region Västra Götaland preoperatively, and after 1 and 6 years respectively.

6-year x-ray

When the introduction of the hip follow-up model was prepared in 2000 – 2002 much time was given over to a standardised x-ray follow-up after six and ten years, e.g. a method CD was produced to be able to achieve a standard assessment of the x-ray images. However, we realised at that time that a uniform assessment and logistics of x-ray investigations were the most difficult part of a national follow-up routine after hip replacement surgery. Unfortunately these fears were confirmed after the 2008 attempt to x-ray the majority of patients who were given a total prosthesis in VGR 2002.

The 6-year check-ups we prepared during autumn 2007 via two meetings with the head (director) of each department and personnel responsible for reporting of THR at respective units. Despite a number of reminders during the year of activity, only 679 of 1,415 hips were x-rayed (48% of non-deceased and non-revised from the 2002 primary cohort). Of those assessed there were very few cases where any ominous findings were indicated. As an example, only less than 1% of the cups were found to show signs of loosening compared with the 5% that we found in a more controlled retrospective study that we carried out in 2001 and 2002 in VGR as preparation prior to the start of the Follow-up Model (see Annual Report 2002).

After much agonising, the registry management has decided to give up the attempt to collect x-ray findings at national level but instead to accept the great success with the collection of patient-reported outcome and that this should constitute the so-called Follow-up Model (even if a classic follow-up model included an x-ray screening).

We recommend, however, that hospitals when carrying out standard surgery, follow the patients with 1–2 x-ray investigations over 10 years. Neither will we be turning off the web-based x-ray assessment function. This database can be used by those hospitals so wishing, for their own follow-up routine.

Patient-reported outcome per hospital

2002-2008

Hospital	Preoperative				Follow-up after 1 years				Gain [3]	Comm.
	Number	C-kat. [1]	EQ-5D	Pain	Number	EQ-5D	Pain	Satisf. [2]		
University/Regional Hospitals										
KS/Huddinge	226	58%	0.41	72	54	0.77	12	12	0.36	
KS/Solna	346	53%	0.37	63	147	0.73	15	17	0.36	
Lund	179	48%	0.29	64	362	0.65	20	22	0.36	
Malmö	161	52%	0.28	64	454	0.67	22	23	0.39	
SU/Mölndal	636	57%	0.33	63	606	0.70	18	23	0.37	
SU/Sahlgrenska	738	51%	0.35	61	903	0.69	17	20	0.34	
SU/Östra	745	43%	0.37	63	706	0.71	17	21	0.34	
Umeå	317	45%	0.29	67	287	0.73	15	17	0.44	
Uppsala	234	55%	0.38	58	152	0.69	19	24	0.31	
Örebro	413	53%	0.42	57	368	0.76	14	15	0.34	
Central Hospitals										
Borås	950	47%	0.40	59	1,006	0.73	16	20	0.33	
Danderyd	1,013	45%	0.36	63	756	0.76	13	17	0.40	
Eksjö	657	38%	0.41	62	522	0.78	14	15	0.37	
Eskilstuna	243	52%	0.27	65	203	0.66	16	20	0.39	
Falun	516	51%	0.41	60	246	0.78	14	15	0.37	
Gävle	283	49%	0.31	65	235	0.71	17	20	0.40	
Halmstad	469	38%	0.39	62	636	0.76	15	19	0.37	
Helsingborg	10	60%	0.29	67						
Hässleholm-Kristianstad	2,213	38%	0.39	59	1,402	0.81	14	15	0.42	
Jönköping	650	40%	0.36	63	519	0.76	14	17	0.40	
Kalmar	449	42%	0.45	60	317	0.78	14	16	0.33	
Karlskrona	49	43%	0.51	34	35	0.64	18	24	**0.13**	
Karlstad	347	42%	0.37	61	269	0.70	17	20	0.33	
Norrköping	72	47%	0.42	60						
S:t Göran	476	57%	0.41	59	204	0.73	16	21	0.32	
Skövde	655	45%	0.33	63	795	0.72	15	18	0.39	
Sunderby (incl. Boden)	319	44%	0.29	67	394	0.71	16	21	0.42	
Sundsvall	489	47%	0.34	66	566	0.73	17	21	0.39	
Södersjukhuset	1,094	43%	0.38	59	812	0.72	19	22	0.34	
Uddevalla	1,467	49%	0.38	62	1,654	0.73	16	20	0.35	
Varberg	763	41%	0.43	62	577	0.80	12	15	0.37	
Västerås	437	41%	0.34	65	146	0.74	14	18	0.40	
Växjö	350	51%	0.44	55	280	0.77	15	17	0.33	
Östersund	992	34%	0.36	63	810	0.77	13	15	0.41	
Rural Hospitals										
Alingsås	1,015	49%	0.44	59	883	0.78	14	18	0.34	
Arvika	241	43%	0.45	61	74	0.80	13	15	0.35	
Bollnäs	795	39%	0.41	65	463	0.76	15	19	0.35	
Enköping	352	36%	0.43	61	167	0.76	17	19	0.33	
Falköping	1,641	36%	0.45	59	1,385	0.82	12	13	0.37	
Frölunda Specialistsjukhus	351	35%	0.41	63	260	0.74	16	20	0.33	
Gällivare	399	44%	0.40	64	433	0.76	17	19	0.36	
Hudiksvall	301	47%	0.39	63	210	0.70	16	23	0.31	

(continued on next page.)

Patient-reported outcome per hospital (cont.)

2002-2008

Hospital	Preoperative				Follow-up after 1 years				Gain [3]	Comm.
	Number	C-kat. [1]	EQ-5D	Pain	Number	EQ-5D	Pain	Satisf. [2]		
Kalix	112	47%	0.33	65	117	0.76	16	19	0.43	
Karlshamn	486	39%	0.39	62	364	0.78	15	16	0.39	
Karlskoga	192	40%	0.36	65	127	0.76	16	20	0.40	
Katrineholm	638	48%	0.36	64	441	0.81	14	17	0.45	
Kungälv	1,190	50%	0.43	58	1,055	0.75	15	18	0.32	
Köping	509	32%	0.39	65	154	0.75	17	18	0.36	
Landskrona	203	34%	0.41	64	203	0.81	13	14	0.40	
Lidköping	832	45%	0.42	58	686	0.77	14	17	0.35	
Lindesberg	560	38%	0.48	58	421	0.81	11	13	0.33	
Ljungby	329	37%	0.46	60	257	0.80	11	15	0.34	
Lycksele	1,025	46%	0.39	65	957	0.79	14	15	0.40	
Mora	296	42%	0.33	68	134	0.79	13	17	0.46	
Motala	760	52%	0.47	58	366	0.75	16	19	**0.28**	
Norrtälje	108	39%	0.49	63						
Nyköping	13	38%	0.49	62						
Oskarshamn	687	36%	0.50	55	469	0.81	11	12	0.31	
Piteå	1,088	43%	0.37	65	872	0.78	14	18	0.41	
Skellefteå	527	45%	0.39	63	461	0.76	14	16	0.37	
Skene	504	41%	0.40	60	459	0.77	15	20	0.37	
Sollefteå	545	44%	0.44	63	532	0.80	14	16	0.36	
Södertälje	189	33%	0.41	61	94	0.77	16	18	0.36	
Torsby	135	39%	0.34	65	33	0.73	14	21	0.39	
Trelleborg	2,466	41%	0.40	64	1,662	0.78	15	17	0.38	
Visby	109	41%	0.41	66	67	0.78	17	16	0.37	
Värnamo	468	42%	0.50	55	340	0.79	13	16	**0.29**	
Västervik	264	41%	0.46	61	177	0.76	16	19	**0.30**	
Örnsköldsvik	728	48%	0.37	64	670	0.78	14	16	0.41	
Private Hospitals										
Carlanderska	120	28%	0.40	62	149	0.86	17	18	0.46	
Elisabethsjukhuset	348	28%	0.47	61	201	0.84	12	12	0.37	
Movement	317	27%	0.47	61	126	0.83	11	13	0.36	
Nacka Närsjukhus Proxima	31	45%	0.30	68	30	0.84	13	19	0.54	
Ortho Center Stockholm	268	37%	0.40	65	56	0.79	15	20	0.39	
OrthoCenter IFK-kliniken	104	28%	0.42	64	3	0.91	3	5	0.49	
Ortopediska Huset	537	34%	0.42	63	11	0.79	10	15	0.37	
Spenshult	114	37%	0.46	59						
Nation	40,855	43%	0.40	62	31,992	0.76	15	18	0.36	

1) Proportion of Charnley category C.

2) Satisfaction (VAS).

3) Difference in EQ-5D after 1 year and pre-operatively. Note that this reflects the difference between mean values after 1 year and pre-operatively, as opposed to the value compass where the gain in EQ-5D index is calculated as the average value of the individual differences.

The table gives the result in the form of number of patients, mean values of pain VAS and EQ-5D index pre-operatively, together with the proportion of Charnley category C patients (i.e. patients with multiple joint disease and/or co-morbidity). Departments with a high proportion of C patients most frequently have lower average values for all parameters both pre-operatively and after one year. However, the prospectively gained values are most often not equally affected by C affiliation.

Notes

Follow-up of activities after THR

The Hip Arthroplasty Register began to openly report hospital results in 1999. The number of variables that are published in this way has increased over the years and is presented in table form in different places in the report. These tables are necessarily complicated and difficult to interpret. Furthermore, it is difficult via tables to gain an overview of the results of each unit in several dimensions. It is now the third year we are using the so-called value compass as a comprehensive picture of the units' activities. The compasses are produced only with a view to obtaining a quick and easily accessible overview. A divergent result in a clinical value compass indicates only if a hospital has a problem area. The compass can be regarded as a signal system.

Using this follow-up model, results are presented this year for all the departments that have been connected to the main follow-up model for more than one year. And have at least 50 patients that have had the 1-year follow-up (59 hospitals). The limit values are the largest and the smallest value of the variable in question plus/minus one standard deviation. This means that the standard values (red area) vary from year to year. The worst value (0.0) for the variables is given as origo and the best value (1.0) at the periphery. This expanded value compass can be seen as a balanced control card. The larger the surface, the better the total result for each hospital. The national average values are given in each figure and each unit can thus compare itself with the national result during the year of activities. Note that the observation period for the variables differs. In this year's compasses the cost per patient (CPP) has been replaced by individual based degree of coverage (with regard to primary operation). That we have replace CPP is due to the fact that the system has still not been implemented nationwide.

Result variables:

- **Patient satisfaction.** Measured on VAS. Can only, like variables 2 and 3, be given if the hospital has been active with the follow-up routine for more than one year (at least 50 patients followed up).

- **Pain relief.** Measured by subtracting the pre-operative VAS value from the follow-up value, i.e. the value gained after one year is given.

- **Gained-health-related quality of life** (gain in EQ-5D-index). The prospective EQ-5D index gained value, i.e. health gain after one year, is given.

- **90-day mortality.** In international literature this variable is used to illustrate mortality following hip replacement surgery and can be a measure of increased mortality from thromboembolic and cardiovascular diseases subsequent to discharge.

- **Degree of coverage.** This year, cost is substituted with individual based degree of coverage at unit level.

- **Reoperation within 2 years.** Gives all forms of reoperation within 2 years during the latest 4-year period.

- **5-year implant survival.** Implant survival after 5 years with Kaplan-Meier statistics.

- **10-year implant survival.** The same variable as above but with a longer follow-up time.

  Linked to each hospital's value compass is also a graphic presentation of the unit's 'case mix'. This is designed in the same way as the value compass and includes the variables which analysis of the registry's database proved to be decisive demographic parameters for both patient-reported outcome and long-term results with regard to need for revision. The larger the green surface in this figure the more favourable the patient profile the relevant hospital has.

- **Charnley classification.** In the figure is given the hospital's proportion of patients classifying themselves as Charnley class A or B, i.e. patients without multiple joint disease and/or incurrent diseases affecting their walking ability.

- **Proportion of primary osteoarthritis.** The more patients the hospitals operate on with diagnosed primary osteoarthritis the better the long-term result, according to the registry's regression analysis of the database.

- **Proportion of patients 60 years or older.** Hospitals operating on many patients over 60 years of age gain better results in the same way as the variable above.

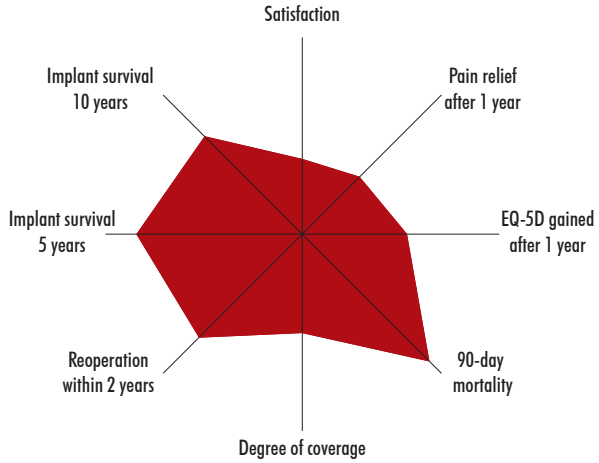
- **Proportion of women.** Women generally have better long-term results than men regarding need for revision, mainly for aseptic loosening.

Discussion

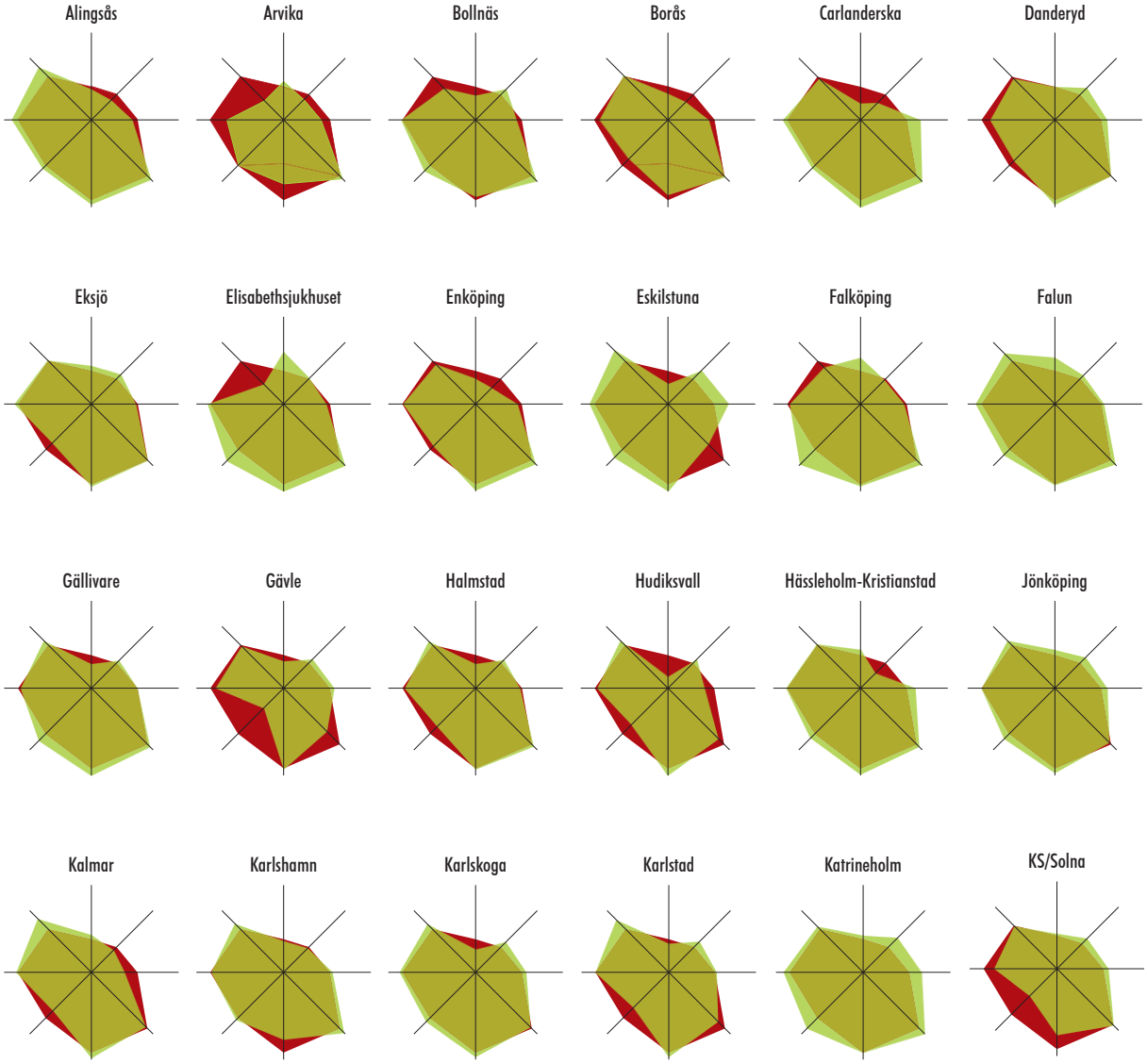
Although, as yet, we lack information from all hospitals, we present this graphic way of showing the clinic results in several dimensions because we believe in the model. There is a strong desire on the part of decision-makers in medical care for access to easily accessible, summarised presentations on clinics'/county councils' results for follow-up activities. Another way of fulfilling this requirement is to create indices as a total sum and that comprises a number of variables. The registry management does not believe in this form of indexing, which seeks to summarise in one number, different dimensions of the result. The greatest risk with indexing is that good results in one variable may be taken out of poor results by another variable or vice versa. Such an index does not encourage in-depth analysis and improvement. Differing degrees of coverage of reported variables may also influence indexing, with misleading results.

Quality indicators

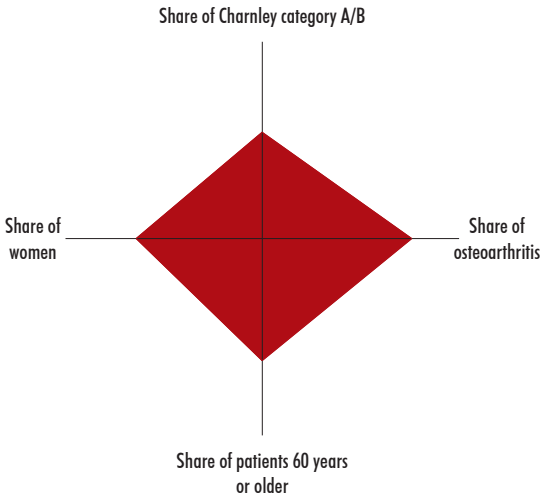
clinical value compass - national averages



The value compasses show in red the national result regarding the eight variables included. The corresponding values for the respective clinic is shown in green. The limit values are set to each variable's largest and smallest value ±1 SD. The poorest value for the variables is given as origo and the best value is at the periphery. The clinics where red fields are shown have a poorer value than the national average for the variable in question. The outcome can be studied in detail in the respective table.

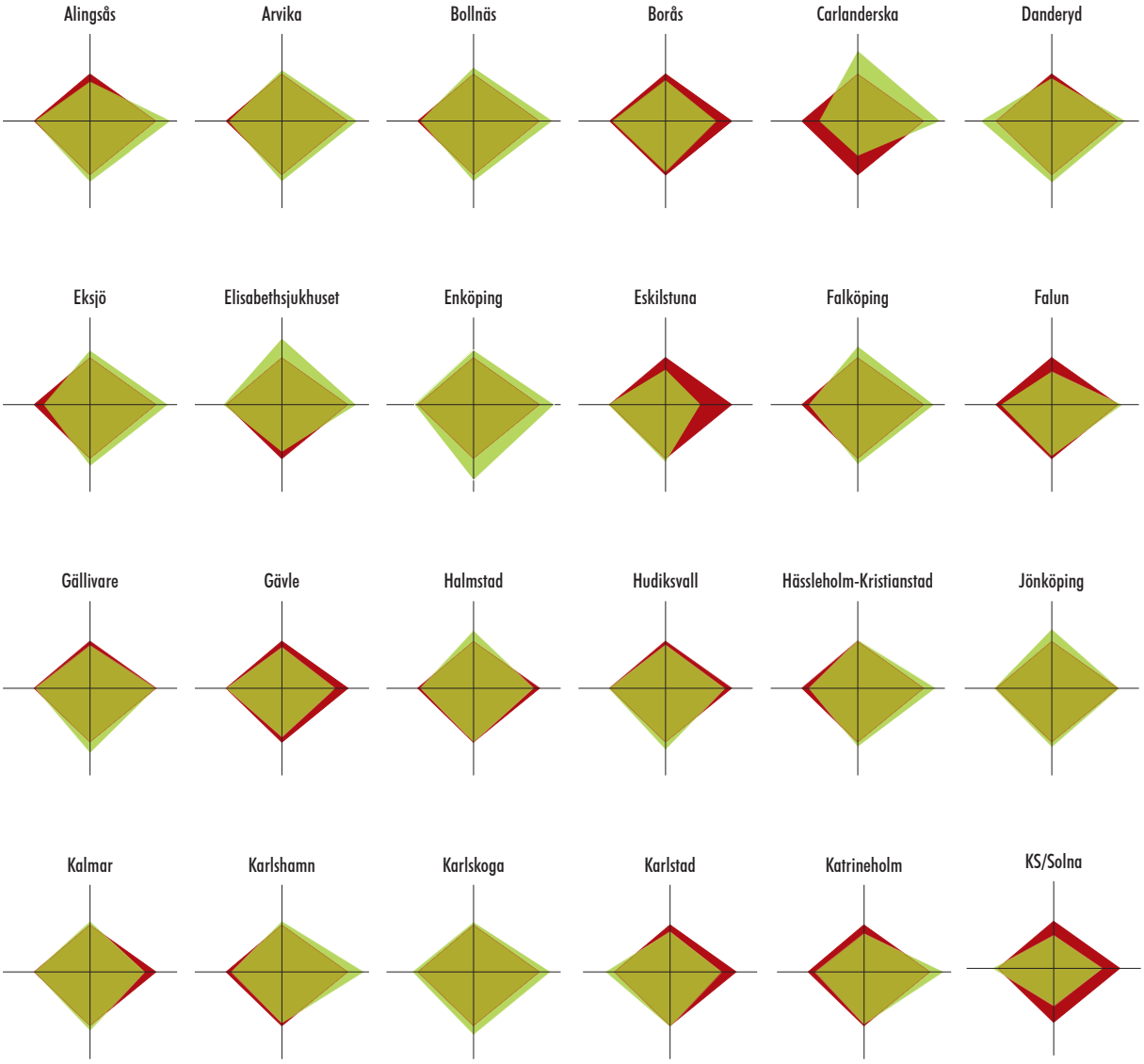


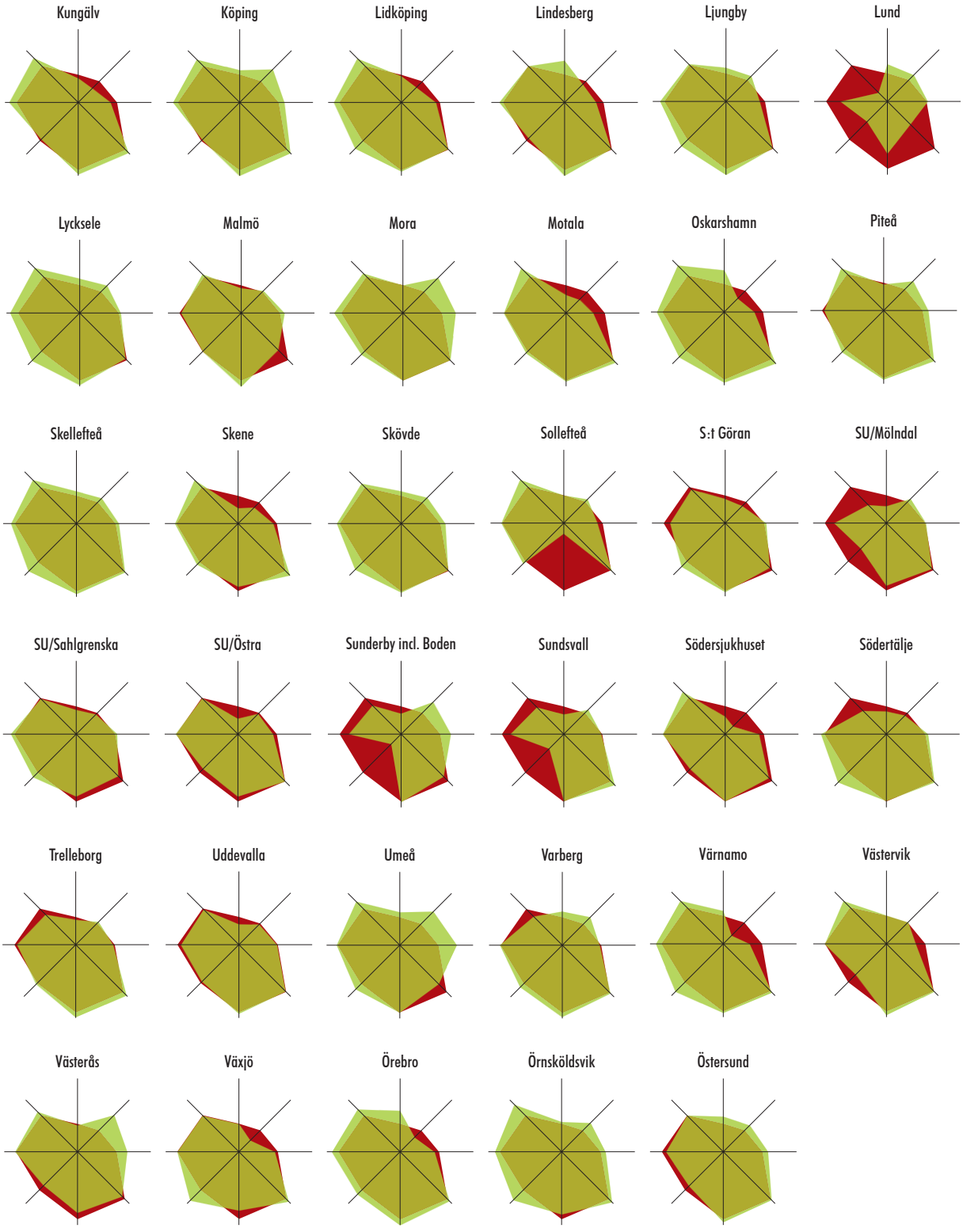
Case-mix factors
national averages



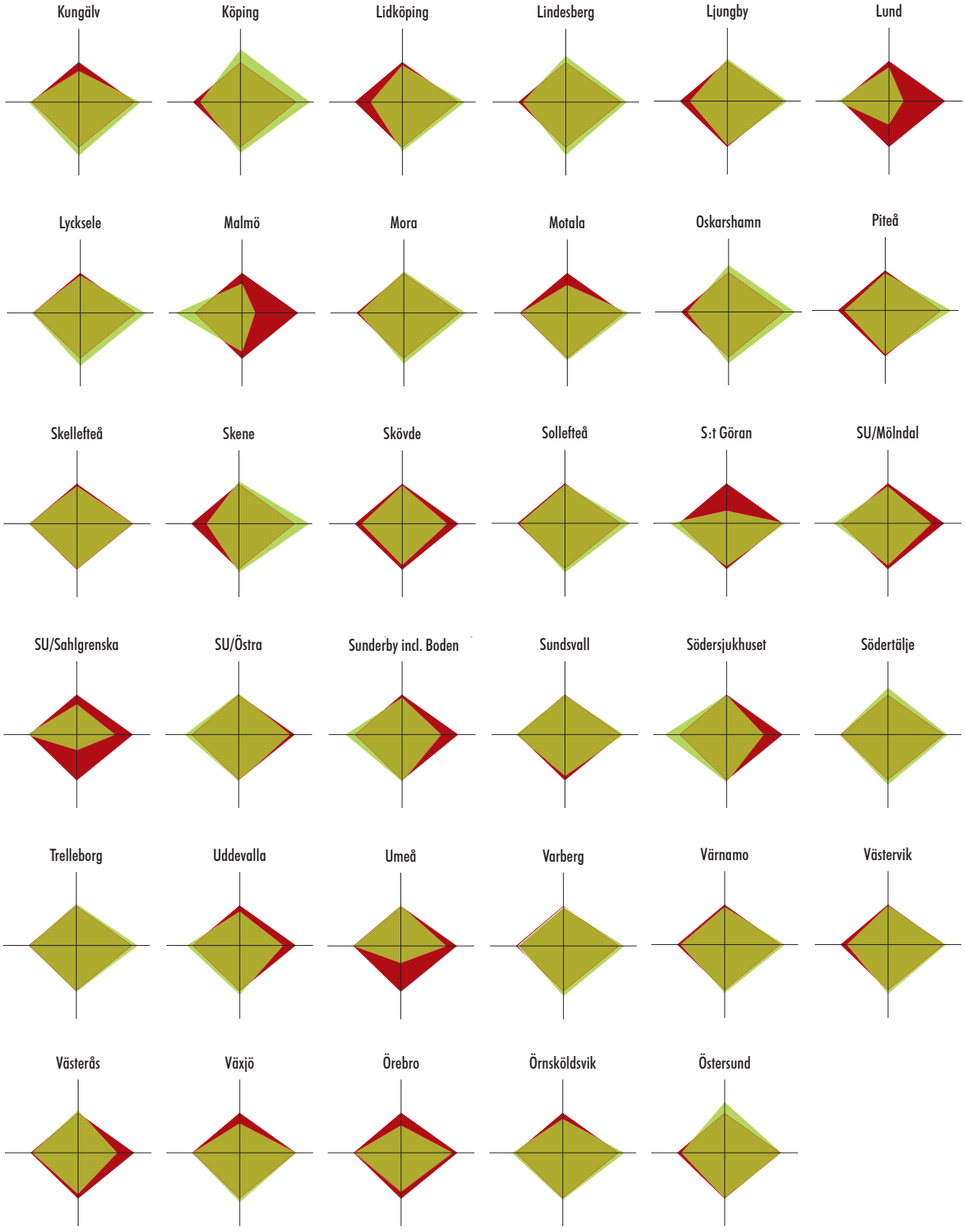
In the graphic presentation of patient demographics ('case mix') the national results regarding the four included variables are shown in red. The corresponding values for the respective hospital is shown in green. The limit values are set to each variable's largest and smallest value ±1 SD. The poorest value for the variables is given as origo and the best value is at the periphery.

When interpreting hospitals' value compass, first and foremost for comparisons the 'case mix' profile must always be taken into consideration!





(continuation of clinical value compass)



(continuation of 'case-mix' factors)

Clinical improvement projects

The registry's main aim is to inform the individual hospitals, about their results and to stimulate local analysis and continual work for improvement.

The registry has refrained from ranking the results of different hospitals. During the year there has been a relatively intensive debate in e.g. Läkartidningen on both the register's and *Open Comparisons'* reporting system. It has been indicated that the statement of operations is not statistically and scientifically correct. However, the registry's Annual Report must not be regarded as a scientific publication but as an assembled signal system, the aim of which is to continually improve the multi-dimensional quality of Swedish hip replacement surgery. If we chose to publish everything in scientific periodicals with classic 'review' systems our feedback to the profession would be seriously delayed and the possibility of quickly implementing 'best practice' would be lost. Each year we publish a number of scientific articles, which methodologically place even higher demands on statement of operations than what we consider we would be able to publish in Annual Reports.

In order to actually get the respective hospitals to always analyse their results as a link in an analysis of activities and development we suggest the following:

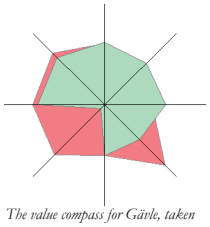
- Focus on the individual result and its time trend.
- Don't worry about others' results with e.g. 'case mix' differences and possible under-reporting from the neighbouring hospital as an excuse.
- Don't focus on the national average – many hospitals are content as long they have better value than the reported average value and then lose pace in their own development. In addition, the average value can, in a result variable at national level, be a poor result with a need for national improvement.
- Discuss 'on line' results and the Annual Report – first and foremost, the hospital complications immediately at internal meetings. It is only when you can identify the problem areas and discover certain systematic shortcomings in the whole process surrounding hip replacement surgery – everything from taking a position on indication, registration, operation to discharge and rehabilitation of the patient when improvement can be achieved.

Dislocation problems

One of the few variables that still have a tendency towards deterioration within Swedish hip replacement surgery is reoperation and revision due to prosthesis dislocation. We have, in several consecutive Annual Reports shown this depressing fact and also described in detail the example that attracted much attention from the local improvement work at Sundsvall hospital two years ago. The good effect of this work locally should have resulted in more rapid implementation of 'best practice' throughout the country but, unfortunately, this has not been the case. A partial explanation may be that the registry's feedback was not sufficiently pedagogical – another that the hospitals in the striving for productivity refrained from inspecting their own routines and processes surrounding hip replacement surgery.

Example of local improvement projects

To again focus on dislocation problems we give an account here of the analysis of Gävle Hospital and their improvement work during the year:



The value compass for Gävle, taken from the Annual Report of 2007.

Already in the 2006 report, the hospital had a high reoperation frequency within 2 years due to dislocations: 2% compared with the national average of 0.6% and as early as 2007 the problem began to be discussed. In the 2007 Annual Report the problem had further accentuated to 2.6% (note that reoperation within 2 years is measured during the past 4 years). The clinic then made contact with the registry management who suggested an investigation and plan of action similar to the one carried out at the Sundsvall Hospital 1.5 years earlier. All cases of dislocation were gone through minutely and were presented at an all-day meeting at the hospital with invited guests from the registry management.

As a reason for an increase in dislocation frequency it was reported that the neighbouring hospital, Bollnäs, had been changed to an elective unit within the county council and that this resulted in the Gävle Hospital being given the task of only carrying out ASA 3-4 operations, i.e. patients with known increased risk of prosthesis dislocation.

The following improvement plan was introduced at the hospital:

- Change of standard caput size from 28 to 32 mm and with preparedness to use still larger caput on special risk patients.
- The surgeon in question must be present when the patient is being prepared.
- All cases must be preoperatively 'according to template' i.e. preoperative planning compulsory for all cases.
- More thorough preoperative patient selection (perhaps say no in certain cases).
- Improve the surgical technique – the clinic is using the posterior incision – capsule and rotator to be sewn back in all cases.
- Examine and discuss postoperative x-ray images in a straightforward manner on the x-ray round – important feedback to all operators.
- Introduction of a 'dislocation school' for all patients after an early first-time dislocation.

In this year's report the department's dislocation frequency has gone down to 1.5%. During the past year (2008) in the four-year observation period only one patient was reoperated due to dislocation.

Patient-reported outcome and analysis of activities

In last year's report three hospitals were analysed with regard to less good results for patient-reported outcome and two of these hospitals analysed the problem to the previous report. The third hospital, that had low gains in the health-related quality of life for its operated patients, has during the year locally discussed this issue. The working hypothesis was that, at the hospital over the years there had been a certain indication slide, which had now been confirmed. This has, as a result, received a more formal attitude to intervention and increased use of non-surgical treatment as a first treatment option for early hip osteoarthritis.

The infection problem

Another problem area is the continued, somewhat increasing frequency of deep infections in connection with implant surgery. Analysis of the infection problem is much more complex than the dislocation problem. The latter problem area can more easily be solved by the local clinics and the individual surgeon. Deep infections are affected more by the whole process surrounding hospital care and even on a more macroscopic level – i.e. both national and global development with regard to resistance development of current infection agents.

The national VRISS (Care related infections must be stopped) project is included, as a part of an increased national initiative on patient safety and that is led via SALAR, with the County Councils' Mutual Insurance Company (LÖF) and the Swedish National Board of Health and Welfare as co-organisers.

The PRISS project 'Prosthesis related infections must be stopped!' is carried out in collaboration between the national professional associations - Swedish Orthopaedic Association, Swedish Infection Doctors Association, Orthopaedic Nurses in Sweden, Swedish Operating Room Nurses Association as well as the Section for Orthopaedic Surgery Rehabilitation. The project is supported by LÖF, as infections in connection with replacement surgery are responsible for a not insignificant proportion of the insurance company's cases. The aim of the project is to reduce the real infection frequency in elective replacement operations in hip and knee by at least 50%. (www.patientforsakringen.se/priss)

The Hip Arthroplasty Register registers only further surgery due to infection. The patients that are treated with e.g. life-long antibiotic treatment are not included in the registry's databases. This fact and a possible under-reporting of infection surgery means that there is therefore a number of unrecorded cases regarding the true incidence of deep hip replacement surgery related infection. The registry, in parallel with the PRISS project has started its own investigation aimed at surveying all infections after hip replacement surgery as follows:

Individual based degree of coverage of primary procedures now lies at 98-99%. The study builds upon the assumption that all patients with diagnosed deep infection are put on at least 4-6 weeks' continual antibiotic treatment. The plan is, after ethical application for a so-called case record study, to merge the three most recent years' prosthesis production with the National Register of Pharmaceutical Products (EpC). The patients, who during this time, were put on antibiotic treatment in accordance with the above will then be checked via medical records – in this way, other serious infections can be excluded and the remaining number should be basis for a, 'next to' safe incident estimate. Hopefully the register can report this study in next year's report.

Analyse the hospital's complication cases in detail and discuss at clinical meetings with all involved - a sure path to improvement!

Environmental and technical profile

For the environmental profile, hospitals report annually on surgical technique and operational environment. It is important that the hospital updates its environment profile via the website. If no change is made, it is assumed that the environmental profile/techniques used are unchanged from the previous year. In the profile, aggregated annual data per clinic is given. This produces an uncertainty in statistical analyses of the database. The primary and reoperation databases on the other hand are based on the individual operation with personal ID number and side as unique variables. Two variables historically found under environmental profile are type of cement and type of incision. These variables have for the past 7–8 years been individual-based and are now reported in the section 'Primary total hip replacement' (page 14).

In recent years we have established that the hospitals very seldom change their profile. This may depend on two things:

1. Change of technique, prophylaxis and operation environment.

2. Forgetting' to register changes. The registry management naturally hopes that the first option is the dominating cause.

The optimum, both from an improvement and research perspective, is of course, to individual-base all variables included in this so-called environmental/technical profile. However, this is against the basic principle with so few variables as possible in order to maintain flexibility to the registry. The day that via direct transfer, (see 'Visions of the future for national quality registers' page 6) we capture our variables to the registry, can individual-basing of these important parameter become reality. If, in addition, the different implant companies can reach consensus about standardising their barcodes (such an international project is in progress) can the registry's data capture expand, become more valid and the individual hospitals' workload radically reduced.

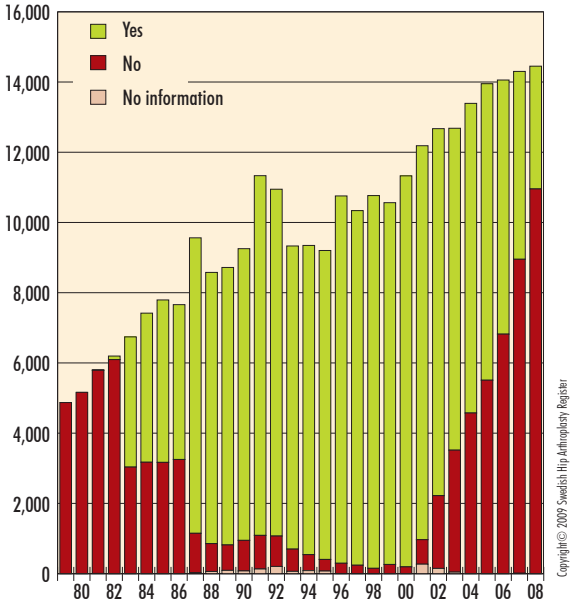
Result for the year

The change from last year's result is extremely marginal. The two trends we saw over several years remain:

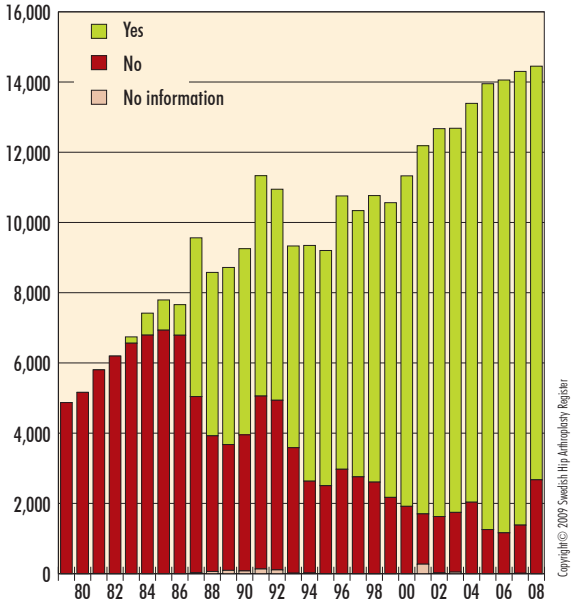
1. The use of brushes declined for the eighth year running. Only 20% use brushes when preparing the cement bed. Brushes can, however, be advantageous in revisions. Regarding cleansing of the cement bed, careful and repeated high-pulsative lavage has a better effect.

2. Proximal sealing plugs for femur cementing should, on strong evidence, be used at 100%. This year, with increasing frequency, almost 20% state that they do not use this type of equipment. If proximal sealing plugs are not used one loses the advantage of the possibilities of good cement penetration, which is an important aspect of good cementing technique.

Cleansing by brush
1979–2008

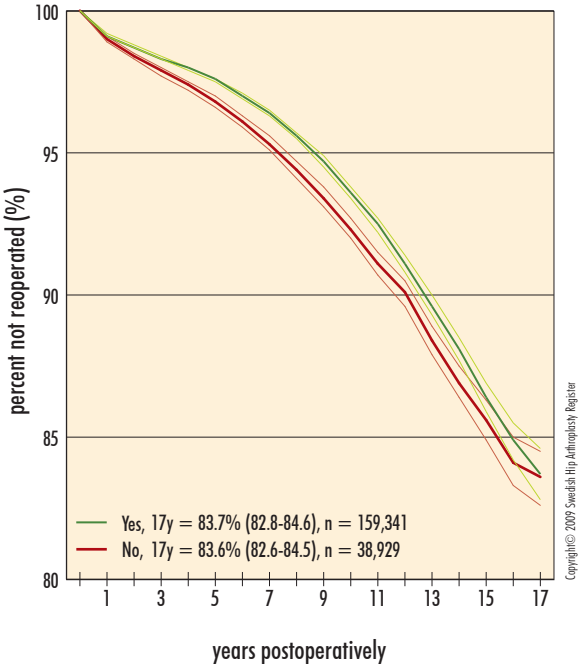


Proximal Femoral Sealing
1979–2008



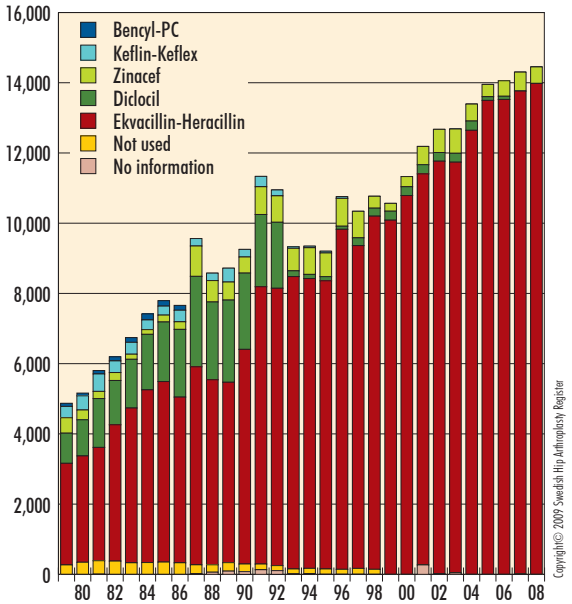
Proximal femoral sealing

all diagnoses and all reasons



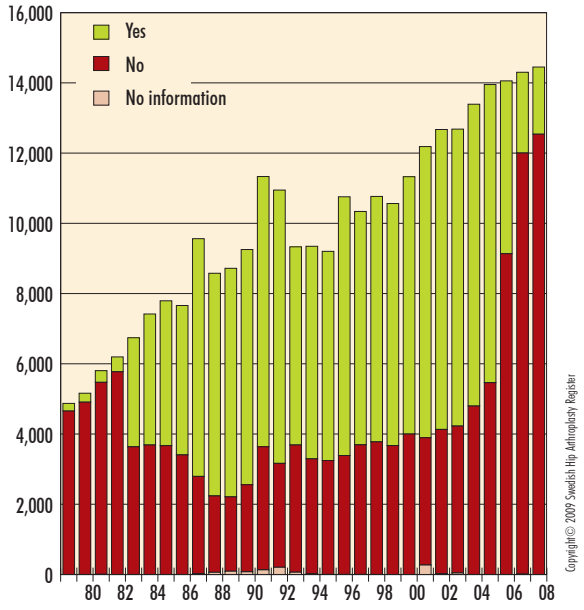
Parenteral brand of antibiotics

1979–2008



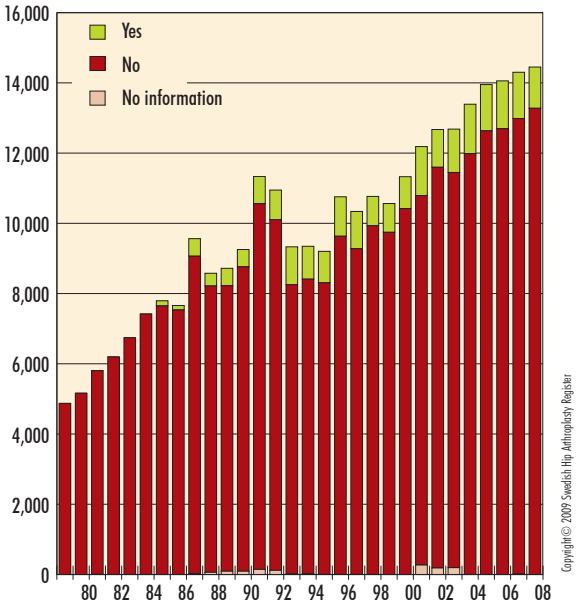
Cleansing by hydrogen peroxide

1979–2008



Cleansing by adrenaline

1979–2008



Follow-up of the free choice of care scheme

Discussion of Swedish medical care during the past few years has focused much on accessibility issues. Both in the care guarantee and in the preceding 'free choice of care' scheme, accessibility is practically always assessed as a time variable. The registry management maintains that accessibility must be systematically linked to outcome both in the short-term and in the long-term. This means a requirement for decision makers to show increased perseverence before arguing for shorter waiting times for surgery, as a guaranteed quality gain for the patient. During the past year this discussion has attracted media attention in a number of reports about poorer results of 'flying doctors' operating within Sweden and the results of Swedish orthopaedic surgeons work abroad – mainly within the hip and knee postoperative area in England.

The question is whether the result after a surgical intervention is worse owing to surgeons facing often new and unfamiliar operating environments and types of prosthesis or conversely if the patients are placed in an queue for surgery at a place other than their home hospital and the indicating orthopaedic surgeon is not the one who later carries out the operation. The high-production elective units often use surgeons from other hospitals in order to be able to meet the demand on the high productivity. A not unusual scenario can therefore be that both surgeon and patient, on meeting in the operating theatre, come from different locations and after this will never meet again!

Hip replacement surgery can be regarded as a standard intervention, which, however, requires experience and technical expertise on the part of the orthopaedic surgeon. Such simple things like setting up routines, logistics in the operating theatre, local routines for antibiotic prophylaxis etc., can suboptimise the otherwise competent surgeon's technical results.

As many county councils have not been able to meet the care guarantee goals, they have been forced into short-term solutions with separate agreements with both public and private care providers. In this way the waiting time has been shortened for those patients who have accepted surgery at a different hospital than their 'own'. Against this background the registry initiated for the Annual Report in 2004, an outcome analysis of patients undergoing total hip replacement surgery outside their home regions during 2002 and 2003. As shown in earlier reports we are following this group of patients continuously. Below is a brief summary of the survey as a material for this year's follow-up (for details see Annual Report 2004-2006)

Reason	Operated in home county (n = 14 785)		Free choice (n = 1 964)	
	number	%	number	%
Aseptic loosening	91	0.6	15	0.8
Deep infection	85	0.6	18	0.9
Fracture	35	0.2	3	0.2
Implant fracture	7	0.0	3	0.2
Dislocation	100	0.7	13	0.7
Technical error	10	0.1	2	0.1
Pain only	7	0.0		
Miscellaneous	19	0.1	2	0.1
Total	354	2.4	56	2.9

Table 1. Frequency of reoperation by cause for patients undergoing surgery in their county of residence and in the 'free flow'. Reoperations up to and including 2008.

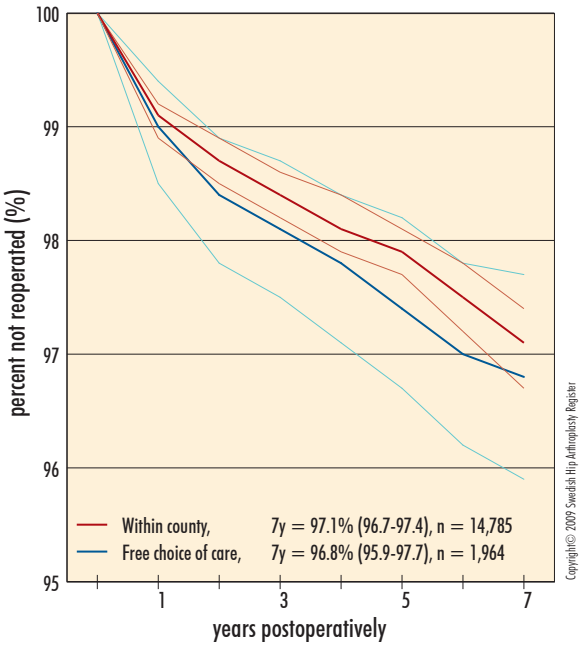


Figure 1. Implant survival for those undergoing surgery under the freechoice-of-care scheme and those operated on within their county of residence, respectively. The difference is not significant according to the LogRank test (p=0.15).

Material

- The analysis included only 'standard patients', i.e. those with primary osteoarthritis as diagnosis and operated on with cemented total hip replacement surgery outside university hospitals (in order to avoid referrals).
- Operated upon within their own county: 14,785 hips, outside their own county: 1,964 hips (2002 and 2003).

Earlier results

- Those who used the 'free choice of care' scheme were younger and there were fewer women than the national average.
- After an average follow-up of 60 months we found a significantly increased frequency of reoperation due to infection amongst those undergoing surgery outside their home county.
- Reoperation for other reasons showed no statistical difference between the two groups.
- Approximately 85% of patients receiving surgery outside their home region and requiring reoperation were treated at their home hospitals.

This year's comparison

The average follow-up time for this year's analysis was 72 months. In both groups a number of further reoperations were carried out during 2008. The difference between the groups with regard to all causes of reoperation was 0.5%. In the within-county group, 2.4% have now undergone reoperation and in the free choice of care group the corresponding figure is 2.9%. The difference is not statistically significant. The two previous years' analyses of this patient group have shown a statistical difference regarding deep infection (see previous Annual Reports!). This difference is no longer significant (p=0.088)

Discussion

The follow-up period is now growing to moderate length and still reflects mainly complications such as deep infection and revision due to recurring dislocations. The frequency of this type of short-term complication will now level off and the next few years will become more interesting with regard to any difference in revision due to aseptic loosening, which in turn can be correlated to a possible suboptimal technique during the operation. For many years all registry analyses have shown that this type of long-term complications become more frequent only after a 7-8 year follow-up.

Many may criticise this increasingly historical follow-up and that the studied group does not reflect the result after the situation today. Unfortunately, the registry has no resources to follow a later cohort. However, it should be possible on an ongoing basis to follow patients who have not undergone surgery at their 'home hospital' via the Patient Registry (PAR) at the Swedish National Board of Health and Welfare. Such a follow-up is, however, restricted by two factors:

1. Low quality of coding both regarding diagnosis and measure (which does not affect the register as the diagnoses and measures are grouped in the registry's databases and that all operation reports are read via the coordinators at the registry).

2. Private care units have low reporting frequency to PAR.

For each unit to be able to retain and develop expertise, the registry management considers that it should follow its own patients and also remedy any of its own possible complications. However, many undertakings within the care guarantee lack contractual provisions that the individual surgeon follow his/her patients and carry out reoperations himself/herself – i.e. one is not given the opportunity to 'learn from one's own mistakes'. Over time this will lower expertise and the opportunity for self-improvement/development.

Optimal accessibility for patients with hip osteoarthritis should include:

- **Adequate and rapid appraisal by primary care.**
- **Access to 'osteoarthritis school' – complete non-surgical therapy as first treatment alternative.**
- **Short waiting time for the patient before assessment by an orthopaedic specialist.**
- **Where surgery is indicated – short waiting time before surgery.**
- **Standardised follow-up, preferably by the operating surgeon.**

Availability is not only a time variable!

Notes

Mortality following total hip arthroplasty

Background

30-day mortality was introduced three years ago as an open variable at unit level. This variable is also included as one of eight parameters in the modified clinical value compass (see section 'Follow-up of activities after hip replacement surgery'). While hip replacement surgery nowadays may be regarded as routine surgery, it is in fact a major surgical intervention, not without risk for the patient. Modern anaesthesiology, meticulous preoperative medical investigation and prophylactic infection and thrombosis measures have resulted in low complications and mortality frequency. However, the indications for implant surgery have, during the past few years, been broadened – both nationally and internationally. More younger and older patients are undergoing surgery now than in the 1970s and 1980s. Today, particularly at larger units, more at-risk patients are undergoing surgery than previously.

The Hip Arthroplasty Register updates its database several times a year with regard to possible dates of death of individuals included (Skatteverket, the Swedish Tax Agency).

Short-term mortality (90-day mortality)

90-day mortality is an indicator frequently used in the literature and applied in several different medical areas. The reasons why a patient may die in connection with or within 90 days of hip replacement surgery (and related to the intervention) may be many, but the dominating causes are cardiovascular or thromboembolic diseases.

The variable should in the future be able to be used as an indicator of the quality of the pre-operative medical assessment and the unit's prophylactic measures. To achieve this requires co-processing with the Causes of Death Register. The new Patient Data Act (1/7 2009) has now made individual-based co-processing with the Causes of Death Register at the Swedish National Board of Health and Welfare, easier. Following introduction of the new law, approval from ethical committees is no longer required for co-processing between different National Quality Registers and the Causes of Death Register. However, the problem is that there is still a delay of approximately one year in the Causes of Death Register database. For this reason we are still unable to state cause of death.

90-day mortality varies relatively widely amongst the Swedish hospitals during the years of observation: from 0‰–49.3‰ and with a national average value of 7.6‰. This means that at national level one patient in approximately 130 undergoing surgery died within three months of the hip replacement surgery during 2005–2008. As expected, the 90-day mortality is higher after surgery at a university/regional hospital than at a rural hospital and above all compared to private care units. This again reflects the patient material at the various hospitals. For this reason in this table we have included the 'case mix' variables: diagnosis, age and gender. Regarding mortality, medical co-morbidity is of course the most important 'case-mix' variable. This year we lack such a variable but following ethical approval we are planning broad co-processing with the EpC Patient Register. Such co-processing will give a more adequate co-morbidity variable (Charlsons Index), which can be used in future comparative mortality analyses.

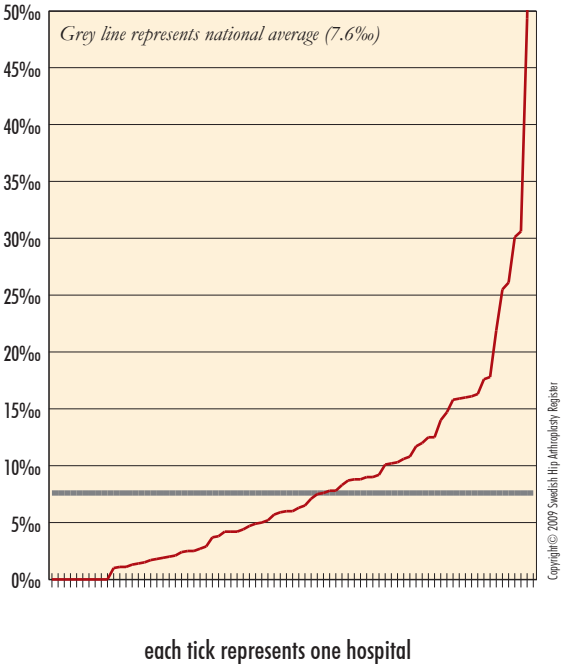
90-day mortality following hemi-arthroplasty is more than tenfold higher – 12.5% – than for total hip replacement surgery. Patients treated with hemi-arthroplasty usually differs from those treated with total arthroplasty, as they are older, generally more ill and often undergoing acute surgery due to fracture. For details and tables see the section 'Hemi-arthroplasty' (page 97).

The registry management recommend the hospitals to check their 90-day mortality in the table and in the event of differing results, initiate a local analysis.

The mortality rates are generally low and should be assessed with the same caution as the variable 'reoperation within 2 years', i.e. it should be assessed as a possible trend over time.

90-day mortality

primary THR performed during the past four years



each tick represents one hospital

90-day mortality

proportion deceased within three months after primary THR, 2005–2008

Hospital	Number [1]	OA [2]	≥= 60years [3]	Female [4]	Mortalitet [5]
University/Regional Hospitals					
KS/Huddinge	1,031	69%	68%	59%	8.7‰
KS/Solna	934	68%	72%	62%	7.5‰
Linköping	225	40%	68%	60%	17.8‰
Lund	365	26%	69%	64%	49.3‰
Malmö	432	27%	80%	69%	25.5‰
SU/Mölndal	649	56%	76%	62%	10.8‰
SU/Sahlgrenska	367	63%	59%	59%	16.3‰
SU/Östra	484	87%	82%	65%	8.3‰
Umeå	320	74%	62%	57%	21.9‰
Uppsala	1,130	53%	70%	58%	30.1‰
Örebro	720	82%	77%	60%	4.2‰
Central Hospitals					
Borås	852	67%	81%	59%	5.9‰
Danderyd	1,582	80%	87%	65%	7.6‰
Eksjö	772	93%	85%	55%	7.8‰
Eskilstuna	360	58%	90%	60%	30.6‰
Falun	1,019	87%	80%	58%	2.0‰
Gävle	536	60%	74%	55%	26.1‰
Halmstad	884	77%	83%	58%	5.7‰
Helsingborg	267	58%	89%	58%	3.7‰
Hässleholm-Kristianstad	3,125	92%	84%	56%	4.2‰
Jönköping	774	84%	82%	64%	10.3‰
Kalmar	756	76%	85%	62%	10.6‰
Karlskrona	118	26%	92%	69%	76.3‰
Karlstad	1,080	68%	83%	65%	17.6‰
Norrköping	641	60%	83%	60%	12.5‰
S:t Göran	1,577	85%	80%	66%	12.0‰
Skövde	557	75%	75%	53%	9.0‰
Sunderby (incl. Boden)	313	45%	81%	66%	16.0‰
Sundsvall	527	81%	79%	61%	1.9‰
Södersjukhuset	1,571	72%	84%	65%	14.0‰
Uddevalla	1,303	78%	82%	60%	9.2‰
Varberg	833	88%	85%	59%	6.0‰
Västerås	722	69%	80%	59%	12.5‰
Växjö	529	83%	87%	61%	3.8‰
Ystad	62	52%	92%	53%	16.1‰
Östersund	797	83%	82%	59%	6.3‰
Rural Hospitals					
Alingsås	828	96%	85%	61%	2.4‰
Arvika	478	92%	87%	56%	4.2‰
Bollnäs	1,023	96%	87%	58%	1.0‰
Enköping	745	96%	90%	63%	2.7‰
Falköping	946	91%	88%	55%	2.1‰
Frölunda Specialistsjukhus	253	99%	88%	70%	0.0‰
Gällivare	426	83%	88%	59%	4.7‰

(continued on next page.)

90-day mortality (cont.)

proportion deceased within three months after primary THR, 2005–2008

Hospital	Number [1]	OA [2]	≥=60years [3]	Female [4]	Mortalitet [5]
Hudiksvall	502	73%	85%	61%	15.9‰
Karlshamn	691	97%	82%	57%	1.4‰
Karlskoga	396	89%	90%	58%	10.1‰
Katrineholm	835	95%	77%	55%	0.0‰
Kungälv	814	89%	87%	60%	2.5‰
Köping	684	97%	84%	58%	1.5‰
Lidköping	556	88%	86%	48%	9.0‰
Lindesberg	566	88%	90%	57%	8.8‰
Ljungby	452	84%	77%	57%	8.8‰
Lycksele	985	93%	87%	59%	10.2‰
Mora	637	90%	89%	58%	7.8‰
Motala	1,606	90%	81%	59%	4.4‰
Norrtälje	428	83%	86%	60%	11.7‰
Nyköping	600	86%	84%	58%	5.0‰
Oskarshamn	884	98%	86%	53%	1.1‰
Piteå	1,216	95%	80%	57%	2.5‰
Skellefteå	405	82%	84%	60%	4.9‰
Skene	302	97%	87%	50%	0.0‰
Sollefteå	499	93%	85%	59%	6.0‰
Södertälje	461	86%	86%	59%	6.5‰
Torsby	316	83%	90%	59%	15.8‰
Trelleborg	2,309	91%	79%	59%	1.7‰
Visby	477	85%	79%	56%	14.7‰
Värnamo	575	88%	84%	58%	5.2‰
Västervik	424	83%	85%	58%	7.1‰
Ängelholm	57	88%	56%	46%	0.0‰
Örnsköldsvik	694	91%	82%	61%	2.9‰
Private Hospitals					
Carlanderska	219	95%	64%	42%	0.0‰
Elisabethsjukhuset	582	88%	79%	62%	0.0‰
Movement	490	98%	81%	56%	0.0‰
Nacka Närsjukhus Proxima	119	99%	72%	51%	0.0‰
Ortho Center Stockholm	780	96%	83%	58%	1.3‰
OrthoCenter IFK-kliniken	112	93%	59%	37%	0.0‰
Ortopediska Huset	1,713	100%	78%	62%	1.8‰
Sophiahemmet	926	100%	70%	50%	1.1‰
Spenshult	228	83%	75%	58%	0.0‰
Nation	56,762	83%	82%	59%	7.6‰

1) Refers to number of primary operations during period.

2) Refers to proportion of primary operations carried out for primary osteoarthritis.

3) Refers to proportion of primary operations in age group 60 years or older (age on primary operation).

4) Refers to proportion of women receiving primary surgery during period.

5) 90-day mortality (number of patients dying within three months of primary operation/ number of primary operations during period).

Gender perspective

Total replacement surgery

More women than men undergo hip replacement surgery. During the past 5-year period the distribution has remained relatively constant (59.1/40.9%). During this period the average age for men was almost three years lower (67.0 against 69.8). The diagnosis primary osteoarthritis was relatively more common in men whilst all of the other osteoarthritis groups (inflammatory arthritis, fracture, osteoarthritis due to childhood disease and idiopathic femoral head necrosis) were most common in women (2004–2008).

Compared with central hospitals that have a gender distribution closest to the national average (woman/man: 60.3/39.7%) more women were operated on between 2004–2008 at university hospitals and fewer at rural hospitals and private hospitals. By adjusting for diagnosis, side and bilaterality in a logistical regression model there is a significant difference only for the two first-mentioned hospital types. The selection of patients with primary osteoarthritis to private hospitals consequently means that a relative dominance of men can be expected.

As pointed out in the previous annual reports choice of fixation differs between the genders. During the past 5-year period, women were more often given all-cemented prostheses. All other fixation concepts (uncementerad prosthesis, hybrid, reversed hybrid and resurfacing prosthesis) were more often used on men. The difference for resurfacing prosthesis is particularly pronounced (RR man/woman: 2.63 2.28–3.04) and least for reversed hybrid (1.25 1.17–1.33). As in previous reports we find a difference between choice of incision. Women were operated on more frequently with anterior lateral incision both in supine position (man/woman: 5.0/6.5%) and when lying on the side (36.4/37.8%). Mini-incision is used more frequently on women (1.0/1.1%) and posterior incision more frequently in men (57.4/54.4). In the logistical regression we find that a woman has approximately 8% higher probability of being operated on with an anterolateral incision when lying on the side (1.08 1.05–1.12) and approximately 43% greater chance of being operated on with a mini-incision (1.43 1.22–1.67) if the gender distribution with posterior incision is used as reference. Consequently uneven representation cannot be explained by e.g. differences in age and diagnosis between the genders as the analysis (based on operations carried out 2004–2008) include adjustment for age, diagnosis, hospital group, side and bilaterality.

Both men and women were more frequently operated on the right side, but as previously we find that this right side dominance is more pronounced in women. Bilateral surgery in one or two stages was also more common in women, possibly on the basis of a dominance of secondary osteoarthritis. However, the difference remains after statistical adjustment (relative risk woman/man: 1,20 1,16–1,24). Between 2004 and 2008, 20.3% of the women and 19.2% of the men underwent their second primary operation of the opposite side.

Outcome: The outcome calculated as risk for revision irrespective of cause differs between men and women. The risk of revision is 1.43 times greater for men (1.37–1.49, Cox-regression: all primary operations 1992–2008 adjusted for age, diagnosis, side, bilaterality, clinic group, incision and type of fixation). Men are particularly associated with a risk of revision due to infection where it is more than doubled (2.05 1.81–2.34) followed by fracture (1.81 1.53–2.14) and loosening (1.44 1.36–1.52). However, we find no certain differences between the genders regarding risk of revision due to dislocation.

The patient-reported results also differ between the genders. In the patient cohort operated in 2004-2008 patients who underwent 21,804 operations answered the questionnaire before and one year after the operation. Here we find that women report a higher EQ5D-gain (0.39 standard deviation = 0.35) than men (0.35 0.34). Surgery led to greater pain relief in women, measured on a VAS scale (women/men: -48 24 for women against -45 22 for men). However, women experience somewhat poorer satisfaction with the operation after one year, which is reported on a reverse VAS scale (women/men mean SD: 19 22/16 20).

Summary: More women than men undergo hip replacement surgery. The operation is also carried out at a greater age. They are more often operated on the right side, often bilaterally, more frequently receive all-cemented prosthesis and the operation is carried out more frequently with an anterolateral or mini incision.

Men are affected more frequently by revision due to fracture, infection and loosening. One year after the operation women report a better effect of the intervention regarding health-related quality of life and pain but are not as satisfied as men.

Hemi-arthroplasty surgery

Women are more often subjected to hip fractures and are also operated on with hemi-prosthesis more often than men. 72.2% of hemi-prosthesis operations registered in 2005–2008 were carried out on women. Evaluations of possible gender-related differences have been carried out on the patients undergoing acute surgery due to hip fracture (93.2%) or later due to healing complications (5%). 313 operations (1.9%) have been excluded from this analysis.

Logical regression is used to adjust for co-variation between different factors. Men who are operated on with hemi-prostheses are approximately one year younger. Both men and women are operated on more frequently on the left side but the dominance is more pronounced for women. Women more often undergo acute hemi-prosthesis surgery than for later complications associated with the fracture (1.19 1.02–1.38). Compared with unipolar design, bipolar prostheses (RR=1.13 1.05–1.21) and monoblock prostheses (RR=1.20 1.06–1.36) are chosen more often for women than for men (Table 3).

Outcome: In general, men are reoperated more often than women (relative risk: 1,22 1,01–1,48). The reason for this is that reoperation due to fracture is more than double as common (2.14 1.29– 3.51). The risk of reoperation due to infection or dislocation does not differ between the genders.

Comment: The uneven gender distribution regarding choice of monoblock prosthesis becomes all the more irrelevant as this

type of prosthesis is in the process of disappearing owing to poor results. The reason that women more often receive bipolar prostheses is unclear. Secondary prosthesis is used more often for men, possibly due to the fact that osteosynthesis is judged to be beneficial for better bone quality.

Summary: The majority of the patients operated on with hemi-prosthesis are women. Women more frequently receive primary hemi-prosthesis compared with men and often of the bipolar type. The risk of revision is higher for men mainly due to peri-prosthetic fractures.

	Female	Male
Average age SD	84.1 6.6	83 7.1
Left-side operation %	53.2	51.0
Secondary prosthesis %	4.8	5.8
Monoblock stem %	11.0	9.5
Fixed joint head – unipolar %	34.9	37.8
Mobile joint head – bipolar %	54.2	52.7

Table 3. Differerence in gender based on logistic regression analysis (p<0,0001-0.03). We do not find any significant difference for the factors bilaterility, type of stem, type of hospital and incision.

During the study period there were differences between the genders.

In total hip replacement surgery regarding:

- **age at time of operation**
- **side operated on**
- **occurrence of bilateral arthroplasty**
- **diagnosis**
- **choice of incision**
- **stem fixation**
- **risk of revision**

In hemi-arthroplasty regarding:

- **age at time of operation**
- **side operated on**
- **diagnosis**
- **risk of reoperation and revision**

Hip fracture and prosthesis surgery

Method and material

The material was obtained from the Patient Register (EpC, Swedish National Board of Health and Welfare), and is one of the national quality indicators regarding musculoskeletal disorders that are included in this year's edition of *Open comparisons*.

Selection criterion was femoral neck fractures (S72.00) in patients over 64 years of age, during 2007 and 2008. The indicator (blue bars in the histogram) shows proportion of patients treated primarily with hemi-arthroplasty (NFB 09 and 19) or total replacement (NFB 29, 39, 49 and 99). The hemi-arthroplasties dominate with approximately 84% of the material. The analysis was carried out only at county council level.

Results

Please see the figure below. The result of the analysis shows a large spread between the various county councils of 38%–67% and a national average of 56.6%.

Discussion

Femoral neck fracture can be treated either with osteosynthesis or with hip replacement surgery. Current research has shown that hip replacement surgery in dislocated fractures (Garden III and IV) gives a considerably better result with fewer than 10% of failures compared with 40–50% following osteosynthesis. These findings have led to changes in the treatment model in Sweden during the past decade. The proportion of prosthesis procedures has increased significantly in the past ten year period from 11 to 57%, in the country as a whole.

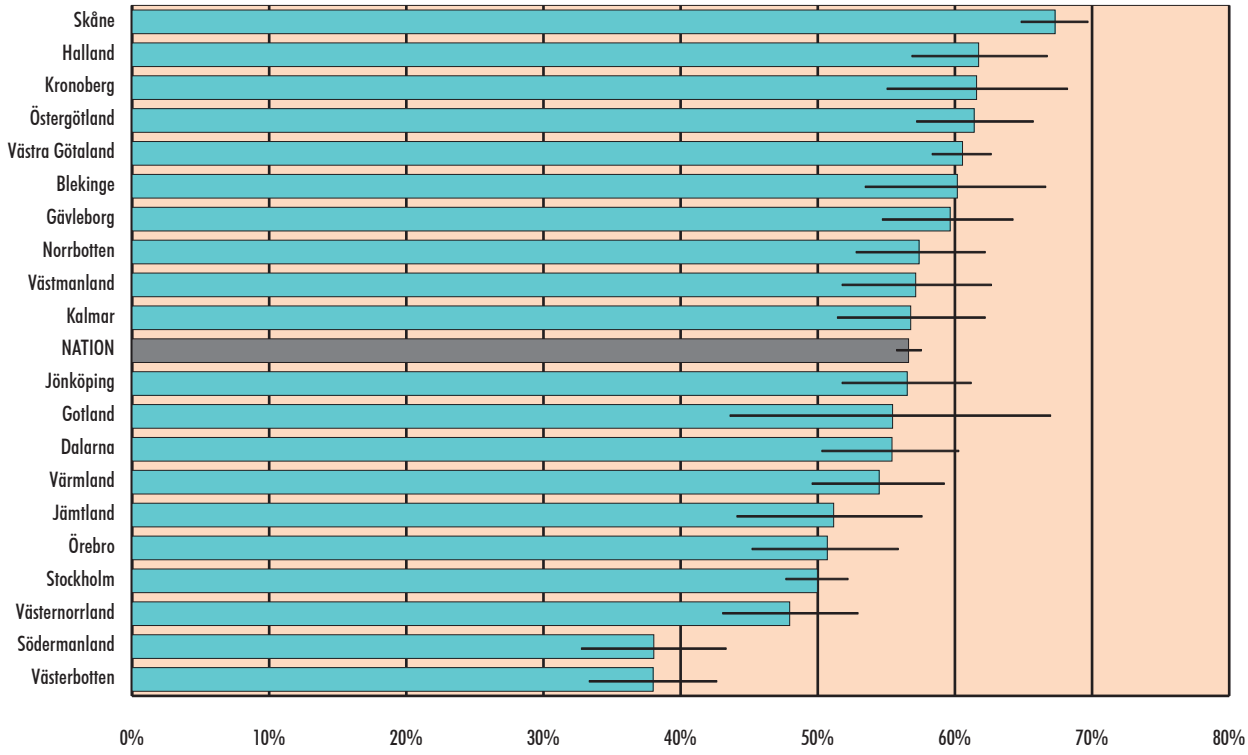
A proportion of 60–70% should receive hip replacement surgery primarily in an evidence-based treatment algorithm. Since 30–35% of femoral fractures should still be operated on with internal fixation as they are not displaced or occur in younger individuals (where there may be advantages with internal fixation). Furthermore, acute, life-threatening disease may lead to internal fixation, a less demanding procedure.

In view of the results of current research, the large variability found between the different county councils is surprising and this year's analysis shows no obvious change compared with last year. The registry management had expected a certain spread but not so large as the analysis shows and that it will not change faster over time. To operate 60–70% of all femoral fractures with prosthesis, however, places great demands on the hospitals with reorganisation of on-duty work and requirements for increased surgical competence. One reason for some clinics/county councils hesitating over full implementation of the new model is the discussion that prolonged operation times and prosthesis costs may make care of hip fractures more expensive.

Whilst the treatment model makes the initial treatment more expensive it results in a fivefold reduction in reoperation frequency and so is instead very cost effective. Primary hip replacement surgery results in less pain, easier rehabilitation and better health-related quality of life for the patient.

Characteristic of the county councils/regions with a large proportion of arthroplasties is their earlier participation in large clinical multi-centre studies that form the basis of the altered treatment model.

Hip arthroplasty among first-time cases of hip fracture as main diagnosis
2007-2008



Hemi-arthroplasty

During 2008 the number of reported hemi-arthroplasties has continued to increase. During the year 4,475 primary operations were registered, compared with 4,265, 4,241 and 3,859 interventions previously. During the four years that the registration continued the proportion of men increased from 27 to 29% and the average age from 83 to 84.

The proportion of primary prostheses has increased from 91 to 94%. Other diagnoses treated with hemi-arthroplasties are complications following fracture treatment with internal fixation (4%), but also malignancy, hip joint dislocation, avascular necrosis without previous hip fracture, obscure pain with several unusual conditions. As the latter 'other diagnoses' make up a heterogeneous group, but above average death rate mainly in the cancer patients, only primary and secondary hemi-prostheses have been included in this year's analyses.

For the monoblock prostheses can be seen a pronounced reduction from 18% 2005 to 3% 2008. Both the registry and scientific studies have shown poor results for both the Austin Moore and the Thomson prostheses. It is therefore gratifying to see a clinical breakthrough. As a result there is an increase in both bipolar (50 to 58%) and unipolar joint heads (31 to 38%). See figure on following page.

The most common bipolar head is VarioCup, whilst Megacaput dominates amongst the unipolar. The Lubinus and Exeter stems dominate. The modern uncemented stems remain unchanged at 3%, with the Corail stem as the most used implant. See table on following page. Swedish orthopaedic surgeons keep to a few implants; both stems and heads make up the seven most frequently used implants for 90% of the operations.

Mortality

As a hip fracture is often a marker of general ill-health or high age, mortality following fracture is high irrespective of how it is treated. Nationally, 90-day mortality is 13%, but varies significantly between different hospitals (6 to 22%). As a hip fracture can be treated with different surgical methods, mortality can be markedly affected by which treatment regime a clinic has. By selecting internal fixation for seriously sick patients instead of arthoplasties, the hospital's results are improved with regard to mortality following hip replacement surgery. High age, male gender and acute surgery (primary prosthesis) also increase the risk of mortality, which is why these variables are shown in the table on the following page. From Rikshöft is quoted the proportion of patients operated on within 24 hours, where a low proportion is a further risk factor. Given these factors, clinics with high mortality should scrutinise their care to identify possible risk factors that can be influenced.

Reoperation

In the register reoperations are noted, of which a number are revisions. Reoperations are all open interventions related to hip complications, whilst revision involves exchange or extraction of some prosthesis components. It is thus crucial that participating hospitals report all reoperations, even those that could be considered to be minor interventions. It is also important that the operations are coded correctly. This applies particularly to fractures adjacent to the prosthesis, which in addition to a S72-code must be coded with T84.0F and Y88.3, in order to be safely identified as a prosthesis related complication.

569 patients underwent at least one reoperation, i.e. a reoperation's frequency of 3.4% where dislocation is responsible for half the cases. See table on following page. Note that closed reductions are not entered in the register, so the actual number of dislocations is higher. Altogether, 820 reoperations have been registered, with change of prosthesis components the most common intervention. Markedly many soft tissue interventions are also carried out, usually caused by infection. See table on following page.

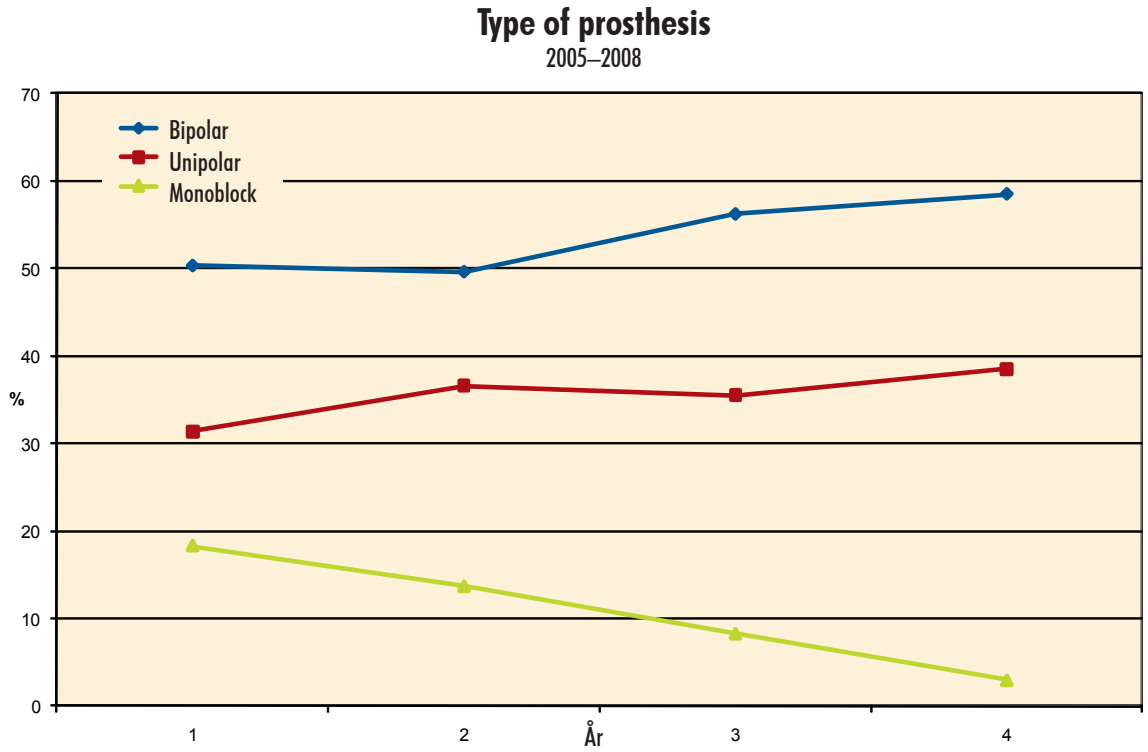
In this osteoporotic patient group it has been feared that periprosthetic fractures would be common, but this appears not to be the case. There could be a risk of under-reporting via incorrect coding as per above. The fractures that occur are in part related to uncemented prostheses (see below). Reoperation due to acetabular erosion and loosening are very unusual. An explanation could be the relatively short follow-up, but also the fact that these diagnoses are not obliged to lead to reoperation/revision, as opposed e.g. fractures or infection. However, theoretically Swedish orthopaedic surgeons' widespread use of bipolar heads and the phasing out of monoblock prostheses should reduce the risk of erosion.

The proportion of reported reoperations is on a level with the scientific studies that presented the results for modern hemi-prostheses, and may be regarded as acceptable. The complication frequency must be seen in the light of the proportion of reoperations after the previously predominant technique, internal fixation, when 30 to 40% needed to be reoperated, i.e. ten times more.

Risk factors for reoperation

Patients who underwent hip fracture related hemi-arthroplasty 2005-2008, have been analysed with regard to risk factors for reoperation (Cox regression analysis). Age under 75 years, uncemented prosthesis stem and a hemi-arthroplasty following unsuccessful internal fixation all led to increased risk of reoperation (1.8 times 1.5–2.4; 2.1 1.6-2.7 and 2.0 1.6–2.6 (95% confidence interval)).

56% of the uncemented stems are Austin Moore prostheses, with known clinical problems. In a separate analysis only modern modular uncemented stems were compared with cemented. Even then there remains a double risk of reoperation with uncemented stem (1.4–2.8). The reason is mainly an increased risk of periprosthetic fracture (2.9 1.5–5.8).



Early reoperation

Complications following hemi-arthroplasty occur early. 72.4% of all registered reoperations take place within six months, which corresponds to 2.8% of the operations that are carried out. Analysis of the years 2007–2008 show a large variation between Swedish hospitals from 0 to 9.5%. See table on following page. The patient selection and treatment strategy for e.g. dislocation influences the frequency. Despite this a high frequency of reoperations are a call for the hospitals in question, to investigate if targeted efforts can reduce the risk of reoperations.

Incision technique and dislocation

Posterior incision is often used in primary hip replacement surgery (see chapter primary arthroplasty). For fracture patients it has been shown both in scientific studies and in the registry that the alternative anterior incision reduces the risk of revision due to dislocation. Swedish orthopaedic surgeons have reduced the proportion of posterior incisions for the hemi-arthroplasties from 53% 2005 to 49% 2008. The clinical recommendation, to use the anterior incision for fracture patients, is further strengthened as we continue to show an increased risk of reoperation due to dislocation with the posterior approach (1.7 1.3–2.2). In this analysis we also find that operations at county district hospitals increase the risk of reoperation due to dislocation (1.5 1.1–2.0).

Stem	2005	2006	2007	2008	Total	Andel[1)]
Lubinus SP II	1,455	1,665	1,966	2,094	7,180	42.6%
Exeter Polished	870	934	1,040	1,191	4,035	24.0%
CPT (CoCr)	187	211	240	274	912	5.4%
MS30 Polished	0	1	111	176	288	1.7%
Thompson	354	360	244	168	1,126	6.7%
Covision straight	0	0	24	151	175	1.0%
Corail Stem	26	95	92	109	322	1.9%
Spectron EF Primary	351	408	181	106	1,046	6.2%
Basis	0	41	50	54	145	0.9%
ETS Endo	98	104	129	48	379	2.3%
Müller Straight	101	84	60	25	270	1.6%
Moore	329	220	78	23	650	3.9%
Charnley	26	31	3	0	60	0.4%
Covision Troy	0	0	4	15	19	0.1%
Bi-Metric Fracture Stem	42	53	19	13	127	0.8%
Spectron Revision	6	10	2	8	26	0.2%
CLS Spotorno	4	3	12	4	23	0.1%
Mutars proximal	0	1	0	3	4	0.0%
Revitan Proximal Cylindrical	0	1	1	3	5	0.0%
Others	10	17	8	3	38	0.2%
Missing	0	2	1	2	5	0.0%
Total	3,859	4,241	4,265	4,470	16,835	100%

The most common hemi-arthroplasty stems 2005-2007. 1) Proportion of total number of operations carried out 2005-2007.

Bi/Unipolar cup	2005	2006	2007	2008	Total	Andel[1)]
Vario Cup	1,001	1,053	1,320	1,380	4,754	28.2%
Mega caput	463	655	681	705	2,504	14.9%
UHR Universal Head	590	581	638	699	2,508	14.9%
V40 Uni polar	277	331	377	494	1,479	8.8%
Ultima Monk	314	435	388	429	1,566	9.3%
Unipolar head	337	449	227	151	1,164	6.9%
Covision unipolar head			19	125	144	0.9%
Unipolarhuvud	95	57	119	105	376	2.2%
Versys endo	5	5	61	104	175	1.0%
Mulipolar cup		1	37	73	111	0.7%
Covision unipolar head for sleeves			7	33	40	0.2%
Covision bipolar shell			4	12	16	0.1%
Tandem bipolar				12	12	0.1%
Scan bipolar head	10	3	6	9	28	0.2%
Moore modular hemi-head (Anatomica)	33	51	13	4	101	0.6%
ic-bipolar head		1		3	4	0.0%
Metasul			10		10	0.1%
Hastings	26	31	3		60	0.4%
Cathcart ball		6	1		7	0.0%
Tumorprosthesis		1			1	0.0%
Convene bipolar shell	1				1	0.0%
Component Labeling missing	1	1			2	0.0%
Missing	14	2	0	3	19	0.1%
Monoblock	692	578	354	129	1,753	10.4%
Total	3,859	4,241	4,265	4,470	16,835	100%

The most common hemi-arthroplasty stems 2005-2007. 1) Proportion of total number of operations carried out 2005-2007.

90-day mortality after hemi-prosthesis

proportion deceased within three months after primary THR, 2004–2008

Hospital	Number [1]	>80 years [2]	Male [3]	Primary prosthetics [4]	Surgery within 48 h [5]	Mortality [5]
University/Regional Hospitals						
KS/Huddinge	261	80%	25%	95%	93%	17.6%
KS/Solna	224	73%	29%	80%	94%	19.2%
Linköping	231	77%	27%	97%	88%	13.0%
Lund	586	67%	30%	96%	93%	14.0%
Malmö	894	81%	30%	95%	87%	13.5%
SU/Sahlgrenska	151	60%	43%	86%		16.6%
SU/Östra	155	74%	25%	95%		8.4%
Umeå	253	63%	28%	93%	92%	12.6%
Uppsala	420	82%	30%	99%		21.4%
Central Hospitals						
Borås	387	84%	33%	95%	90%	17.3%
Danderyd	406	79%	26%	98%		14.3%
Eksjö	197	84%	30%	95%	97%	6.1%
Eskilstuna	228	80%	21%	96%	89%	18.4%
Falun	467	71%	22%	90%	95%	7.3%
Gävle	436	77%	22%	89%		13.8%
Halmstad	275	83%	31%	94%	94%	22.2%
Helsingborg	615	73%	30%	95%	89%	18.0%
Hässleholm-Kristianstad	477	74%	25%	93%	91%	15.1%
Jönköping	242	79%	29%	98%	89%	11.2%
Kalmar	397	81%	31%	96%	97%	15.9%
Karlskrona	367	78%	34%	98%		12.5%
Karlstad	173	83%	31%	89%	100%	16.2%
Norrköping	229	89%	26%	98%	95%	14.8%
S:t Göran	497	85%	21%	88%		13.1%
Skövde	204	77%	22%	91%	92%	7.8%
SU/Mölndal	1,115	75%	28%	96%	80%	13.2%
Sunderby (incl. Boden)	522	69%	28%	97%		12.5%
Sundsvall	266	64%	29%	88%	99%	9.8%
Södersjukhuset	897	79%	30%	81%	86%	11.5%
Uddevalla	827	79%	32%	95%	90%	13.2%
Varberg	249	76%	31%	90%		12.0%
Västerås	499	76%	27%	98%		13.0%
Växjö	229	76%	29%	95%	81%	10.0%
Ystad	199	74%	18%	97%	100%	6.5%
Örebro	353	72%	27%	90%	93%	9.9%
Östersund	310	72%	25%	93%	93%	11.3%
Rural Hospitals						
Alingsås	162	68%	24%	98%	97%	10.5%
Arvika	19	84%	37%	68%		10.5%
Gällivare	50	68%	14%	92%		10.0%
Hudiksvall	197	81%	30%	93%	100%	18.8%
Karlskoga	126	72%	27%	88%		9.5%
Kungälv	191	83%	34%	97%	88%	12.0%

(continued on next page.)

90-day mortality after hemi-prosthesis (cont.)

proportion deceased within three months after primary THR, 2004–2008

Hospital	Number [1]	>80 years [2]	Male [3]	Primary prosthetics [4]	Surgery within 48 h [5]	Mortality [5]
Lidköping	149	73%	28%	79%	90%	12.1%
Lindesberg	114	78%	35%	96%	90%	14.9%
Ljungby	112	88%	28%	99%	94%	19.6%
Mora	128	81%	25%	94%	100%	14.8%
Motala	135	77%	23%	97%	86%	9.6%
Norrtälje	43	81%	19%	81%		14.0%
Nyköping	128	88%	17%	94%	94%	7.8%
Skellefteå	163	70%	25%	93%	95%	6.1%
Sollefteå	165	70%	28%	95%		10.9%
Södertälje	77	77%	21%	84%	100%	13.0%
Torsby	104	76%	35%	93%	87%	21.2%
Visby	116	79%	24%	89%	94%	6.0%
Värnamo	165	82%	26%	96%	96%	9.7%
Västervik	105	79%	15%	83%	96%	5.7%
Örnsköldsvik	128	69%	29%	98%		12.5%

1) Refers to number of primary and secondary operations during the period.
2) Refers to proportion of operations on patients aged over 80 years.
3) Refers to proportion of women during the period
4) Refers to the proportion of primary operations during the period (not secondary).
5) Refers to proportion undergoing surgery within 48 hours (from Rikshöft's Annual Report 2006).
6) 90-day mortality (100 (number of patients dying within three months of primary operation/ number of operations during the period)).*

Hospitals with fewer than ten hemi-arthroplasties 2005-2007 excluded.

Reason for reoperations

number of individuals, 2005 - 2008

Reason	Number	% of reop.	% of primary THR
Dislocation	281	49.4%	1.7%
Infection	156	27.4%	0.9%
Fracture	80	14.1%	0.5%
Erosion	24	4.2%	0.1%
Loosening (early/late)	11	1.9%	0.1%
Others	17	3.0%	0.1%
Total	569	100%	3.4%

Type of reoperation

number of primary THRs, 2005–2008

	Number	% of reop.
Exchange of prosthesis component	349	42.5
Wound revision	205	25.0
Removal of prosthesis component	152	18.5
Open reduction only	47	5.7
ORIF without revision	28	3.4
2-stage THR op after removal of stem/Girdlestone)	12	1.5
Re-use of old component	11	1.3
Removal of foreign bodies	9	1.1
Wedge augmentation of cup	4	0.5
Femoral amputation	3	0.4
Total	820	99.9

Reoperation within 6 months per hospital

2007–2008

Hospital	Number	EarlyReop	%
University/Regional Hospitals			
KS/Huddinge	144	5	3.5%
KS/Solna	111	9	**8.1%**
Linköping	144	1	0.7%
Lund	328	5	1.5%
Malmö	430	10	2.3%
SU/Sahlgrenska	11	0	0.0%
Umeå	143	4	2.8%
Uppsala	242	7	2.9%
Central Hospitals			
Borås	214	11	5.1%
Danderyd	193	4	2.1%
Eksjö	98	0	0.0%
Eskilstuna	105	4	3.8%
Falun	229	9	3.9%
Gävle	230	6	2.6%
Halmstad	154	6	3.9%
Helsingborg	288	12	4.2%
Hässleholm-Kristianstad	238	2	0.8%
Jönköping	120	6	5.0%
Kalmar	226	4	1.8%
Karlskrona	182	2	1.1%
Karlstad	119	2	1.7%
Norrköping	118	0	0.0%
S:t Göran	295	2	0.7%
Skövde	121	0	0.0%
SU/Mölndal	690	20	2.9%
Sunderby (incl. Boden)	290	17	**5.9%**
Sundsvall	136	8	**5.9%**
Södersjukhuset	472	14	3.0%
Uddevalla	442	4	0.9%
Varberg	140	1	0.7%
Västerås	243	12	4.9%
Växjö	102	5	4.9%
Ystad	87	1	1.1%
Örebro	183	3	1.6%
Östersund	154	8	**5.2%**
Rural Hospitals			
Alingsås	78	4	5.1%
Arvika	19	0	0.0%
Gällivare	19	0	0.0%
Hudiksvall	119	6	5.0%
Karlskoga	51	3	**5.9%**
Kungälv	102	0	0.0%
Lidköping	74	3	4.1%

(continued on next page.)

Reoperation within 6 months per hospital (cont.)

2007–2008

Hospital	Number	EarlyReop	%
Lindesberg	42	4	**9.5%**
Ljungby	62	4	**6.5%**
Mora	72	2	2.8%
Motala	68	1	1.5%
Norrtälje	27	1	3.7%
Nyköping	65	1	1.5%
Skellefteå	88	2	2.3%
Sollefteå	102	0	0.0%
Södertälje	44	0	0.0%
Torsby	48	1	2.1%
Visby	48	4	**8.3%**
Värnamo	65	0	0.0%
Västervik	50	3	**6.0%**
Örnsköldsvik	64	1	1.6%
Nation	8,729	244	2.8%

Red marking indicates values one standard deviation below nationwide average.

NARA – a Nordic register co-operation

In last year's report we described in detail the collaboration between the established Nordic implant registers, which resulted in the formation of NARA (Nordic Arthroplasty Register Association).

To the great delight of the registry management the collaboration has deepened during the past year and among other things has resulted in NARA's first scientific publication in Acta Orthopaedica (August 2009): The Nordic Arthroplasty Register Association. A unique collaboration between 3 national hip arthroplasty surgery registries with 280,201 THRs. The article shows e.g., that we in the Nordic region, despite our closeness, have different user profiles with regard to implants and fixation methods, i.e. all the more often nationally well-documented implants are chosen.

NARA has also expanded during the year as Finland is now part of the organisation and our hope is that Iceland is also starting up a registry. The Knee Arthroplasty Registry has, during the year, worked with a 'minimal dataset' and the first merged database is being analysed with the aim of publishing a first article of the same descriptive model as for the hip replacement surgery.

Planned and ongoing projects for hip arthroplasty surgery in NARA

- Analysis of the modern resurfacing prostheses' Nordic results.
- Analysis of young patients' results in the Nordic region (≤ 50 years).
- The Nordic results of hip arthroplasty surgery due to AVN (avascular caput necrosis).
- The Nordic results for hip arthroplasty surgery due to childhood hip disease.
- In-depth analysis of infection in hip arthroplasty surgery surgery – Nordic problems.

www.nordicarthroplasty.org

The BOA project

BOA — Better management of patients with osteoarthritis

In the previous Annual Report we described the so-called BOA register in detail. The aim of this project is to gradually become a national diagnosis register for patients with hip and knee osteoarthritis. We know, via various studies that in large parts of Sweden the care programmes that has existed since the 1970s is not being followed, with regard to the fact that early non-surgical treatment is the primary therapy for osteoarthritis in the hip and the knee.

The Hip Arthroplasty Registry has in recent years widened its area of interest to the whole course of the disease mainly for patients with osteoarthritis. The surgical procedure with choice of good operation techniques and well-documented types of prostheses has for some time been analysed in detail by the registry. There are, however, a number of factors, which are not surgery-dependent, that affect the subjective, patient-reported results and the cost-effectiveness of the intervention.

Examples of such factors are:

- Early care of osteoarthritis patients with adequate non-surgical treatment.
- Avoidance of unnecessary sicklisting.
- Right indication for surgery.
- Information about the condition and the right expectations after surgery.
- Correct post-operative information.
- Standardised rehabilitation measures.
- Adequate follow-up with early intervention after both short-term and long-term complications.

The BOA organisation with osteoarthritis schools has the aim and vision to influence these factors.

www.boaregistret.se

Notes

Regions – process and results measurements

During the past five years the largest number of hip arthroplasties have been carried out in the Uppsala-Örebro region (16,182) and least in the Northern region (7,679). However, the population data varies considerably regionally. Since 2007 the average frequency of hip arthroplasties per inhabitant and region is based on the number of operations carried out during the most recent 10 year period. Previously, 1992 represented the reference year, which meant that the observation period increased continually. Since 2007 the number of operations per inhabitant and year during the most recent 10-year period has increased from approximately 127 to 144 per 100,000 inhabitants (156 per 100,000 in 2008). The regional differences with the lowest procedure frequency in region Stockholm & Gotland as well as region West and a higher procedure frequency than the average in the four other regions remains, however, with a tendency to a certain levelling out. Region North still lies 10% above the average corresponding highest observed procedure frequency. The lowest value is to be found as before in region West with 14% below average.

Compared with the statistics from 2007 a relative reduction is noted in region North and an increase in region Stockholm & Gotland whilst region West remains at a low level. There may be several explanations for these differences. Regional differences in the occurrence of hip diseases and injuries that may motivate the prosthesis operation can vary regionally. Even if the optimal procedure frequency seen from a public health economic perspective is unknown, it appears that the observed differences

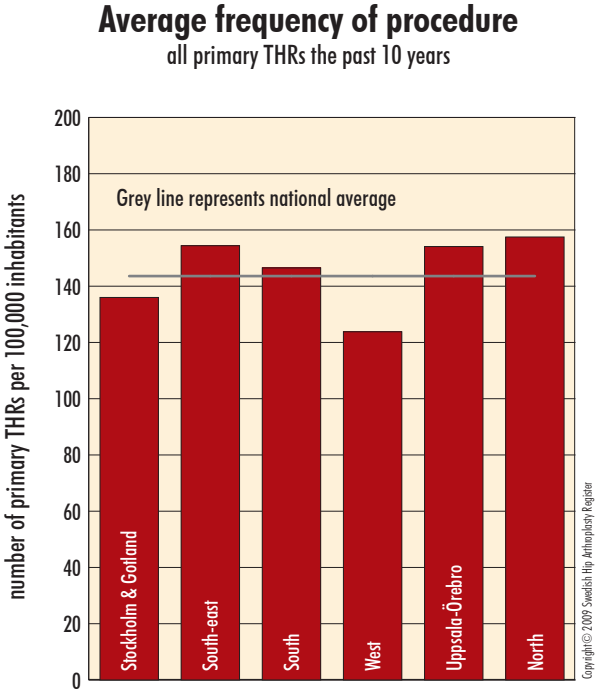


Figure 1. Average procedure frequency in the different regions for primary total hip arthroplasty performed during the past 10 years. Procedure frequency is calculated as a mean value of the procedure frequencies for the units included in each region.

Regions	Primary osteoarthritis	Inflammatory arthritis	Fracture	Childhood disease	Idiopathic fem. head necrosis	Sec. arthritis after trauma	Tumor
Stockholm-Gotland	83.2	1.6	9.8	2.2	2.6	0.2	0.4
Southeast	83.1	1.6	11.6	1.4	1.8	0.1	0.6
South	83.1	2.5	8.5	1.6	3.3	0.2	0.8
West	81.8	2.8	10.2	2.3	2.1	0.2	0.6
Uppsala-Örebro	81.0	2.5	10.5	2.7	2.6	0.1	0.6
North	85.2	2.2	7.6	2.0	2.3	0.1	0.7
Nation	82.6	2.2	9.8	2.1	2.5	0.2	0.6

Table 1. Distrubition of diagnoses between regions in percentage at operation with hip prosthesis. Diagnosis group "Other" (<0,05%/ region) is excluded.

Regions	Cemented	Uncemented	Hybrid	Reversed hybrid	Resurfacing implant
Stockholm-Gotland	69.2	11.8	0.7	15.7	2.6
Southeast	86.3	6.7	3.1	3.1	0.8
South	85.6	7.0	1.4	3.6	2.4
West	75.2	12.8	5.2	5.2	1.6
Uppsala-Örebro	81.1	10.9	0.8	6.1	1.2
North	90.9	5.0	0.7	3.0	0.5
Nation	80.2	9.5	1.9	6.7	1.6

Table 2. Distrubition of type of fixation between regions in percentage at operation with hip prosthesis 2004–2008.

within Sweden are however, still as noteworthy. There is cause to investigate how differences in the population's demographics, attitude to intervention and accessibility to medical care affects the procedure frequency of hip replacement surgery.

In an analogy with changes in the number of procedures per inhabitant, the greatest regional increase between 1992 and 2008 in region Stockholm & Gotland (1,137) whilst the northern region had the least change (+44). The average age at the time of the primary operation varied between 68.4 (North and West) up to 69.5 (Southeast). In five out of six regions the average age has been reduced between the years 1992 and 2008 and at most approximately two years (Stockholm & Gotland). In other regions the reduction varies between 0.4 and 1.1 year. In region West the average age changed insignificantly between 1992 and 2008, from 69.6 to 69.4.

In five out of six regions the gender distribution in 2004–2008 has been relatively equal with approximately 58.1 (South) to 59.3% (North) women. In Stockholm & Gotland the number of women went up to 61.4%.

The diagnosis primary osteoarthritis was most common in region North, which also carried out the lowest relative proportion of hip arthroplasties due to fracture (7.6%). Corresponding regions with the lowest proportion of primary osteoarthritis and the highest proportion with fracture diagnosis were the regions Uppsala-Örebro and the Southeastern. The diagnosis femoral head necrosis, which often afflicts patients taking certain types of medicine e.g. cortisone, as well as certain groups of drug/alcohol misusers varies between 1.8 and 3.3% (Table 1).

Choice of fixation varies regionally (Table 2). In region North, 90% of the patients were given all-cemented prostheses against less than 70% in region Stockholm & Gotland. Other methods of fixation also showed a large variation between regions.

A certain variation regarding choice of fixation is motivated not least in order to gain wider experience of new prosthesis concepts. By concentrating the use of certain implants one gains better experience and surgical skills in handling the new prosthesis concept. Furthermore, there is a certain selection of patients with specific problems often related to anatomy abnormality, who require special implants or where cemented fixation is less appropriate. It is not possible to assess for certain which mix of different ways of fixing a hip prosthesis is the most optimal. It is however, important that shifts within this area such as possible changes in prosthesis design take place slowly so that the profession is given sufficient time to learn the new technique. Increasing incidence of complications such as early revision of periprosthetic fracture, dislocation and early loosening should be regarded as warning signals and incentives for improvements.

Summary: There are regional differences in diagnosis, gender distribution, choice of fixation methods and procedure frequency per inhabitant. The differences in gender distribution are small and may possibly be explained by demographic factors and to a certain extent, differences in diagnosis distribution. Even if a certain levelling out of the regional differences takes place in the procedure frequency per inhabitant, the figures for, above all, region West appear to be noteworthy. They could justify further studies of the population's demographics, attitudes to intervention and accessibility of medical care.

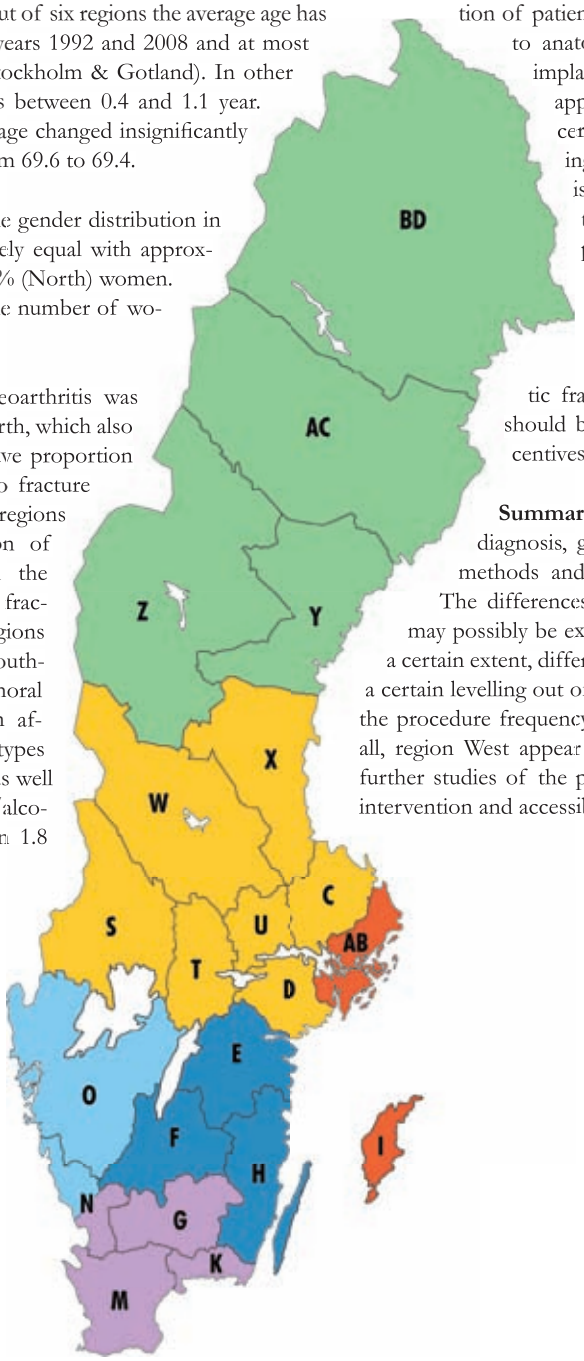


Figure 2. Regional distribution according to the National Board of Health and Welfare. Letters refer to county designations. Subsequent pages include two pages for each region. On these pages, tabs are coded in the same colour as on the map to make them easier to find.

Notes

National quality indicators

Under the heading *Open comparisons* the Swedish National Board of Health and Welfare and the Swedish Association of Local Authorities and Regions are co-operating to openly report and compare the quality and efficiency of the health and medical services. One aim of this work is to make the Swedish governmental financed health and medical services open to inspection. The general public and interest groups of different types are entitled to information on the quality and efficiency of the activities. *Open Comparisons* also provides objective material for the public and political debate on health and medical care.

An equally important aim is to contribute to the management of health and medical care. County councils and regions have improved support in the form of knowledge for follow-up and control of their own activities. The comparisons spur county councils and regions to improve and contribute to mutual learning.

In this year's report (the fourth in the order, published 23/11 2009) the number of quality indicators has been increased from 101 to over 124. For each indicator the county councils are ranked in diagrams where the result of the county council and the country are reported. An 'indicator', in common parlance, is a sign or signal of something, not an obvious fact but a natural interpretation. An indicator points to a case to study further, evaluate and possibly change The aim of *Open comparisons* is to go as far as giving the signal, but no further. Gender distribution statistics are often reported and the gender differences commented on in the text. In this year's report a number of indicators will be put forward at hospital level to also stimulate local improvements.

The Swedish Hip Arthroplasty Register is one of 22 National Quality Registers that supply data to *Open comparisons*. The registry is responsible for three indicators as below. A further two indicators illustrate hip replacement surgery with data from the Patient Register (EpC, the Swedish National Board of Health and Welfare): 'Hip fractures and arthroplasty' and 'Readmission within 30 days' and these indicators are shown in this report on pages 96 and 40 respectively.

Implementation

Within the medical areas with established National Quality Registers, the Swedish National Board of Health and Welfare and SALAR started a collaboration with the registry in autumn 2005 to obtain adequate indicators. One of the basic requirements was that the indicators should be reported openly. After discussion with the registry management the following indicators were selected from the Swedish Hip Arthroplasty Register:

Short-term complications, i.e. reoperation (of all kinds) within two years of primary operation. Reported for the previous four years. This variable should in this connection be considered as a medium quality indicator. Note that the report applies to complications dealt with surgically (see section 'Short-term complications – reoperation within 2 years', page 36).

10-year survival of prosthesis 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 operations are included. The result refers to the period of activities from 1999 up to and including 2008. This variable should be considered as slow but in the long-term an important quality indicator.

EQ-5D index gain 1 year after operation. The government commission states: 'that indicators that reflect patient-reported quality should be included'. The patient-reported outcome with health gain is an important variable for this patient group, operated on with low health-related quality of life as an indication for surgery. This variable is to be regarded as a fast quality indicator.

Results

In interpretation of these results the confidence interval, clearly shown in the illustrations, must be observed. If the confidence intervals overlap, one can simply say that there is probably no statistical difference between the results stated. The patient demography ('case mix' is included in the tables) between the various county councils must also be observed. Certain county councils have no university/regional hospitals within their area and are then able to work with a less risk-burdened patient profile.

Short-term complications. As indicated, the complication rates are low and should be assessed with caution. This quality indicator can really only be evaluated over time, i.e. if there are clear trends in the latest annual analyses.

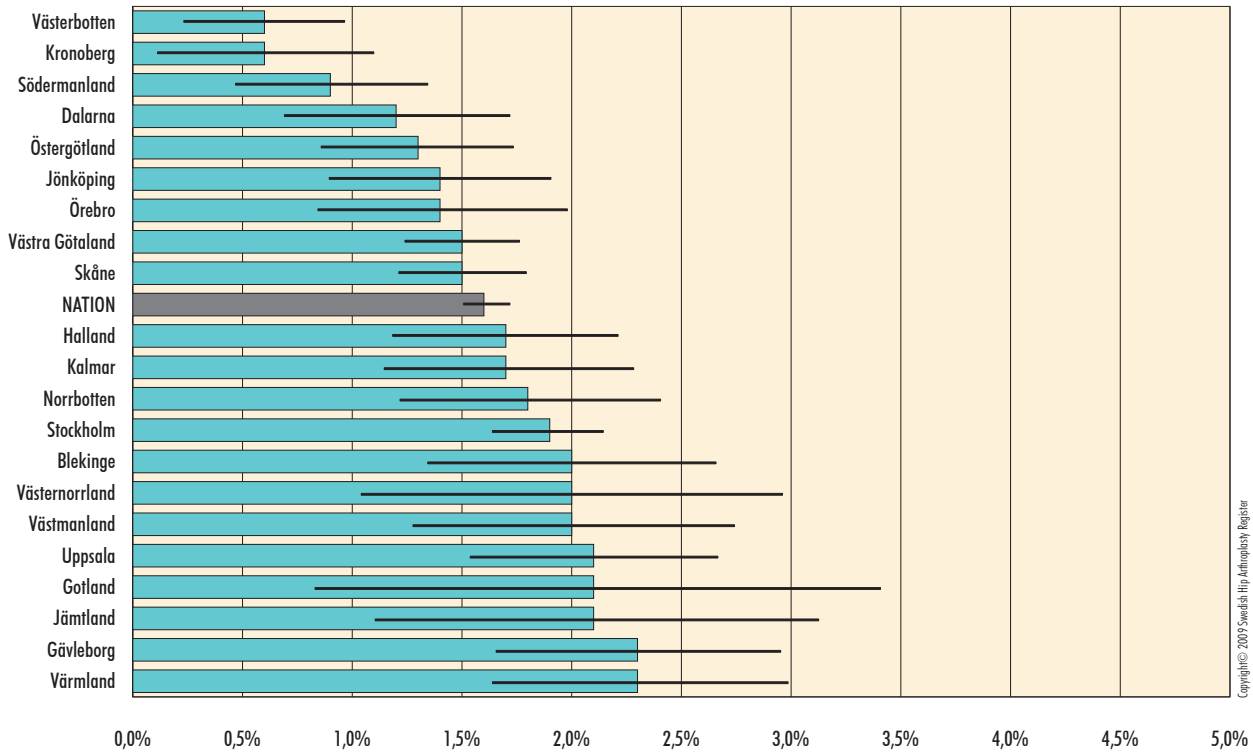
10-year survival. This indicator was changed last year in such a way that the observation period is now the most recent 10-year period (1999-2008). Previously it covered 1992 until the current year. This change can involve alterations to county council results and further confidence intervals.

EQ-5D index gain. All county councils now participate in this follow-up routine, but the county councils that joined most recently have relatively few 1-year follow-ups, therefore the entire period since EQ-5D was introduced (2002–2008) is material for the analysis. Next year this will be changed to illustrate the latest year of activities, which means that the indicator can be used as a fast indicator .

The genus perspective. All three indicators show differences between the genders. Many previous studies have shown a generally increased risk of reoperation and revision for men. The current results confirm these previous findings. Large population studies (cross-section studies) in Sweden have shown that women in general report poorer health-related quality of life than do men of corresponding ages. Gain in the EQ-5D index, however, is the result of a prospective longitudinal study, and women have given a somewhat marginally better health-gain.

Reoperation within 2 years per county

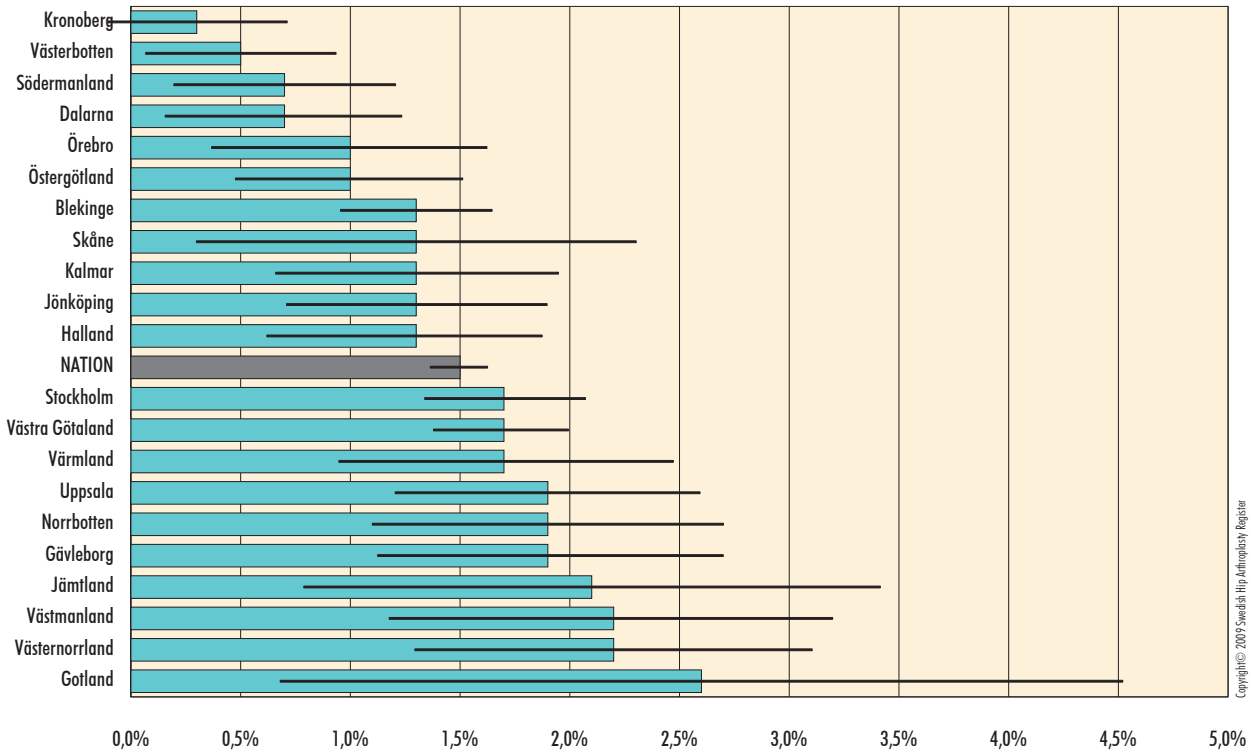
2005–2008



	Primary THRs	– Total –		– Infection –		– Dislocation –		– Loosening –		– Others –	
	Number	Number	%	Number	%	Number	%	Number	%	Number	%
Västerbotten	1,710	10	0.6%	7	0.4%	2	0.1%	0	0.0%	5	0.3%
Kronoberg	981	6	0.6%	0	0.0%	2	0.2%	0	0.0%	4	0.4%
Södermanland	1,795	16	0.9%	3	0.2%	7	0.4%	0	0.0%	7	0.4%
Dalarna	1,656	19	1.2%	12	0.7%	6	0.4%	0	0.0%	4	0.2%
Östergötland	2,472	31	1.3%	7	0.3%	16	0.7%	1	0.0%	13	0.5%
Jönköping	2,121	30	1.4%	17	0.8%	10	0.5%	1	0.1%	7	0.3%
Örebro	1,682	24	1.4%	11	0.7%	5	0.3%	0	0.0%	12	0.7%
Västra Götaland	8,346	126	1.5%	56	0.7%	41	0.5%	8	0.1%	41	0.5%
Skåne	6,822	105	1.5%	45	0.7%	23	0.3%	8	0.1%	49	0.7%
Nation	56,762	933	1.6%	375	0.7%	322	0.6%	59	0.1%	307	0.5%
Halland	2,435	41	1.7%	17	0.7%	15	0.6%	2	0.1%	8	0.3%
Kalmar	2,064	36	1.7%	25	1.2%	8	0.4%	1	0.1%	7	0.3%
Norrbotten	1,955	35	1.8%	12	0.6%	17	0.9%	4	0.2%	6	0.3%
Stockholm	11,122	208	1.9%	65	0.6%	74	0.7%	20	0.2%	79	0.7%
Blekinge	809	16	2.0%	2	0.3%	13	1.6%	1	0.1%	1	0.1%
Västernorrland	1,720	34	2.0%	20	1.2%	10	0.6%	0	0.0%	7	0.4%
Västmanland	1,406	28	2.0%	7	0.5%	16	1.1%	2	0.1%	5	0.4%
Uppsala	2,457	51	2.1%	15	0.6%	24	1.0%	5	0.2%	17	0.7%
Gotland	477	10	2.1%	3	0.6%	3	0.6%	0	0.0%	4	0.8%
Jämtland	797	17	2.1%	3	0.4%	10	1.3%	1	0.1%	5	0.6%
Gävleborg	2,061	47	2.3%	20	1.0%	16	0.8%	2	0.1%	12	0.6%
Värmland	1,874	43	2.3%	28	1.5%	4	0.2%	3	0.2%	14	0.8%

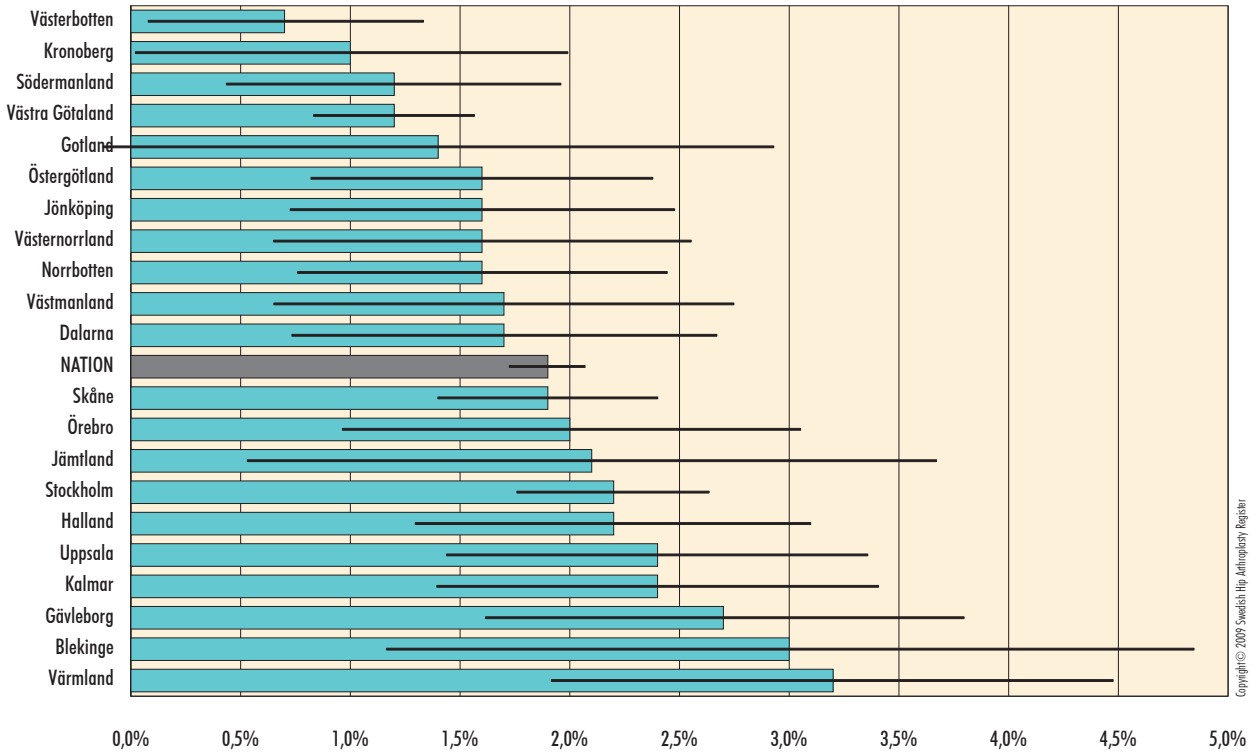
Reoperation within 2 years per county - only female

2005–2008



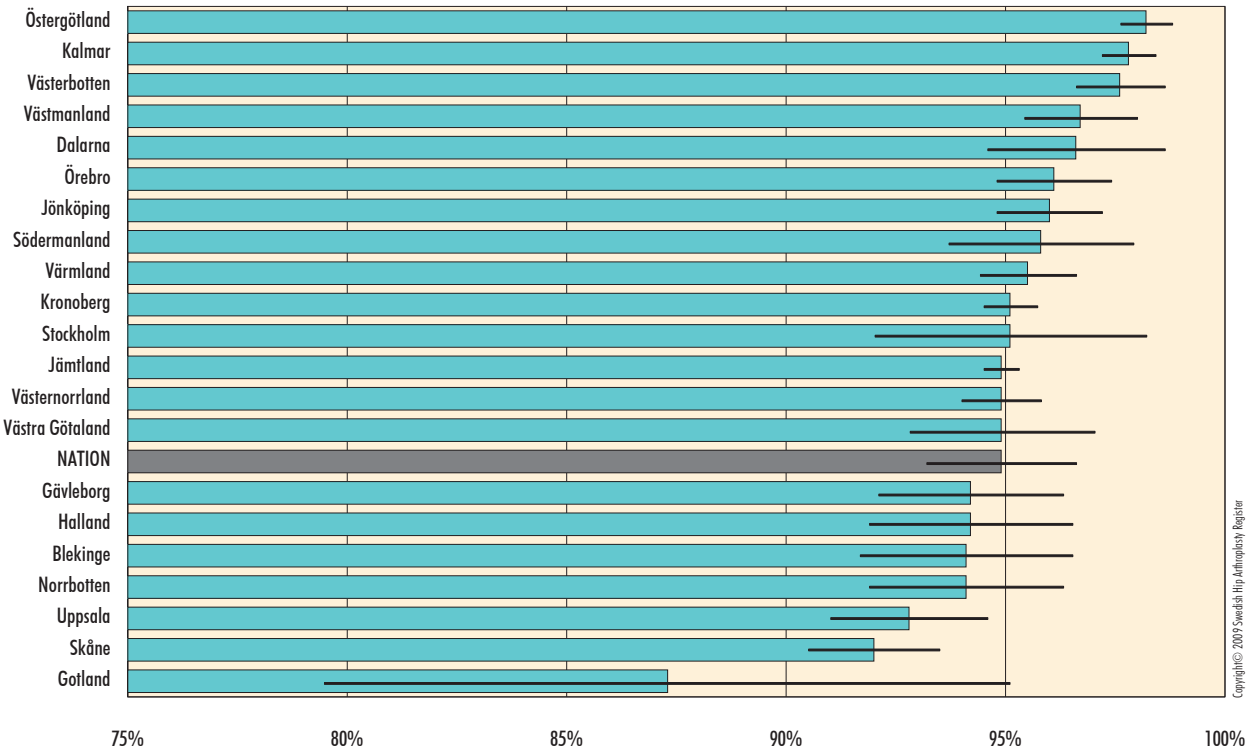
Reoperation within 2 years per county - only male

2005–2008



Implantsurvival after 10 years per county

1999–2008



	Number of THRs	OA [1]	≥ = 60 years [2]	Female [3]	10 years	K.I.
Gotland	942	83%	20%	56%	87.3%	±7.8%
Skåne	16,669	80%	19%	59%	92.0%	±1.5%
Uppsala	5,039	69%	21%	61%	92.8%	±1.8%
Blekinge	1,953	86%	19%	59%	94.1%	±2.2%
Norrbotten	4,299	82%	18%	59%	94.1%	±2.4%
Gävleborg	5,026	80%	17%	59%	94.2%	±2.3%
Halland	4,740	83%	17%	58%	94.2%	±2.1%
Jämtland	1,643	82%	19%	58%	94.9%	±1.7%
Västernorrland	4,047	87%	19%	61%	94.9%	±2.1%
Västra Götaland	18,883	79%	19%	59%	94.9%	±0.9%
Nation	129,587	81%	19%	60%	94.9%	±0.4%
Kronoberg	2,243	84%	18%	57%	95.1%	±3.1%
Stockholm	25,437	82%	21%	63%	95.1%	±0.6%
Värmland	4,202	79%	15%	61%	95.5%	±1.1%
Södermanland	4,068	80%	18%	58%	95.8%	±2.1%
Jönköping	4,839	87%	16%	58%	96.0%	±1.2%
Örebro	4,156	83%	17%	59%	96.1%	±1.3%
Dalarna	3,947	86%	18%	58%	96.6%	±2.0%
Västmanland	3,244	82%	18%	57%	96.7%	±1.3%
Västerbotten	3,905	84%	20%	60%	97.6%	±1.0%
Kalmar	4,518	81%	16%	58%	97.8%	±0.6%
Östergötland	5,787	74%	19%	60%	98.2%	±0.6%

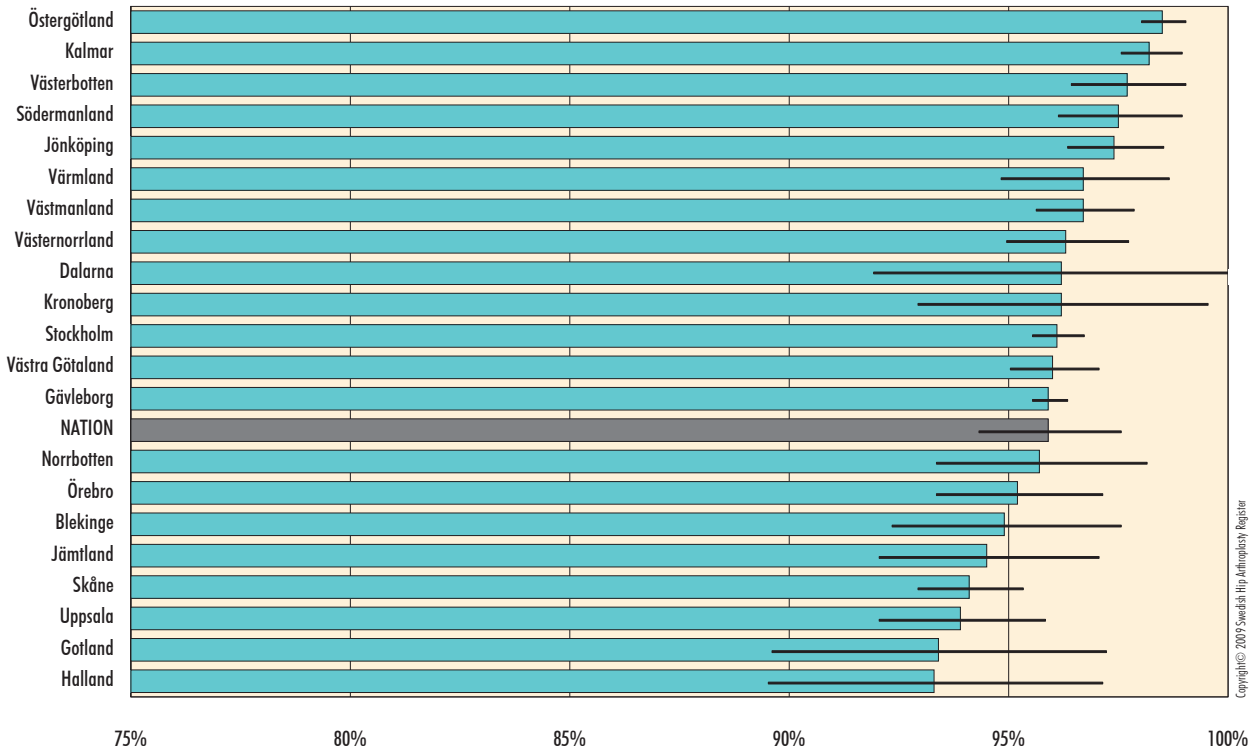
1) Refers to the share of primary THRs performed due to primary osteoarthritis.

2) Refers to the share of primary THRs in the age-group 60 years or older (age at primary operation).

3) Refers to the share of women.

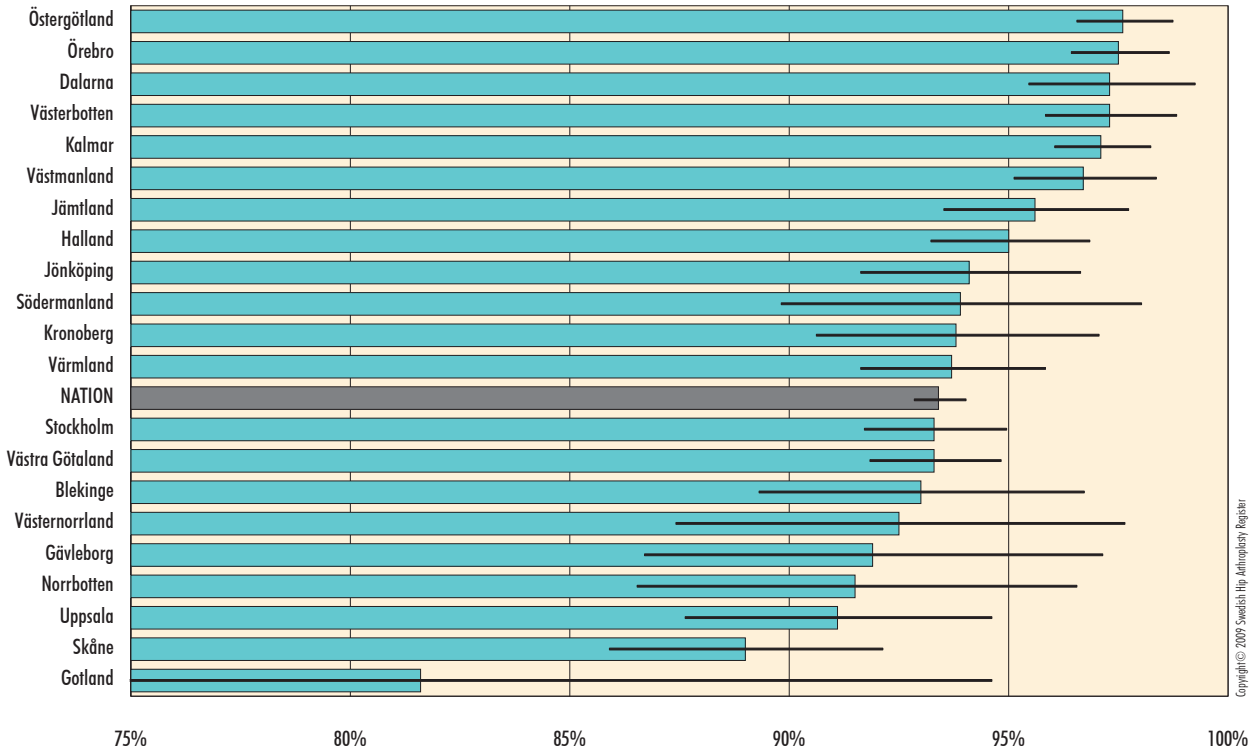
Implantsurvival after 10 years per county - only female

1999–2008



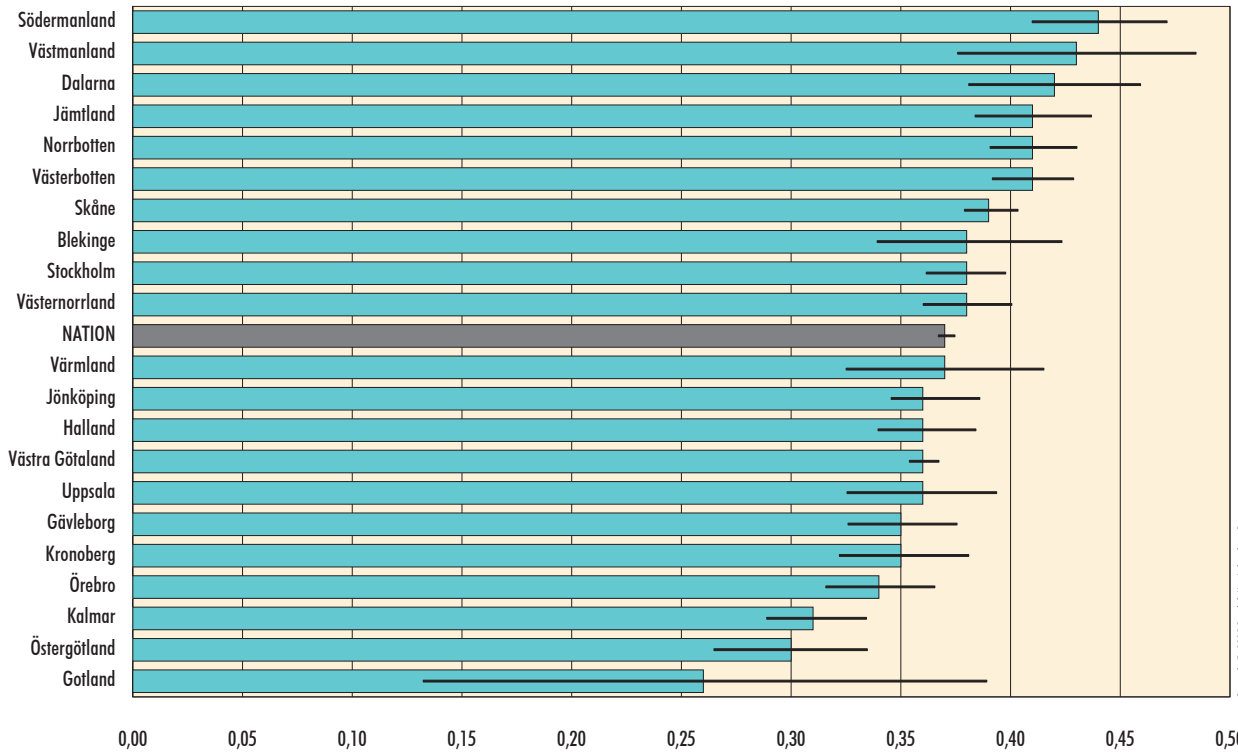
Implantsurvival after 10 years per county - only male

1999–2008



Gain in EQ-5-index after 1 year per county

2002–2008

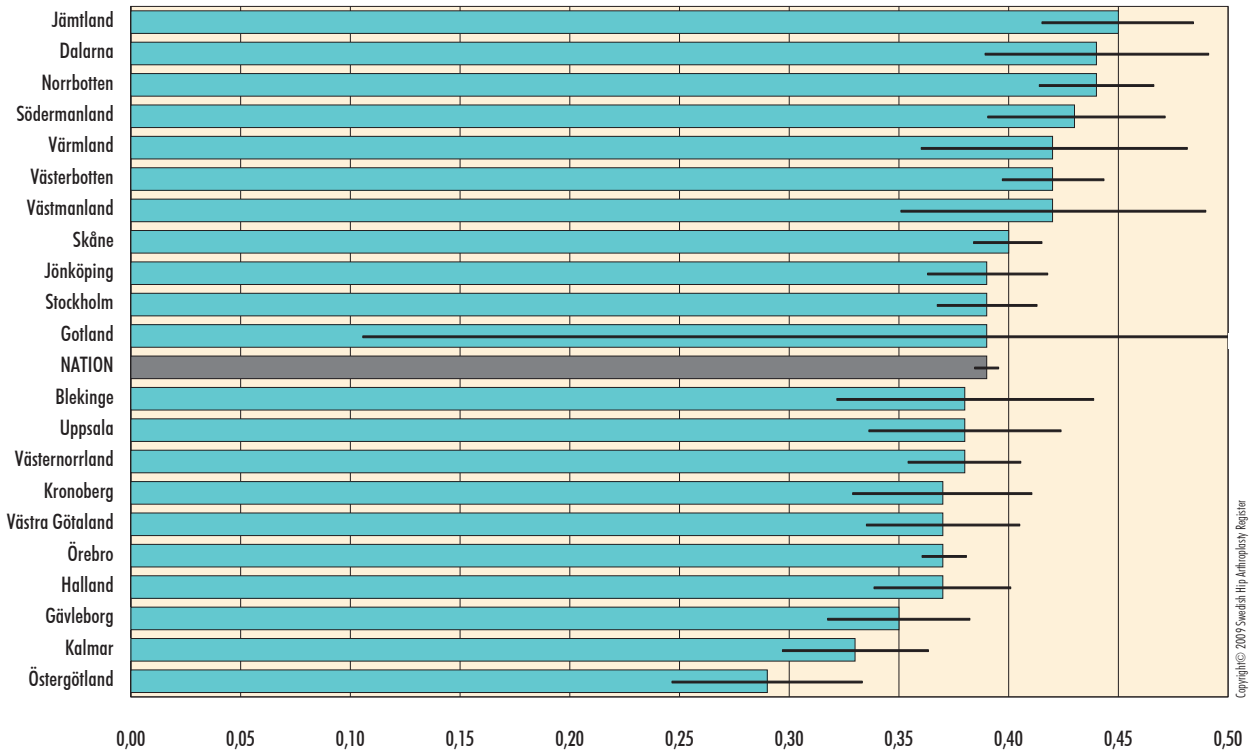


	Number [1)]	Share C-pat. preop.	EQ-5D-index preop.	EQ-5D-index 1 years	Gain in EQ-5D-index after 1 years	Comments
Gotland	26	23%	0.50	0.76	0.26	
Östergötland	358	53%	0.46	0.75	0.30	
Kalmar	836	39%	0.49	0.80	0.31	
Örebro	699	43%	0.46	0.80	0.34	
Kronoberg	457	46%	0.45	0.80	0.35	
Gävleborg	783	42%	0.40	0.75	0.35	
Uppsala	371	37%	0.44	0.80	0.36	
Västra Götaland	8,319	44%	0.41	0.77	0.36	
Halland	951	38%	0.43	0.79	0.36	
Jönköping	1,133	38%	0.42	0.78	0.36	
Värmland	257	43%	0.39	0.76	0.37	
Nation	25,024	43%	0.40	0.77	0.37	
Västernorrland	1,261	45%	0.40	0.77	0.38	
Stockholm	1,506	46%	0.38	0.76	0.38	
Blekinge	288	40%	0.39	0.77	0.38	
Skåne	3,282	42%	0.40	0.79	0.39	
Västerbotten	1,349	44%	0.38	0.79	0.41	
Norrbotten	1,356	45%	0.36	0.77	0.41	
Jämtland	779	33%	0.37	0.78	0.41	
Dalarna	317	48%	0.37	0.79	0.42	
Västmanland	212	35%	0.34	0.77	0.43	
Södermanland	484	49%	0.33	0.77	0.44	

1) Refers to the share of preoperatively examined patients with follow-up after 1 year.

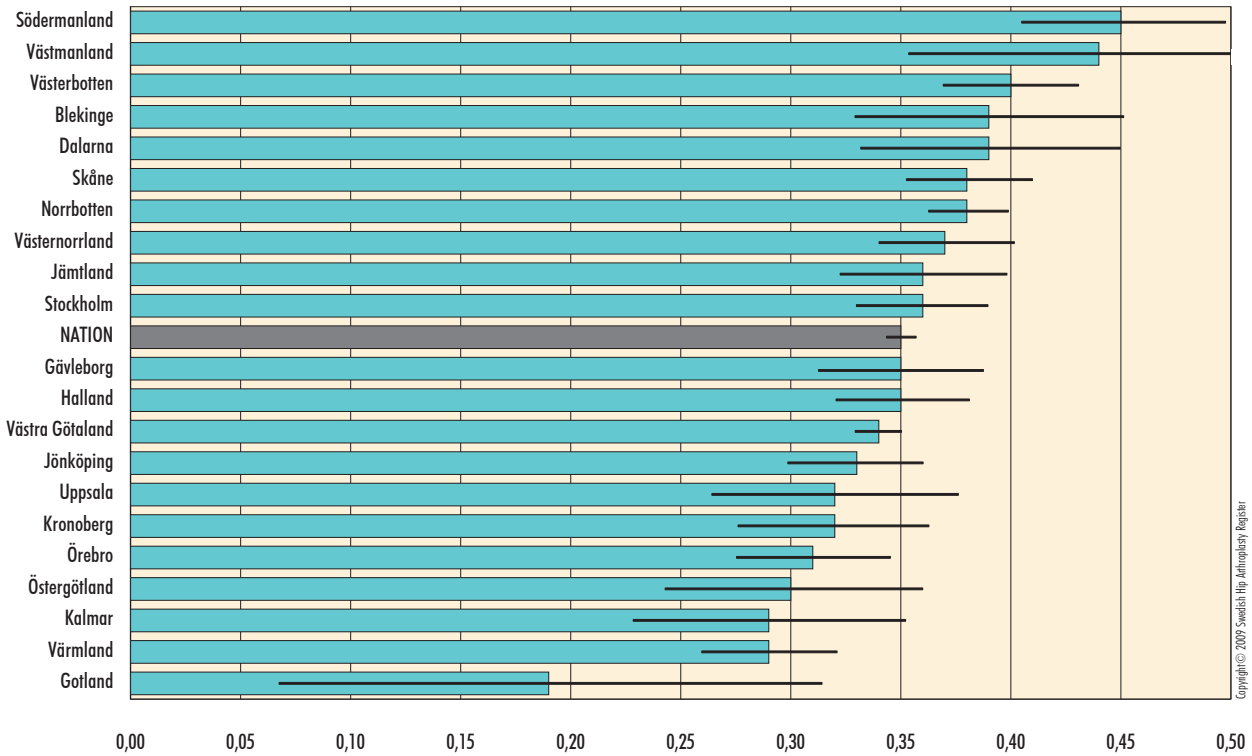
Gain in EQ-5-index after 1 year per county - only female

2002–2008



Gain in EQ-5-index after 1 year per county - only male

2002–2008



Summary

The Swedish Hip Arthroplasty Register's Annual Report seeks to give an all-round picture of hip replacement surgery in Sweden. We hope that the open reporting of a number of variables will lead to an increased pressure for change at the hospitals. Despite Sweden having the lowest reported revision frequency in the world there are clearly defined problem areas, which are possible to influence via systematic improvements.

The work carried out by the Swedish Hip Arthroplasty Register and other National Quality Registers are attracting more and more attention within all parts of the Swedish healthcare establishment – from politicians, employees to the various professions and the academic world. Focus on the register has increased so radically in the past years that this year we chose to provide information on the interests of the various players for register-based improvements and clinical research in the section: 'Vision of the future for the Swedish National Quality Registers'.

This year's report is seriously delayed owing to a number of interacting factors. Work on the Register and the Annual Report is becoming increasingly expensive both with regard to personal and financial resources. In addition, for the past four years the Register also includes hemi-arthroplasties that are reported separately in the report. The register results are being used increasingly in management and control of the orthopaedic medical care in which hip replacement surgery in the form of total and hemi-prosthesis surgery represents a major part of this care, both with regard to procedure frequency and cost.

In Sweden in 2008 14,451 primary total hip arthroplasties were performed, which is an increase compared with the previous year. The procedure frequency during 2008 is then 156 total hip arthroplasties per 100,000 inhabitants. During the year 2,065 reoperations were reported, which unfortunately is a certain increase compared with 2007. During the year 4,475 hemi-prostheses and 139 reoperations were registered. Therefore, in total, in 2008, 21,130 operations were reported to the Swedish Hip Arthroplasty Register.

New this year

The Swedish Hip Arthroplasty Registry moved in late autumn 2008 to new premises at Nordiska Högskolan för Folkhälsovetenskap (NHV - see picture below) (the Nordic School for Public Health) and together with the Swedish National Diabetes Register and support from Region Västra Götaland (VGR) – formed the Center of Registries in Region Västra Götaland. On August 24, 2009, the decision group for the National Quality Registers decided to designate the Center of Registers as Sweden's fifth quality register centre of expertise.

Development areas

The Nordic co-operation (The Nordic Arthroplasty Register Association - NARA) has further deepened during the year. Finland has now announced that it will be joining the organisation. The aim of this association is to promote Nordic implant research and possibly produce standardised Nordic quality indicators for implant prosthesis surgery. The organisation has attracted much attention at EU level and is seen as a role model for quality control and the spreading of knowledge within an ordinary medical care area.

In Sweden there has been debate on whether the considerable success of the Swedish Hip Arthroplasty Register with regard to quality work has also brought with it an obstacle to continued development of new techniques and prosthesis solutions. We now have an instrument which with great statistical power can widen our possibilities of analysis not least as an effect of the fact that user profiles are different in the four participating countries. A merged database (Denmark, Norway and Sweden) for hip replacement surgery from 1995 and on has been created, and NARA's first scientific report was published in August 2009 and a number of Nordic manuscripts are under preparation.

During the year the registry has continued its collaboration with the Epidemiological Centre (EpC, the Swedish National Board of Health and Welfare). Co-processing with the Patient Register at individual level has been used, like last year, to produce a detailed analysis of degree of coverage at hospital level. This type of co-processing analysis with the health data register at the Swedish National Board of Health and Welfare can in the future be of great important for continued quality development for Swedish hip replacement surgery. In the health data register and Statistics Sweden we can capture important variables that we do not register in our normal register routine. This type of database also opens up new research fields within the area.

In last year's report we published costs and cost utility effect at hospital level. Even then we established the lack of a national standard for cost calculation and this year we have refrained from a similar analysis. In our view, however, registers are excellent instruments for health-economic analysis – above all since the register now has a national procedure for measuring health-related quality of life. We await a national implementation of the CPP system (cost per patient). This individual-based cost calculation now includes approximately 60% of the hospitals producing hip replacement surgery in Sweden. SALAR runs the national CPP database and its intention is to achieve national coverage for the system within the near future.

This year's in-depth analyses

In this year's Report a number of specific analyses are presented:

Degree of coverage. Degree of coverage is an absolutely essential part of a register's data quality and credibility. Unless the coverage is high, all analyses become burdened with great statistical uncertainty. This year's analyses showed a good degree of coverage of approximately 90% with regard to registration of primary total hip arthroplasties and hemi-arthroplasties. However, there are individual hospitals that have poorer registration frequency and the registry management urges the hositals to review their routine in order to achieve better registration.

Total prostheses:

Significance of the surgical incision. The analysis includes all patients who have undergone surgery since 1992. Use of the posterior approach is declining and the anterolateral approach, patient on side is increasing. Posterior incision is favourable for avoiding revision due to loosening. It also gives greater patient satisfaction than the anterolateral incision, patient on side, after one year. Anterolateral incision, patient on side, has advantage for avoiding revision owing to dislocation. It also gives greater patient satisfaction than the corresponding access with the patient in supine position. Anterolateral incision in supine position also involves increased risk of loosening and infection. This access does not appear to have any other advantages based upon available data in the register. We also find that this incision provides poorer patient-reported outcome.

Cups with hydroxylapatite. In general the risk of revision increased when using HA coating of the three most common and studied implants. Separate analysis showed significant increase in risk for Romanus and Harris-Galante, two types of prosthesis that are no longer used. Regarding Trilogy, we find no advantages with ceramic coating. The result suggests instead, an increased use of implants without HA coating in the primary prosthesis case.

Reversed hybrid. Reversed hybrid prosthesis means a clear and certain increased risk of revision owing to fracture of the femur. The concept decreases the risk of revision owing to loosening. So far, this effect is slight and should be seen against a short observation period in the registry.

Resurfacing prostheses. In general the use of resurfacing prostheses are associated with an increased risk of early revision. This problem could mainly be related to certain types of prosthesis or related factors such as the shape of the instrumentation and the training of individual surgeons, factors that cannot be evaluated in the register.

Optimal antibiotic prophylaxis. We find that antibiotic prophylaxis for a day is sufficient. Despite antibiotics of the cephalosporin type involving lower risk of infection, these should mainly be used in selected cases in order to reduce the risk of resistance development. The daily dose of beta lactam resistant penicillin (cloxacillin) should exceed four grams in order to reduce the risk of future revision due to loosening.

Hemi-arthroplasty

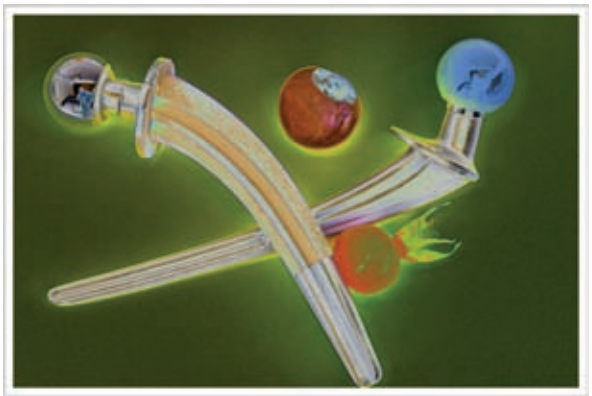
Posterior versus anterior incision. The clinical recommendation, to use anterior incision for fracture patients, is further strengthened as we continued after this year's analysis to show a significantly increased risk of reoperation due to dislocation when using the posterior incision.

Bipolar versus unipolar heads. In last year's analysis we found surprisingly, a significantly increased risk of revision with hemi-prostheses with bipolar head compared with unipolar. In the same analysis this year there is no longer any difference for the Exeter stem with bipolar UHR head compared with unipolar V40 head. The combination Lubinus stem with bipolar head (VarioCup) shows, however, a continued higher risk of revision compared with when the same stem is used with unipolar head (Megacaput).

Clinical improvement projects

Nationally

Sweden has the world's lowest reported revision frequency. Even in the recently published material from the first NARA analysis, significantly Sweden has the best result compared with our closest neighbouring countries. One of the explanations is that we in Sweden use few and well-documented types of prosthesis and similar technique. In addition, we have been careful with the introduction of new implant technology and new surgical techniques. This continued national quality improvement



may be explained at least in part by the fact that the registry has been in operation for many years and that Swedish orthopaedic surgeons note the recurrent feedback provided by the registry via the website, annual reports and orthopaedic meetings. As, during the past 10 years we have approached a 95% 10-year prosthesis survival we must expect a slowdown in result improvement regarding revision frequencies at national level. The variation between different hospitals and for certain patient groups is, however, more apparent and therefore there is quite clearly residual realistic potential for improvement.

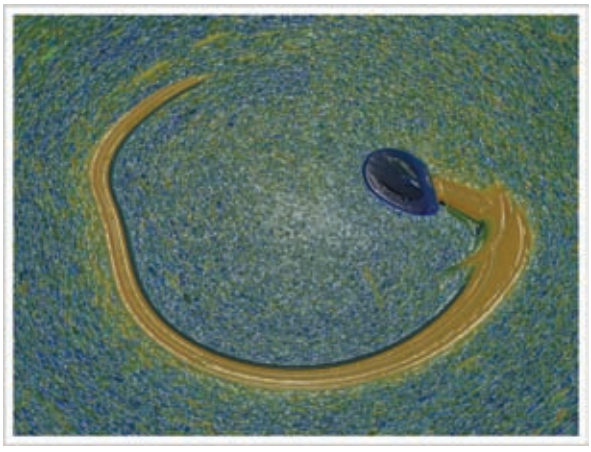
Unfortunately, this year's analysis shows a break in trend compared with the past few years as the number of reoperations has increased from 1,913 (2006) to 2,065. The difference compared to previous years is small and could depend on random variability, but is still worrying. It is above all noteworthy that the causes of reoperation change. Reoperation due to infection and dislocation are increasing at the same time as reoperation due to loosening continues to decline. Increase in reoperation due to infection can be partly explained by a somewhat changed treatment strategy in the event of suspicion of deep infection. Fewer hospitals operate on the patient early with extensive soft-tissue debridement in an attempt to avoid prosthesis removal.

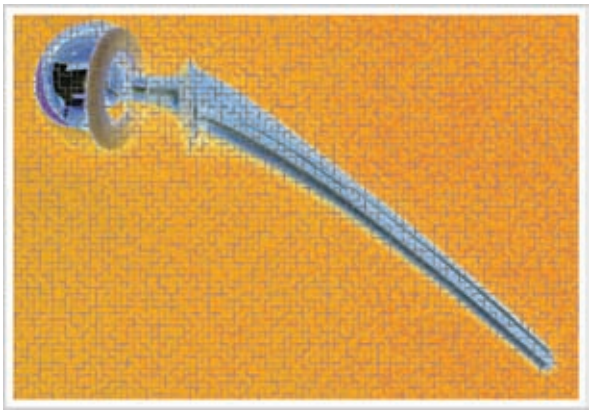
With regard to the again increasing frequency of reoperation due to dislocation, there is a major possibility of improvement if all hospitals adopted the previously described Sundsvall model (see Annual Report 2006).

Locally

In this year's Report the Gävle Hospital has been specially inspected owing to divergent results. This unit's local analysis and improvement programme can be read in detail in the report. Already in this year's Report on Reoperation within 2 years, a clear improvement can be discerned. The registry management feel that the hospitals throughout the country have formed a positive attitude to the open reporting.

In previous years the hospitals, in connection with the Annual Report, were given a confidential report with the personal ID numbers of their patients who were operated on at other units. This report has been valuable for the units' analysis but cannot be distributed in the future due to the new Patient Data Act.





Inclusion of patient-reported outcome makes it possible for the hospitals to analyse their outcome starting from the needs of the patients. There is now a tool that can be used for improvement in respect of care programmes for patients with hip disease, i.e. measures that can improve the patients' degree of satisfaction and health gains and that do not need to be directly connected to the surgical intervention.

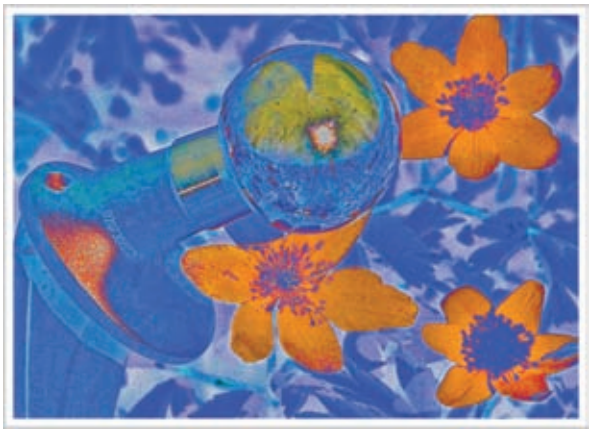
Achievement of goals

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

The standardised follow-up of all patients with their own estimation of the result of hip replacement surgery has extended to the whole country. Currently there remain two units that still have not joined (Linköping and Sophiahemmet). Since health gain measured in EQ-5D since 2006 is considered as a national quality indicator, all hospitals and county councils should participate in this routine. The six-year follow-ups were introduced in Region Västra Götaland during 2008. Gratifyingly we discovered a high degree of coverage regarding PROM data of almost 90% after six years and that the patients reported a continued high degree of satisfaction and well-maintained health-related quality of life.

The hemi-prosthesis registration achieved national coverage from January 1, 2005 and the registration has a good individual-based degree of coverage of almost 96%. Via the Patient Register analysis of the frequency of patients undergoing primary prosthesis surgery following femoral neck fracture, we know that the new treatment algorithm for these fractures has not been fully implemented throughout the country.

National and international discussion is continuing with regard to whether patients with dislocated femoral fracture should receive hemi- or total prosthesis. As these treatment alternatives are now combined into one and the same register we will be able to carry out analyses of this issue within a few years. This national analysis will also include patient-reported outcome and will probably have great influence both nationally and internationally.



Problem areas

The problem of declining procedure frequency at university hospitals remains and is further accentuated. This trend must be broken, otherwise there is a great risk that the quality of hip replacement surgery will decline due to worsened opportunities for training and clinical research.

We find in this year's analysis, clear demographic differences depending on type of hospital, where the university hospitals have a dominance of somewhat younger and sicker patients with secondary osteoarthritis, the county hospitals show a similar profile, yet closer to the national average whilst the rural hospitals and above all, the private hospitals have a relative dominance of healthier and somewhat younger men with primary osteoarthritis. Since the rural hospitals and above all private hospitals operate on 'healthier' patients with less co-morbidity and on technically simpler cases, paradoxically and under the aegis of the care guarantee scheme, it can result in worsening accessibility for the 'more seriously ill' and more difficult cases. Hip replacement surgery has for many years been one of the medical interventions burdened by long waiting times.

During the past few years there has been a strong focus on accessibility issues within Swedish medical care. Unfortunately, this focus has been entirely directed at accessibility as a time variable: time for surgical treatment. However, the registry management maintains that accessibility for the hip patient should include rapid and adequate care throughout the whole course of the disease, and that the possible surgery must be followed-up with an outcome analysis before shortened waiting times can be cited as improved quality.

Current trends

The greatest change with regard to implants is an ongoing trend towards the use of all-uncemented prostheses. Also increasing is the so-called reversed hybrid with an uncemented stem and a cemented cup.

The use of mini-invasive surgery and resurfacing prostheses, which is increasing strongly in the rest of the world, is at a continuing low but slowly increasing level in Sweden. Both these techniques have, after short follow-up in the register, significantly increased revision figures compared with the conventional techniques.

Conclusion

The registry management wish to thank all hospitals for good co-operation during the past year. This important work is becoming increasingly interactive and is thereby stimulated by the feedback of results in a more active and constructive manner. Together we can, both within the profession and amongst decision-makers, further improve the quality of Swedish hip replacement surgery and have more and more satisfied patients.

Photo: Göran Garellick

Current research projects

The main task of a national quality register is data capture, analysis and feedback, which will lead to improvement. However, the very comprehensive databases have a large research potential. Nine dissertations and one hundred scientific articles have been published, which wholly or partly build upon analyses from the Swedish Hip Arthroplasty Register. The clinical research, and above all, register based research, has for several years had low status in Sweden. However, a clear and gratifying break in trend has taken place in the past few years.

Within research and evidence-based medicine the randomised and prospective study (RCT) is regarded as the research gold standard. However, we do not have the possibility to carry out this type of studies within all areas – above all not within the surgical disciplines. A nationwide prospective observation study (register study) has qualities that cannot be achieved with a RCT. Extensive material, above all, provides the opportunity with great statistical power, to analyse unusual complications. Another major advantage is that it is possible to achieve generalised results – a result achieved within the whole profession. In a RCT a so-called performance bias may easily occur, i.e. these types of studies often reflect an intervention at a special unit and/or by the innovator of a method. Prospective observation studies must initially be seen as hypothesis generating studies, which can give ideas to relevant randomised studies.

As the majority of national quality registers are personal ID number based, their databases after ethical approval can be co-processed, partly between the different registers and partly with the health data register (the Patient Register, Cancer Register. The Causes of Death Register etc.) that can be found at the Epidemiological Centre at the Swedish National Board of Health and Welfare and also the various databases of Statistics Sweden. The national CPP (cost per patient) has also, when co-processing, the possibility to increase the register's possibilities to carry out adequate health-economic studies. These types of amalgamated databases (which after co-processing are de-identified) have the potential to become completely world-unique instruments for studying the importance of a number of background variables for medical results such as socioeconomic variables, medical comorbidity etc. This, in turn, will result in fewer variables being included in the quality register's data capture and that it provides material for degree of coverage analyses, case mix analyses, population data and so on.

The registry management would strongly point out that the register's databases are not just a concern for the registry employees in Göteborg. All researchers, both within and outside the country can, if adequate issues exist, use the register for research.

Research projects within the registry

The registry management and the steering group include a number of postgraduate researchers who are supervisors and co-supervisors for a number of PhD students. Within this group, research is being carried out regarding prosthesis fixation, health economics, hip fractures and prosthesis surgery, periprosthetic fractures, revision surgery and patient-reported outcome following prosthesis surgery.

This group consists of:

- Johan Kärrholm, Göteborg
- Göran Garellick, Göteborg
- Cecilia Rogmark, Malmö
- Leif Dahlberg, Malmö
- André Stark, Stockholm
- Rudiger Weiss, Stockholm
- Per Wretenberg, Stockholm
- Nils Hailer, Uppsala
- Hans Lindahl, Trollhättan
- Peter Herberts, Göteborg

PhD students with all or parts of their dissertation material from the registry:

Ola Rolfson, Mölndal
Health economic aspects of hip replacement surgery.

Buster Sandgren, Stockholm
Computer tomography of patients who have received uncemented acetabular component surgically inserted in connection with hip replacement surgery.

Ferid Krupic, Mölndal
Significance of socioeconomic variables for outcome following hip replacement surgery.

Olof Leonardsson, Malmö
Hip fracture treatment with hip prosthesis.

Oskar Ström, Stockholm
Health economic aspects of hip replacement surgery.

Viktor Lindgren, Stockholm
Complications and outcome following hip replacement surgery with special concentration on infections and the significance of the surgical incision.

Stergios Lazarinis, Uppsala
Evaluation of hydroxylapatite coated surface in uncemented hip prosthesis.

Truike Thien, Göteborg defended on June 11, 2009 her thesis with the title: *Influence of postoperative treatment, surface treatment and stem design on the outcome of primary total hip replacement surgery.* This dissertation included part work based on the Swedish Hip Arthroplasty Register's databases.

The registry is also undertaking research co-operation within NARA and the group's first scientific article has now been published and a further five manuscripts are in progress.

The Swedish Hip Arthroplasty Register databases are still under-exploited in a research context. The registry management invites all interested researchers with adequate problem areas to seek co-operation with the registry.

Publications

Scientific articles

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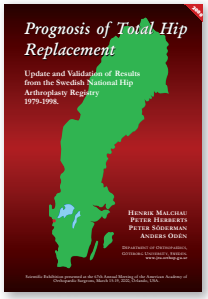

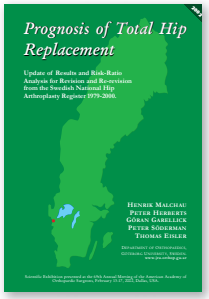

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20 The Future Role of Cemented Total Hip Arthroplasty, pages 367-369
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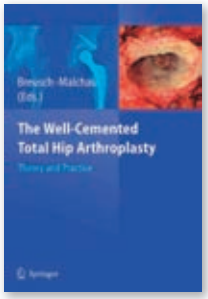

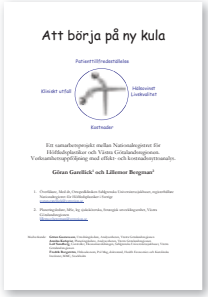

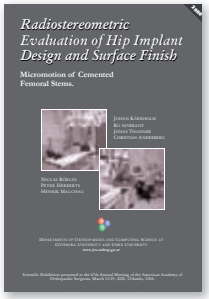

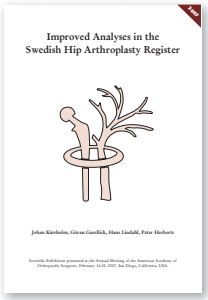

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Swedish Hip Arthroplasty register

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