Swedish Hip Arthroplasty Register

Annual Report 2009
(shortened version)

TOTAL ARTHROPLASTY

315 055
PRIMARIES
1979-2009

38 720
REOPERATIONS
1979-2009
(closed reduction excl.)

31 312
REVISIONS
1979-2009

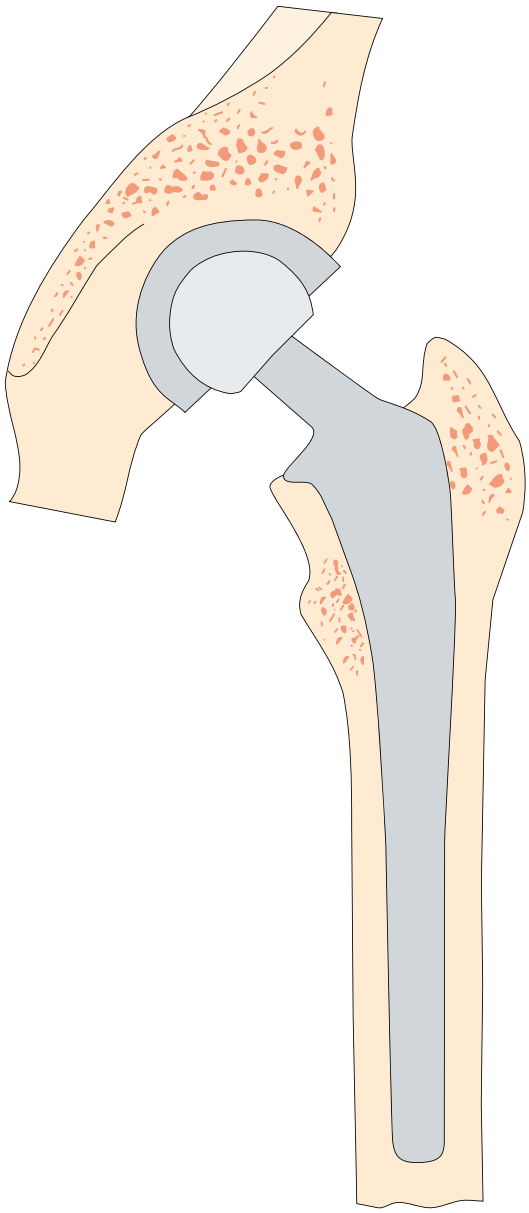
2 392
ENV./TECH PROFILES
1979-2009

100 693
PATIENT OUTCOME
2002-2009

HEMI ARTHROPLASTY

21 347
PRIMARIES
2005-2009

1 105
REOPERATIONS
2005-2009



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Swedish Hip Arthroplasty Register

Annual Report 2009

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Introduction

During the past year interest in the National Quality Registers has continued to grow, among decision-makers, the professions and clinical researchers alike. The Open Comparisons report by SALAR, which is based largely on result and process measures from various quality registers, is widely considered as the catalyst for an ongoing paradigm shift regarding management, control and implementation of 'best practice' in the Swedish health services. County councils and regions have long run medical care with cost analyses and production calculations as the starting point – the shift consists of a greater focus on medical results. The Quality Registers have published medical result measures for many years, but it was only since they were collected in a joint national report that medical quality has achieved a clear breakthrough in the strategic management of health and medical care.

The National Quality Registers have long been partially unexploited gold mines for Swedish clinical research, and in general the interest from our seats of learning has been low. In register research, too, there is also something of a shift, with increased interest from the medical research community.

The Swedish Hip Arthroplasty Register is in its thirty-second year of operation. Analyses of the significance of various prosthesis types and of techniques for re-operation frequencies, short-term and long-term, are still a central job of the Registry. The Registry's on-going feedback to the profession has brought about national adaptation to optimal techniques and the use of few and well-documented types of prosthesis, which has resulted in continually improved prosthesis survival.

However the Registry's main job is to analyse the whole process surrounding hip implant surgery – that is, to identify predictors of both good and poor outcomes in a multi-dimensional and individual-based manner. The 10-year survival of our commonest and best documented prostheses is today over 95% and potential for improvement exists predominantly within certain patient groups. There is probably a greater opportunity to improve the outcome from the patient's perspective by optimising work on indications, care processes, and rehabilitation; and by implementing non-surgical early care of patients with hip osteoarthritis – operating on the right patient at the right time and with the right technique.

The Swedish Hip Arthroplasty Register is a fusion of two registers: one for total hip arthroplasty surgery with osteoarthritis/arthritis as main indication, and one for hemi-arthroplasty with hip fractures as main indication. The patient groups differ widely: one a relatively healthy population with an average age of around 70 years the other a group of patients with an average age of just over 80 with pronounced medical co-morbidity and short expected survival.

Open reporting

The Swedish Hip Arthroplasty Register reports openly on a large number of outcome variables at unit and county-council levels. Three of these variables: patient-reported health gain (EQ-5D-index gain after 1 year), short-term complications at 2 years and 10-year implant survival, are included as national quality indicators in Open Comparisons.

Open reporting of the units' results is important as a motor of activity analysis and development. However, interpretation of the results is difficult and can lead to un-nuanced and unscientific debate. Since quality-register reporting is being increasingly used for control and planning within care, there is a desire to create easily-accessible methods of summing results that are hard to interpret by indexing and ranking hospitals. This is in turn to be used in a 'care-choice perspective' for the patient. This type of reporting has great statistical-methodological problems. The Hip Arthroplasty Register entirely avoids ranking outcomes, but encourages all units to analyse their own results as a step in the work of continual improvement.

This year's in-depth analyses

The Registry's on-going registration and regular reporting of standard results is significant for maintaining high quality in hip implant surgery. We have for many years run and reported a series of in-depth analyses of various issues. These analyses have improvement work as their goal, but they are also important for new development and the publication of scientific reports. Certain registries both in Sweden and among our Nordic neighbours write only descriptive annual reports and elect instead to publish all in-depth analyses only as works in scientific journals. We believe in seeking early feedback to the profession in an attempt to implement 'best practice' rapidly. Going via scientific publication frequently takes several years and does not reach all colleagues. A well-balanced compromise between these two report systems is probably the optimal way of spreading register results.

Some examples of areas that have been specially scrutinised: degree of coverage at unit level, procedure frequencies for both total- and hemi-arthroplasties, trends in implant selection and fixation methods, results with cross-bonded high-molecular plastic, results following operation with resurfacing prostheses, risk analysis for re-operation with hemi-arthroplasties and finally response frequencies of and results regarding patient-reported outcome.

Degree of coverage/completeness

All units (79 hospitals), public and private, that perform total hip implant surgery are included in the Register. All 56 hospitals that perform hemi-arthroplasties also report to the Registry. The Hip Arthroplasty Register thus has 100% coverage regarding hospitals (coverage). The degree of coverage for primary arthroplasties at individual level (completeness) has also this year been checked via a data match with the Patient Register at the National Board of Health and Welfare. This is reported in detail in later chapters. The degree of coverage at national level was 97.4% for total arthroplasties and 96.1% for hemi-arthroplasties.

Patient-reported outcome was reported during 2009 from all hospitals except one private hospital in Stockholm. The response frequency for 1-year check-ups on patients undergoing surgery in 2008 was just over 90%.

Reporting

Most units report via the web application. Copies of medical records from re-operations are sent during the year with varying delay. Centralised scrutiny of medical record copies and systemised data collection are necessary for register analysis.

Feedback

All publications, annual reports and scientific reports are shown on our website.

The Sweden Hip Arthroplasty Register in collaboration with the Swedish Knee Arthroplasty Registry invites all units to an annual users' meeting in Stockholm (Arlanda).

The Registry has for many years sent to all clinics a list of patients who have undergone re-operation. Following the introduction of the new Patient Data Protection Act, it is no longer permitted to feed back via the Register to a primary unit regarding whether patients underwent re-operation outside the county council/region of that primary unit, i.e. to feed back across the principals' boundaries without the patient's consent. This part of the law runs directly counter to the Registry's chief task and has been met with irritation from many units. The legislators are currently being called upon to review and improve this part of the Act.

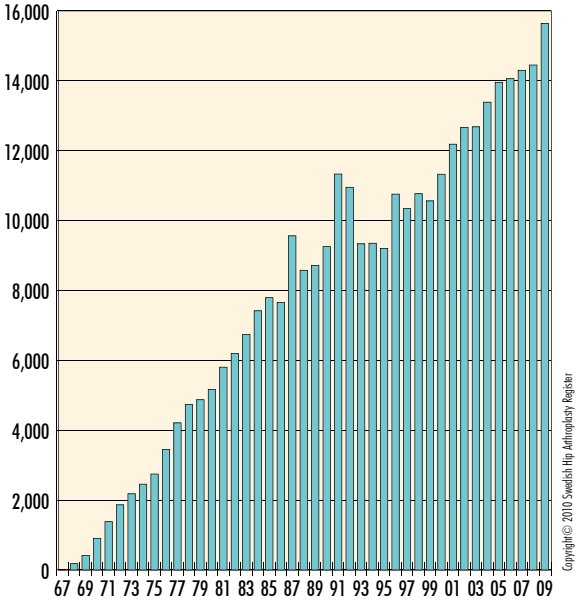
Local analysis and development of activities

Throughout its years of operation the Registry's intention has been that feedback and open reporting should stimulate participating units to carry out local analyses of their activities and that this should lead to measures for improvement. In the past few years we have in each Annual Report selected good examples of such work. This year we publish the written report of one unit on its comprehensive analysis. We consider that this example should stimulate all units to act likewise. Considering that costs for faulty results represent about 30% of total health and medical care costs, a time- consuming analysis of this type is nevertheless cost-effective in the long run.

This year's production

In 2009 the procedure frequency for hip implant surgery increased dramatically by 8% to an 'all-time high' (167/per 100,000 inhabitants) – see bar diagram. The development regarding knee arthroplasties was even more accentuated with a 13% increase. A difficult question arises: does the increase depend on a dammed-up need or are we seeing a shift in indication in the wake of the care guarantee?

Primary total hip replacement in Sweden



Numbers of primary total hip arthroplasties performed in Sweden between 1967 (6 operations) and 2009 (15,646 operations), inclusive.

In addition, for the first time, more total hip arthroplasties are being carried out in private organisations compared with the production at university/regional hospitals. In most cases these producers lack R&D and/or training obligations. This development may in the long term be serious regarding the maintenance of competence and development, that is, training and research.

Our thanks to all our co-workers

The Swedish Hip Arthroplasty Register is based on decentralised data capture, for which reason the units' contact secretaries' and physicians' contributions are entirely necessary and invaluable for the Register's function. Very many thanks for all contributions during the past year!

Gothenburg in October 2010

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Degree of coverage

A high degree of coverage is one of the most important factors for the success, credibility and its ability to conduct qualitative improvement work and clinical research. Degree of coverage should be given at individual level (completeness). Degree of coverage regarding participating departments (coverage) is an important variable but, if any department underreports at individual level, analyses and feedback become misleading. All hip-arthroplasty-producing units in Sweden, both public and private, have for many years participated in reporting to the Registry. Current analyses have as their objective to elucidate coverage at individual level (completeness).

Method

Data matching of the Registry's databases with the Patient Register (PAR, National Board of Health and Welfare; NFB09 and NFB29, 39, 49. 62 and 99 for total hip arthroplasty; NFB09 and NFB19 for hemiplasty) at individual level (personal identity number) gives three different outcomes:

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

2. Individuals registered only in the Hip Arthroplasty Register.

3. Individuals registered only in the PAR.

The degree of coverage for the Swedish Hip Arthroplasty Register is given in the following table as the sum of outcomes 1 and 2 and that for the PAR as the sum of 1 + 3.

We do not know if these results reflect the true coverage since patients may have undergone arthroplasty without the care unit in question registering the measure in either of the two registers. The number of such cases should have been low in Sweden in 2009.

Weak points in the analysis

1. **Laterality.** In most cases the Patient Register lacks laterality, that is right/left are not included as unique variables; which they are in the Hip Arthroplasty Register. Patients undergoing bilateral surgery in one hospital visit and patients with both hips operated on during 2009 may 'disappear' using the selection criteria chosen for the data match.

2. **Registration lagging behind.** Certain units are 'chronic laggers' – not infrequently even from year to year – which is a great disadvantage in this type of necessary quality checking. Experience shows that a further 250 to 300 operations are registered during the following year – sometime units find operations that have not been registered in connection with ongoing checks, probably against local patient- administration systems.

3. **Administrative amalgamations of hospitals and the opposite, i.e. that operations are performed in 'satellite hospitals'.** As described earlier both these expressions of structural change within orthopaedics represent a future 'threat' to fair open reporting. Differences in degree of coverage may then have non-medical logistic explanations such as that a hospital reports to PAR via its 'main hospital' and to the Registry via the unit where the operation was carried out.

   The Swedish Hip Arthroplasty Register has always and will always state the affiliation to the hospital body/operational environment where the intervention in question was performed. This is to be able to analyse complications. The Registry's goal is not to illustrate the principal's productivity figures from an organisational unit but to relate outcome to each hospital body (see section Environmental and technical profile).

Results

Total arthroplasties. Units with values below one standard deviation from the national average are marked in red in the table. Six units are marked thus regarding their degree of coverage in the Register. In the analysis, which covered operation year 2006, 17 clinics fell below this guide value.

As with previous analyses, the private units were poor at reporting to PAR; 5 of 10 did not report at all to the National Board of Health and Welfare. This is noteworthy since registration to the PAR is statutory. This year, too, some public units have fallen down on their PAR reporting.

In the re-matching of the 2008 degree of coverage this rose by 0.5% to 98.0% coverage, i.e. that the lag in registration to the following calendar year was 0.5%.

Hemi-arthroplasties. Hemi-arthroplasties have only been registered for five years yet the degree of national coverage is already up to 96.3%. Many National Quality Registers with many-year histories only reach coverages of 60-80%. Like last year, eight hospitals failed to reach the guide value for reporting to the Hip Arthroplasty Registry. No private hospitals carry out this acute surgery and it is therefore remarkable that seven hospitals did not reach the goals for registration to the patient administrative system since this reporting underlies most county-council economic compensation levels.

Re-operations and revisions. While a good degree of coverage for this type of intervention register naturally includes a degree of coverage regarding reporting of possible re-operations/revisions, analysis of secondary measures proves to be much harder owing to the low quality of coding for re-operations. Once again the Registry management wishes to urge all hospital administrators at department meetings to encourage all their operating colleagues to devote time and thought to code categorising. This issue, which is important for statistics and economic compensation, should be included as a defined part of specialist training.

Degree of completion for new variables. The pressure for new in-depth analyses has prompted us, following discussion at a user's meeting three years ago, to expand the variables by adding length and weight (BMI) and ASA degree on an individual basis. The Registry management is aware of the difficulties of adjusting entry routines at each unit, which is why we now note with great satisfaction the good figures for degree of coverage for most units. The national mean for the new variables is bet-

ween 90 and 95%. Some ten units have fallen off somewhat and we hope for continued improvement!

Discussion

We are to carry out an annual degree-of-coverage analysis and publish the result openly at unit level in the Annual Report. This is important for several reasons:

- The new Patient Data Protection act which came into force for the quality registers on 1 July 2009, increases the demand on units to inform patients on admission that they are being registered in a National Quality Register. This can lead to more patients electing not to be included. For this reason the individual units are faced with a pedagogical challenge, namely to have a routine to explain adequately to the individual patient the utility of running a national register, and that its task is to ensure each patient optimal treatment. The need for such information is probably increasing in a time of increased public debate on individual integrity.

- The continuing structural transformation of Swedish orthopaedics is placing increased logistic demands for the patient's operation to be registered at the correct unit.

- Open reporting and regular discussion of the Registers' data quality is included as a successful part of general strategy for increased coverage for all National Quality Registers.

- A very important component in improving a clinic's degree of improvement – regarding both primary and secondary surgical interventions – is to nominate an interested contact physician; and above all the relevant contact secretary should have a job description that includes allocation of hours to manage the unit's contacts with and entries to one or more registers; and to have this person visit the Hip Arthroplasty Registry for training. The latter is even more important if the unit should change contact secretaries for any reason.

The Swedish Hip Arthroplasty Registry has always and will always state hospital affiliation to the hospital body/surgical environment where the intervention in question has been carried out. This is to be able to analyse complications. The Registry's goal is not to illustrate the principals' productivity figures from one organizational unit but to relate outcome to each hospital body (see section Environmental and technical profile.)

NOTE! Always try to use the correct ICD-10 and measure codes.

Degree of coverage for total arthroplasties

registrations during 2009

Hospital	No. [1]	SHAR [2]	PAR [3]
University/Regional Hospitals			
Karolinska/Huddinge	277	98.6%	**74.7%**
Karolinska/Solna	191	99.4%	91.6%
Linköping	69	**90.8%**	100.0%
Lund	80	97.5%	92.6%
Malmö	87	100.0%	92.0%
SU/Sahlgrenska + Mölndal + Östra [4]	382	95.7%	95.5%
Umeå	106	97.3%	96.4%
Uppsala	311	98.1%	96.5%
Örebro	177	98.3%	95.6%
Central Hospitals			
Borås + Skene [5]	289	98.6%	98.3%
Danderyd	376	99.7%	99.2%
Eksjö	211	95.1%	97.8%
Eskilstuna	108	99.1%	95.4%
Falun	328	98.8%	100.0%
Gävle	168	98.8%	95.3%
Halmstad	215	93.5%	98.7%
Helsingborg	76	97.4%	96.2%
Hässleholm-Kristianstad	895	99.9%	97.8%
Jönköping	206	98.1%	96.2%
Kalmar	194	98.5%	99.0%
Karlskrona + Karlshamn [6]	235	96.7%	95.5%
Karlstad	239	96.0%	97.2%
Norrköping	234	99.2%	98.7%
S:t Göran	416	98.1%	99.1%
Skövde + Lidköping + Falköping [7]	486	99.1%	97.9%
Sunderby	41	97.6%	92.9%
Sundsvall	211	97.7%	98.1%
Södersjukhuset	383	98.4%	98.4%
Uddevalla	362	98.6%	95.1%
Varberg	266	99.3%	98.1%
Västerås	431	96.9%	96.4%
Växjö	100	**86.9%**	95.6%
Ystad	3	**75.0%**	100.0%
Östersund	237	98.0%	98.0%
Rural Hospitals			
Alingsås	224	98.6%	97.3%
Arvika	165	93.2%	95.5%
Bollnäs	301	98.1%	97.8%
Enköping	231	100.0%	99.1%
Frölunda Specialistsjukhus	81	97.6%	97.6%
Gällivare	86	100.0%	97.7%
Hudiksvall	132	98.5%	94.0%
Karlskoga	141	99.3%	99.3%
Katrineholm	229	99.2%	**87.5%**
Kungälv	180	97.3%	97.8%
Lindesberg	208	100.0%	99.5%
Ljungby	194	98.9%	97.9%
Lycksele	316	99.7%	99.7%
Mora	217	98.7%	99.6%
Motala	340	96.9%	99.4%
Norrtälje	132	97.0%	94.8%
Nyköping	157	99.3%	**87.9%**
Oskarshamn	198	99.0%	99.5%
Piteå	352	98.9%	98.6%
Skellefteå	94	100.0%	96.8%
Sollefteå	116	**69.5%**	97.0%
Södertälje	138	97.2%	95.1%
Torsby	100	99.0%	100.0%
Trelleborg	514	**88.6%**	97.6%
Visby	141	96.5%	97.2%
Värnamo	145	98.0%	97.3%
Västervik	108	98.2%	99.1%
Ängelholm	45	100.0%	100.0%
Örnsköldsvik	162	96.5%	94.1%
Private Hospitals			
Aleris Specialistvård Sabbatsberg	122	**92.4%**	93.2%
Carlanderska	44	100.0%	**0.0%**
Elisabethsjukhuset	84	100.0%	**0.0%**
Movement	193	99.5%	99.0%
Nacka Närsjukhus Proxima	100	93.5%	94.4%
Ortho Center Stockholm	410	100.0%	99.8%
OrthoCenter IFK-kliniken	99	100.0%	**0.0%**
Ortopediska Huset	441	98.9%	**81.6%**
Sophiahemmet	173	100.0%	**0.0%**
Spenshult	104	100.0%	**0.0%**
Nation	15,607	97.4%	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 2009

Hospital	No. [1]	SHAR [2]	PAR [3]
University/Regional Hospitals			
Karolinska/Huddinge	108	99.1%	89.9%
Karolinska/Solna	76	100.0%	94.7%
Linköping	79	**87.8%**	97.8%
Lund	159	95.2%	**83.8%**
Malmö	237	99.6%	95.8%
SU/Sahlgrenska + Mölndal + Östra [4]	331	97.1%	**87.4%**
Umeå	70	**87.5%**	95.0%
Uppsala	90	98.9%	95.6%
Örebro	108	99.0%	92.6%
Central Hospitals			
Borås + Skene [5]	72	96.0%	93.3%
Danderyd	123	99.2%	91.9%
Eksjö	50	96.1%	98.0%
Eskilstuna	71	100.0%	93.0%
Falun	123	98.4%	97.6%
Gävle	116	100.0%	93.1%
Halmstad	69	94.6%	98.7%
Helsingborg	152	97.4%	96.2%
Hässleholm-Kristianstad	121	97.6%	93.5%
Jönköping	60	95.2%	**88.9%**
Kalmar	93	99.0%	93.7%
Karlskrona + Karlshamn [6]	85	**89.5%**	**86.3%**
Karlstad	58	92.0%	92.0%
Norrköping	65	98.5%	98.5%
S:t Göran	188	94.4%	95.4%
Skövde + Lidköping + Falköping [7]	119	98.4%	95.1%
Sunderby	138	99.2%	94.9%
Sundsvall	75	98.7%	97.4%
Södersjukhuset	239	96.3%	96.3%
Uddevalla	218	97.8%	94.6%
Varberg	77	97.5%	98.7%
Västerås	84	**83.1%**	94.0%
Växjö	38	**71.7%**	96.2%
Ystad	51	98.1%	92.3%
Östersund	72	100.0%	95.8%
Rural Hospitals			
Alingsås	29	96.7%	93.3%
Arvika	25	**86.2%**	96.6%
Gällivare	7	100.0%	100.0%
Hudiksvall	40	100.0%	97.5%
Karlskoga	30	100.0%	96.7%
Kungälv	70	100.0%	95.7%
Köping	1	100.0%	100.0%
Lindesberg	26	100.0%	100.0%
Ljungby	27	100.0%	100.0%
Mora	43	100.0%	100.0%
Motala	23	**71.9%**	96.9%
Norrtälje	46	100.0%	100.0%
Nyköping	30	100.0%	90.0%
Piteå	1	100.0%	100.0%
Skellefteå	43	97.7%	90.9%
Sollefteå	39	97.5%	**82.5%**
Södertälje	29	100.0%	96.6%
Torsby	30	100.0%	93.3%
Visby	35	100.0%	**88.6%**
Värnamo	29	96.6%	96.6%
Västervik	32	94.1%	97.1%
Örnsköldsvik	49	**86.0%**	**87.7%**
Nation	4,499	96.3%	93.7%

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'

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

Primary total hip arthroplasty

The number of primary hip arthroplasties performed increased during 2009 to 15,646, compared with 14,454 the previous year, which is the largest increase since 1996. The change is also considerable seen in a 10-year perspective. In 1999, 10,563 operations were registered, which corresponds to an increase of 48% during the period.

Demography and unit group

The mean age for primary hip arthroplasty has successively decreased since 1992, among women from 70.2 to 69.4 years in 2009. Among men the reduction in age is somewhat greater, from 68.3 to 66.9 years (Figure 1). For the 18-year period during which personal identification number has been linked to primary hip arthroplasty, this trend has also been noted regarding gender distribution. The proportion of men increases, from 39.2% to 41.2% if the 3-year period 1992-1994 is compared with that between 2007and 2009 (Figure 2). The change has taken place mainly during the most recent 10-year period. The highest proportion of men during the period, 41.6%, was noted during 2009.

Between 1992 and 2009 the distribution of diagnoses changed (Figure 3). The proportion of primary arthroses increased from about 75% to 83%. Particularly evident is the reduction in inflammatory joint disease (Figure 9). During the most recent 3-year period primary arthrosis dominated among men (men 87%, women 80.8%) while the diagnoses inflammatory joint disease and fracture were commoner among women (men 1.2% and 6.8%, women 2.4% and 11.5%). Secondary hip osteorthritis due to idiopathic femoral head necrosis is more equally distributed between the sexes.

In summary more and more patients are undergoing primary total hip arthroplasty. The increase is somewhat skewed between the sexes in favour of younger men. The proportion of primary osteoarthritis is increasing and the proportion of patients with inflammatory joint disease is decreasing, both relatively and in absolute numbers. The proportion of patients undergoing total hip arthroplasty for fracture has not changed appreciably during the past six years.

Operating units

In previous reports we have noted that increasing numbers of hip arthroplasties are being carried out at private clinics chiefly at the expense of a decreasing proportion carried out in university clinics. In 1992 approximately 1% were performed at private clinics (n=122) and 23% at university clinics (n=2,468). In 2009 the corresponding proportions were 11.3% and 10.7% respectively; and in absolute terms 1,775 and 1,667, respectively, meaning that private hospitals have now overtaken university/regional hospitals' volumes of primary arthroplasties (Figure 4).

Analysis of demographic variables related to operating clinics for 2009 shows that the mean age was significantly lower for those patients who were operated on at university/regional hospitals and private hospitals compared with central and rural hospitals (Table 1). Private hospitals also took patients with lower BMIs compared to county and rural hospitals. Other comparisons do not reach significance. In addition, the degree of morbidity (ASA degree) decreases as the values to the right in the table are followed, which means that the most seriously ill patients undergo surgery at university/regional hospitals and the most healthy at private hospitals. The same circumstances apply to the proportion of primary osteoarthritis, which is lowest at university/regional hospitals and highest at private hospitals. No established difference in gender distribution can be shown for 2009 (all established differences: $p<0.002$).

In summary, increasing numbers of patients are undergoing surgery at private clinics, chiefly at the expense of the proportion at university/regional hospitals. In general, patients at private hospitals more often have primary osteoarthritis and are healthier than those at other types of hospital. Compared with county and county-district hospitals they are also younger and have lower BMIs.

Fixation and choice of implant

The relative decline in all-cemented hip implants has been going on since 1999. Between 2005 and 2008 the number of all-cemented hip implants has declined in absolute numbers. During 2009, however, the number increased by 555 operations. Relatively, however, there was a reduction (-2.0%) but not as pronounced as during the immediately preceding years. During 2009, reverse hybrids were responsible for the largest increase (+1.9%), while all-cemented prostheses increased only marginally (+0.4%) (Figure 5).

During 2009 Lubinus whole plastic (n=5,555), ZCA XLPE (n=1,995) and Contemporary Hooded Duration (n=1,959) were the three most used cemented cups and Trilogy (n=828), Trident HA (n=439) and Allofit (n=241) were the three most used uncemented cups regardless of choice of stem fixation. On the stem side, Lubinus SPII (n=6,115), Exeter Polished (n=3,247) and MS Polished (n=1,030) and on the uncemented side Corail (n=1,180), CLS Spotorno (n=1,007) and Bi-Metric (n=860) dominated regardless of choice of cup fixation. Eleven cup types and eight stem types (cemented and uncemented) were responsible for 90% of all inserted cups and stems. Forty-four different cup types and 38 different stem types were each responsible for the remaining tenth of the total volume. Some of these prostheses were new types specially studied in clinical research series, old types phased out or other special prostheses adapted to patients with special anatomy or high risk of dislocation.

In summary the relative decline in all-cemented hip implants continued during 2009 even though it appears to have slowed

When risks are stated in the Report these are given in comparison with a reference group, the composition of which is clear from the text. For a risk increase (value over 1) or decrease (value under 1) to be considered established with at least 95% probability, the 95% confidence interval (marked as CI) should be outside 1. Relative risk is abbreviated in the Report as RR. In all cases calculation of risk is based on different forms of regression analysis (logistic regression, Cox regression) to compensate as far as possible for skewed distribution regarding for example gender, age or diagnosis between the groups being compared.

down. Reverse hybrids and all-uncemented fixation continued to increase. The majority of implants used have good clinical documentation.

All-uncemented fixation

We have investigated the outcome of all-uncemented implants in a co-operative project with the Department of Orthopaedics, Akademiska sjukhuset, Uppsala. Analysis of all operations from 1992 to 2007 inclusive shows that fixation entirely without cement involved an increased risk of revision. Choice of uncemented cup involved an increased risk of revision due to loosening, which in the Register also includes the diagnoses osteolysis and/or wear. In separate analyses of the five most used types of cup, this difference disappeared. Uncemented stems involve an increased risk of revision owing to fractures close to the implant but a reduced risk of revision for loosening.

Comparison between cemented and uncemented hip implants has often been criticised in that older implants no longer used are included in the analysis. For an analysis to be credible and representative, on the other hand, it is necessary for one and the same prosthesis design to be studied over a long period. The clinical effects of slow migration, joint wear, unfavourable loading of bone tissue and wear between the different parts of the prosthesis often fail to emerge until 10-20 years after the index operation but can then require considerable resources to remediate in a revision.

Since there is in Sweden a clear trend towards increased use of uncemented fixation, we have updated the comparison between all-cemented and all-uncemented prostheses. To reflect in the most practical manner the prostheses used in the past few years we used the following selection criteria. The implant (both cup and stem) must have been inserted in at least 200 operations during the past five years (2005-2009). Implant systems where either cup or stem (or both) were not used during these five years were therefore excluded.

In total 128,451 cemented and 8,285 uncemented prostheses were inserted between 1992 and 2009. The mean follow-up time was 5.4 (SD=3.9) years for the cemented group and 3.2 (SD=2.9) years for the uncemented group.

In general the choice of uncemented prosthesis involved an increased risk of revision (Figures 6a-f). Seen relatively, uncemented prostheses are revised more often owing chiefly to fractures close to the prosthesis and technical problems, while the relatively most common cause of revision of a cemented prosthesis is loosening. An analysis of prosthesis survival shows that the increased risk of revision of uncemented prostheses was caused chiefly by an increased risk of complications in the form of fractures close to the prosthesis and technical problems. Technical problems are most often described as 'incorrectly inserted prosthesis parts' and where location is given it is commonly the cup side that is involved.

The statistical analysis is rendered more difficult by the fact that in many cases there is no clear proportionality between survival curves over time. In certain cases they even cross one another. This means that statistical models based on proportionality should not be used. We therefore limited the analysis to the first five years after operation and limited the outcome to revision irrespective of component revised and for all reasons excluding infection. Adjustment was made for age (4 groups: <50, 50-59, 60-75, >75), gender, diagnosis and choice of incision. For the same methodological reason as given above, the age group over 75 was analysed separately. In the first analysis including patients up to 75 years and after adjustment for age group, gender, diagnosis and incision, we found that uncemented prostheses increased the risk of non-infectious revision (RR=1,74 CI: 1.41-2.14, p<0.0001). In a corresponding analysis of the group over 75 years we found no secure difference (RR=2.24. CI:0.7-7.19, p=0.18). however the number of patients in this group with all-

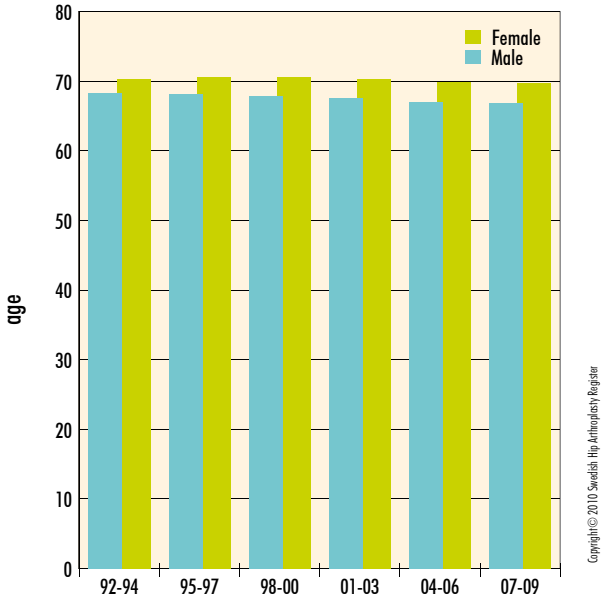


Figure 1. Mean age for men and women that was operated with primary hip prosthesis in three-year intervals 1992-2009.

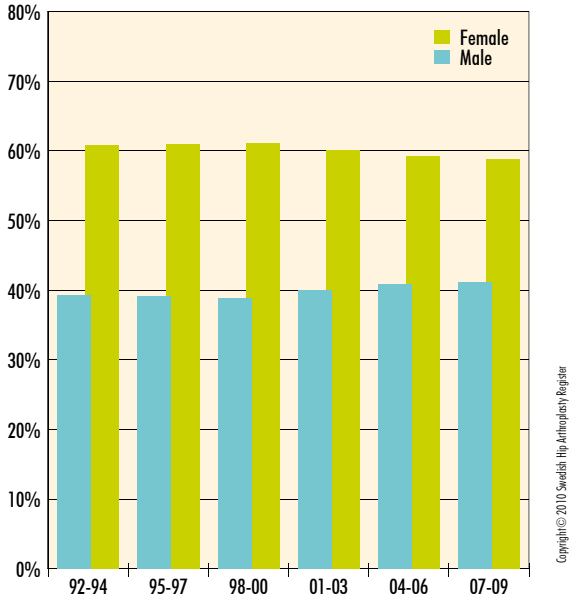


Figure 2. Distribution of sex among patients that was operated with primary hip prosthesis in three-year intervals.

uncemented prostheses is small (186 of 44,423) meaning that no certain conclusions can be drawn.

In summary, we find that modern all-uncemented prostheses compared with all-cemented have poorer prosthesis survival up to five years after operation owing to problems caused by fractures close to the prostheses and other surgical-technical problems.

Cross-linked high-molecular plastic

At the end of the 1990s a new type of plastic was introduced in cemented cups and as plastic liners in uncemented cups. By irradiating the plastic with higher doses than normally used for sterilization an increased cross-linking is obtained between the molecules and improved wear characteristics. At the same time free radicals are formed which, if not neutralized, accelerate the ageing of the plastic (oxidization). The free radicals are normally removed with heat treatment of the plastic. In recent years other methods have also been launched. The high wear resistance of the new plastic material has great theoretical advantages, but it also involves a measure of insecurity since long-term documentation is largely absent.. The first generations of this new polymer also had somewhat poorer mechanical characteristics. In certain cases disquiet has been expressed over the fact that the plastic particles formed in the wearing of the cross-link plastic are smaller and have a more aggressive biological effect.

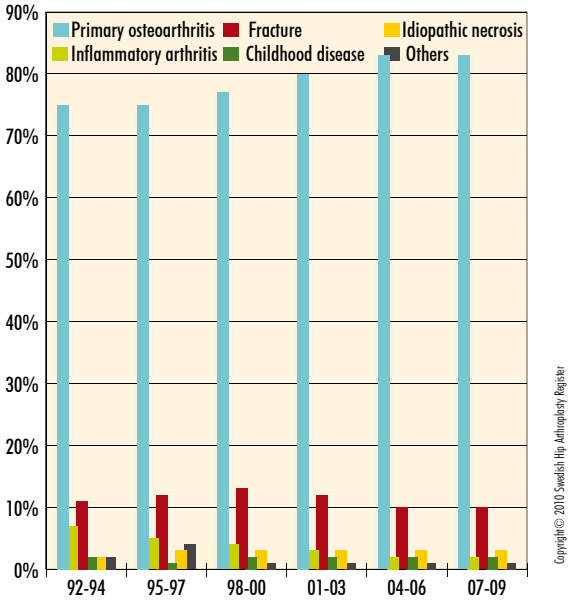


Figure 3. Distribution of diagnoses i three year intervals 1992–2009 (both sexes).

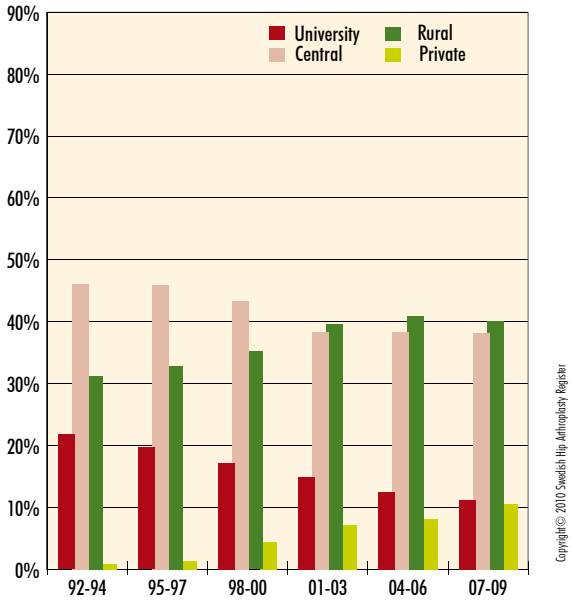


Figure 4. Distribution of primary prosthesis between different types uf units, related to three-year intervals.

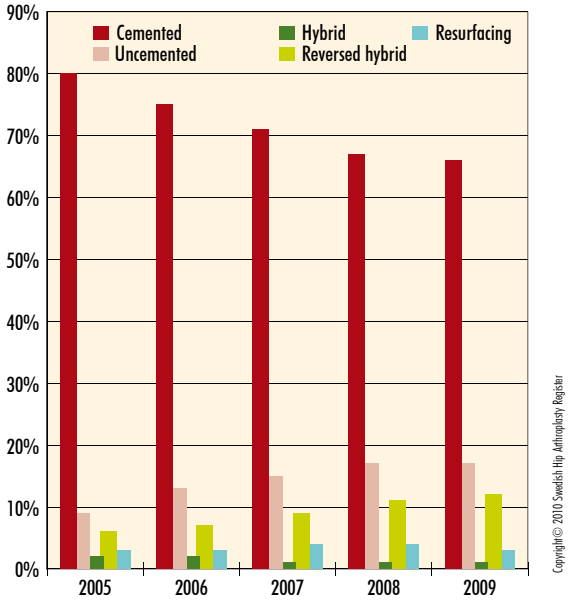


Figure 5. Distribution of type of fixation 2005-2009.

In Sweden, the introduction of these new plastics has been very cautious. Prospective randomized studies of certain of these polymer materials have shown that they do indeed reduce wear up to seven years post-operation. Regarding cemented cups, a start was made in Sweden on using high-molecular plastic somewhat more extensively as recently as 2006 (Figure 7). The observation period is short (1-4 years). Of the three types (Reflection XLPE, ZCA, XLPE, Marathon XLPE) inserted in more than 25 cases until 2009 (n=7,207) only 44 cups have been revised (0.6%) of which 35 for dislocation/infection and only 1 for loosening.

Turning to uncemented cups the situation is similar except for one implant type (Trilogy). The Trilogy cup with cross-linked high-molecular plastic lining has been used since 2000. Between 2000 and 2009 4,142 cups with conventional plastic and 2,390 with high-molecular plastic were registered. Since the conventional plastic was replaced successively, we made a preliminary comparison of the cups inserted from and including 2000 (Figure 8). The analysis excluded special liner types (constrained) intended to counteract dislocation, plastic linings with 22mm femoral heads and all those without the component number specifying choice of plastic type. We demonstrated no differen-

ces in risk of aseptic loosening whether all causes were included or only loosening/osteolysis. This result remained if adjustment was made for age, gender, diagnosis, HA/TCP coating or not, size of cup and presence or absence of screw holes (Cox regression). Since the observation period is still short we are to repeat this analysis and hope to be able to include more prosthesis types in future reports.

In summary we can demonstrate no advantages or disadvantages of the new plastic. Nor was this expected in view of the fact that the primary problem with which the new plastic is intended to cope is not expected to lead to a lower revision incidence until after 7-10 years at the earliest. Nor can we demonstrate any unexpected problems giving rise to an increased revision incidence.

Metal-metal joints

Operations with resurfacing prostheses with metal-metal articulation have been noted during the past few years. In the Australian register, in the NARA group and in earlier annual reports, an increase of early revision has been demonstrated. In April the Medi-

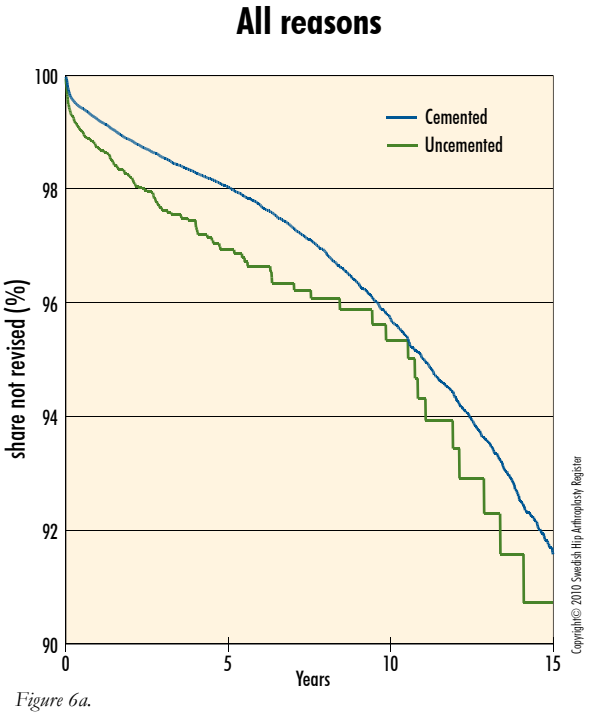


Figure 6a.

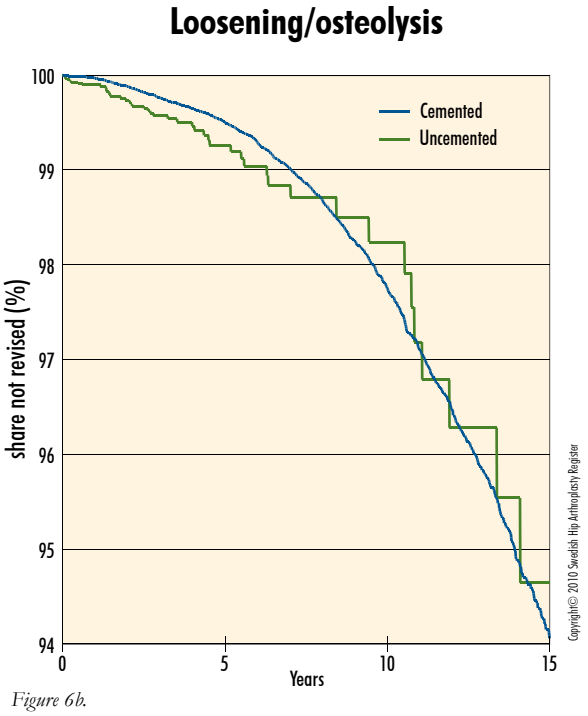


Figure 6b.

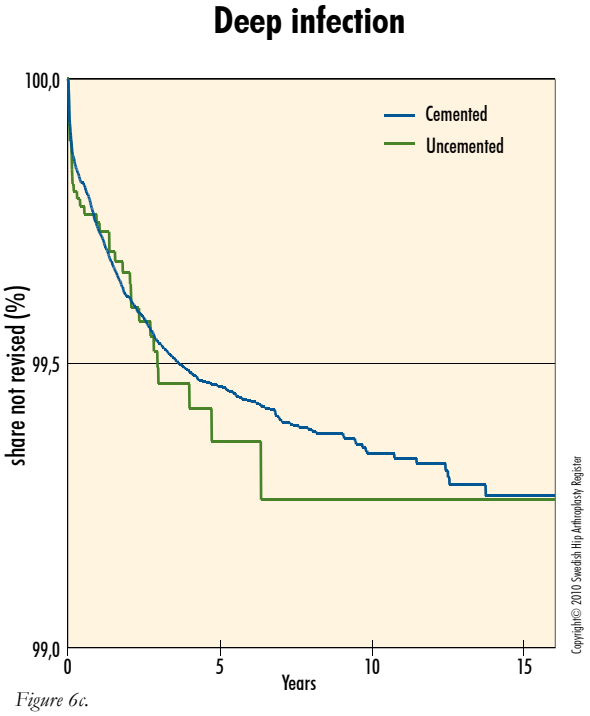


Figure 6c.

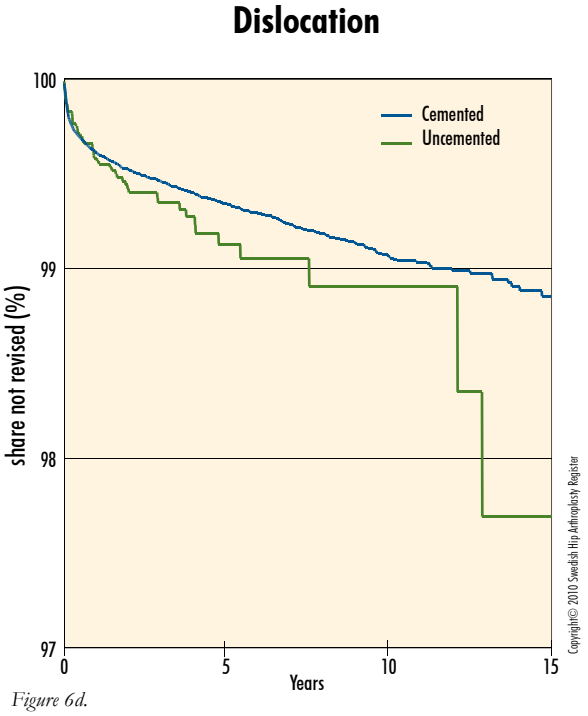
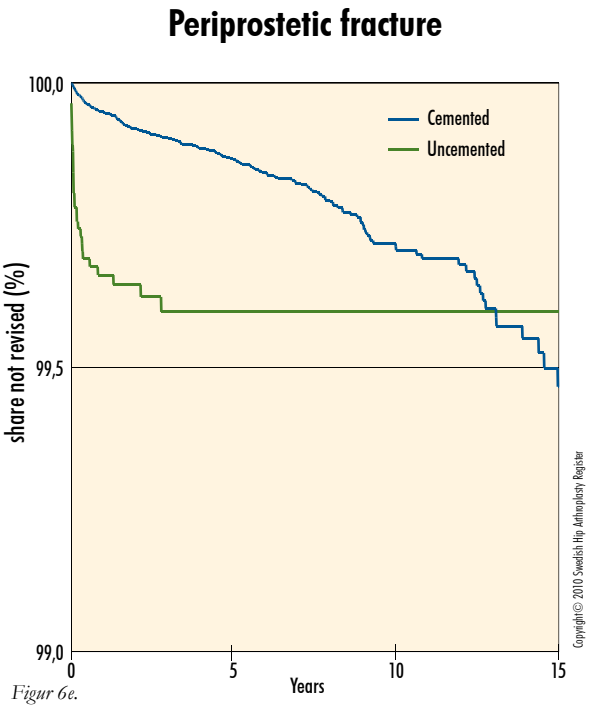
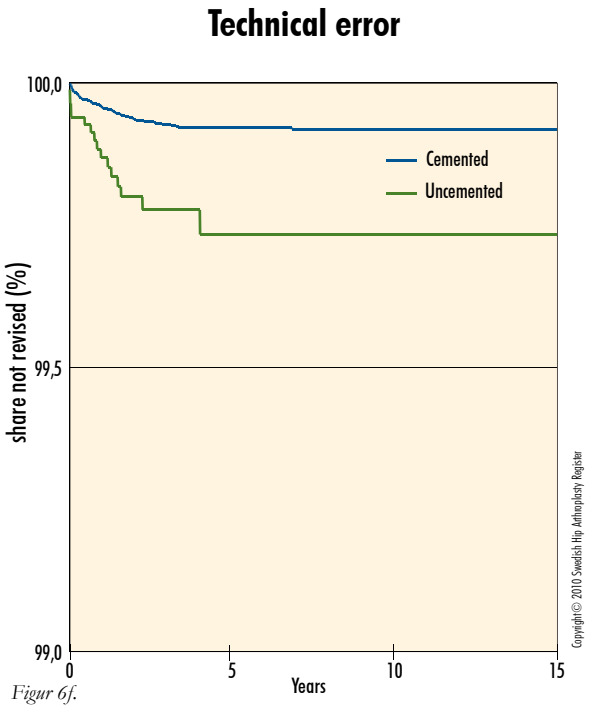


Figure 6d.



Figur 6e.



Figur 6f.

Figure 6a-f. Survival of prosthesis for wholly-cemented (blue line, n=128,451) and wholly uncemented (green line, n=8,285) prosthesis related to reason to revision, regardless of prosthetic component revised. To represent the current choice of implant, only prostetic components used during 2005-2009 and with at least 200 operations performed, are included in the analysis.

cal and Healthcare Products Regulatory Agency in England issued a warning regarding soft-tissue reactions reported chiefly among women. There is therefore reason to continually monitor the results following this type of prosthesis operation. For prostheses inserted from 1999 onwards we can in the component data base study details regarding choice of joint head and joint surface on the cup side. In total, 2,632 prostheses with metal-metal articulations were registered. Of these, 1,577 were registered as complete resurfacing implants, 621 as conventional (or short) stem prostheses combined with cups of surface replacement type, and lastly 434 implants of more conventional design.

The majority of the metal-metal articulations inserted in Sweden between 1999 and 2009 thus consisted of a metal cup resurfacing type commonly combined with a femur part of corresponding design or a large joint head fixed to a conventional stem.

Resurfacing prostheses

The number of resurfacing prostheses inserted in Sweden increased strongly until 2007 when it was 295, corresponding to 2.1% of the total number of prostheses inserted. The number has since decreased. Until and including 2008 the proportion of women was 30.6%, decreasing during 2009 to 16.7% probably because a number of studies have shown increased complication frequency among women.

In Sweden this market is dominated by three types (BHR: 50.7%, Durom: 23.4%, ASR: 23.3%), where the BHR proportion is successively increasing. For this year's Report we analysed the outcome in the form of aseptic loosening based on the three commonest prostheses. To reduce the risk of a comparison with conventional prostheses, the age limit was set to 70 since only six patients in the resurfacing group were older than 70. In addition, patients with remaining conditions following fracture were excluded (two resurfacing cases). In a further attempt to equate these groups, the starting year was set to 2001. This meant that 59,559 conventional and 1,549 resurfacing prostheses were included. Following adjustment for age, side, gender, diagnosis and incision there remained an increased risk of aseptic loosening of the resurfacing prostheses (RR: 2.51. CI: 1.89—3.35). In the men the risk increase was less pronounced (1.60, 1.04-2.48) than among the women (4.64, 3.15—6.83).

	University/Regional Hospitals			Central Hospitals			Rural Hospitals			Private Hospitals		
	No.			No.			No.			No.		
Age [1]	1,667	65.3	64.6 - 66.0	6,040	69.2	68.9-69.5	6,164	69.0	68.8-69.3	1,775	66.2	65.7-66.6
Share women %	1,667	57.5		6,040	59.0		6,164	59.0		1,775	58.0	
BMI [1]	1,332	27.0	26.5-27.4	5,217	27.1	26.9-27.3	5,695	27.4	27.3-27.5	1,736	26.5	26.4-26.7
ASA [1]	1,471	2.11	2.07-2.14	5,821	1.98	1.97-2.00	5,790	1.89	1.87-1.90	1,763	1.65	1.62-1.67
Share osteoarthritis %	1,667	61.7		6,040	79.4		6,164	91.7		1,775	95.9	

Table 1. Age, distribution of sex, BMI, ASA and share of osteoarthritis - related to type of surgical unit during 2009. The variation in count for type of unit is caused by missing registrations. 1) mean ±95% confidence interval.

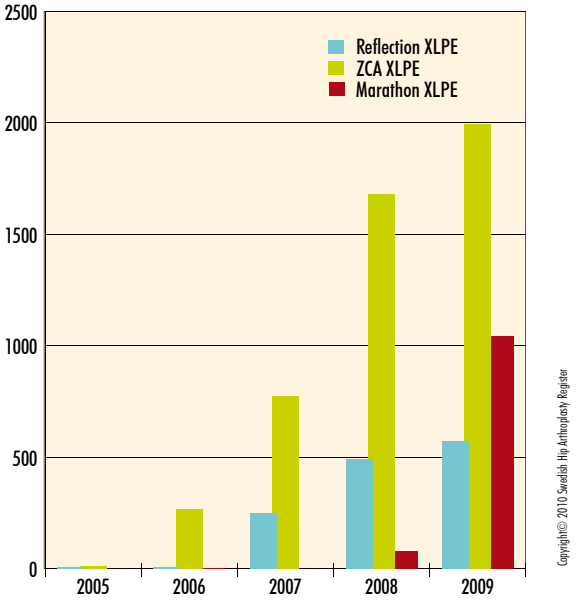


Figure 7. The number of inserted cemented cups with cross-linked high-molecular plastic 2005-2009 (only types with >25 inserted cups per year included).

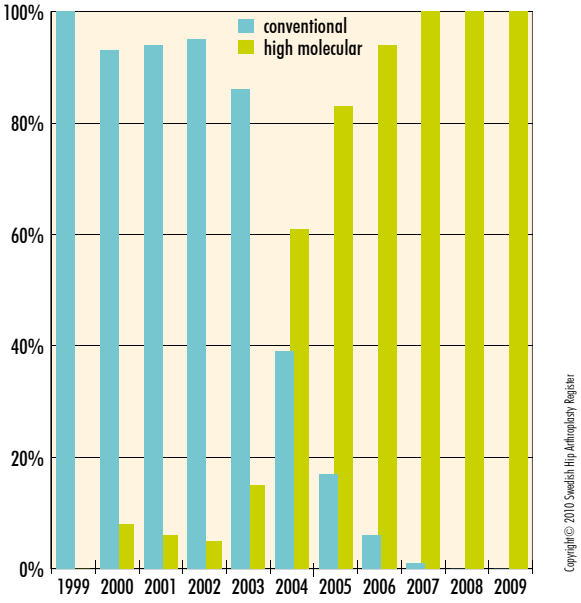


Figure 8. Distribution of conventional (gamma radiated with 2,5 mRad in inertia gas) and high-molecular (gamma radiated with 9,5 mRad and heat treated) plastic at insertion of uncemented Trilogy cup during 1999-2009.

Analysis of the three most used types favoured the BHR. For Durom, the risk of revision was increased (RR: 2.94, CI: 1.51—5.73) and for ASR (2.26, 1.02—4.98) compared with BHR. However, it cannot be stated on the basis of register data whether this depended on prosthesis design, type of instrument, surgeon's experience or any other factor not noted in the Registry's database.

In summary, several unclear points remain concerning resurfacing prostheses. The early risk of revision is still high in Sweden. The long-term effects of metal-metal articulation are unclear and serious soft-tissue complications have been observed, chiefly among women. Based on observations from the Registry, the NARA database and other studies, we consider that if resurfacing prostheses are used this should be under controlled forms. The operation must be carried out at centres with sufficiently large volumes to maintain good surgical competence and the patients should be followed-up continually. Operations on women should be avoided.

Total hip arthroplasty in inflammatory hip joint disease

The treatment algorithm in rheumatoid arthritis and other inflammatory joint diseases has radically changed in Sweden over the past 20 years. The algorithm includes an altered, earlier and more aggressive pharmaceutical treatment compared with the eighties and the beginning of the nineties. At the beginning of the period Methotrexate was introduced and at the end of the nineties what are termed biological pharmaceuticals (TNFα inhibitors). The latter, chiefly, cost the community thousands of millions of Swedish crowns (1.5 thousand million in 2009) but have at the same time radically changed patients' work ability and health-related quality of life. At county-council level, costs are discussed instead of the social cost-effectiveness of the treatment. In such an analysis of effectiveness, all cost bearers should be included. One of many areas for saving is the radically reduced need for surgical treatment. The figure below shows the strongly reduced need for total hip arthroplasty for inflammatory joint disorder during the period 1992–2009 with a fall from 9% to 1.8% of total national production.

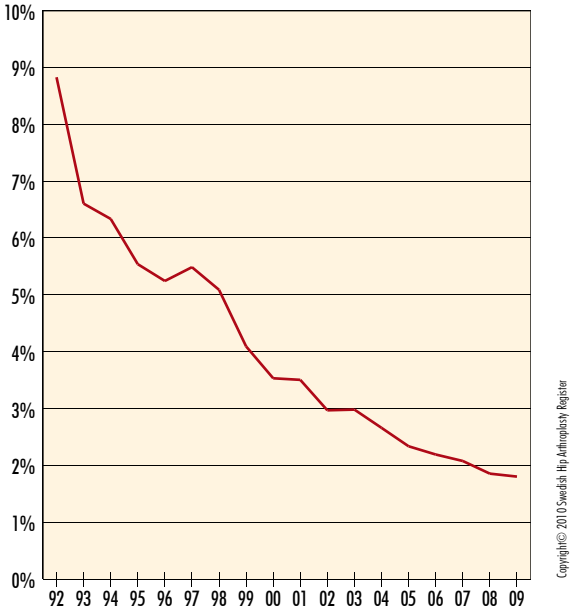


Figure 9. Share of patients operated with total hip prosthesis and diagnosed with inflammatory hip joint disease (total number has decreased from 840 to 280).

15 most common implants

most used during the past 10 years

Cup (stem)	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
Lubinus all-poly (Lubinus SP II)	50,834	5,709	5,546	5,266	4,916	4,937	77,208	36.2%
Exeter Duration (Exeter Polished)	8,039	1,121	1,122	812	227	207	11,528	7.9%
Charnley Elite (Exeter Polished)	4,411	982	1,166	1,207	1,030	517	9,313	6.6%
Contemporary Hooded Duration (Exeter Polished)	1,372	578	639	785	1,394	1,717	6,485	4.8%
Reflection (Spectron EF Primary)	5,486	789	672	285	160	127	7,519	4.3%
FAL (Lubinus SP II)	2,930	599	534	448	419	438	5,368	4.0%
Charnley (Charnley)	55,496	8	2	3	1	0	55,510	3.4%
ZCA XLPE (MS30 Polished)	1	7	222	402	860	990	2,482	1.8%
Charnley (Exeter Polished)	1,534	518	282	206	78	2	2,620	1.6%
Trilogy HA (CLS Spotorno)	133	179	284	347	380	380	1,703	1.3%
Reflection XLPE (Spectron EF Primary)	0	4	6	242	460	508	1,220	0.9%
Allofit (CLS Spotorno)	307	127	129	131	293	221	1,208	0.9%
OPTICUP (Scan Hip II Collar)	1,983	0	1	0	0	0	1,984	0.9%
Weber all-poly cup (Straight-stem standard)	670	164	126	192	11	0	1,163	0.8%
Charnley Elite (Lubinus SP II)	821	187	124	96	52	21	1,301	0.8%
Others (1,241)	108,616	2,987	3,206	3,880	4,173	5,581	128,443	
Total	242,633	13,959	14,061	14,302	14,454	15,646	315,055	

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)	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
Trilogy HA (CLS Spotorno)	133	179	284	347	380	380	1,703	16.5%
Allofit (CLS Spotorno)	307	127	129	131	293	221	1,208	11.7%
CLS Spotorno (CLS Spotorno)	627	110	163	194	69	45	1,208	8.3%
Trident HA (Accolade)	33	70	133	147	164	233	780	7.6%
Trilogy (CLS Spotorno)	212	86	88	93	80	27	586	5.4%
Trident HA (ABG II HA)	0	24	30	107	80	107	348	3.4%
Trilogy HA (Corail stam)	0	0	2	47	80	155	284	2.7%
Trilogy HA (Versys stam)	223	25	9	0	0	0	257	2.5%
Trilogy HA (Bi-Metric lat)	2	19	51	51	70	59	252	2.4%
Trident HA (Symax)	0	17	68	79	45	29	238	2.3%
Ranawat/Burstein (Bi-Metric lat)	0	5	28	26	55	122	236	2.3%
Pinnacle HA (Corail stam)	0	0	7	17	93	100	217	2.1%
Trilogy (Wagner Cone Prosthesis)	136	23	23	37	19	2	240	2.0%
Trilogy HA (Bi-Metric HA ocem)	162	22	4	3	4	1	196	1.9%
TOP Pressfit HA (CFP stam HA)	32	9	7	32	55	55	190	1.8%
Others (266)	6,424	285	334	375	360	539	8,317	
Total	8,291	1,001	1,360	1,686	1,847	2,075	16,260	

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)	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
Trilogy HA (Spectron EF Primary)	1,001	88	102	24	18	8	1,241	27.9%
Trilogy HA (Lubinus SP II)	847	73	51	55	66	56	1,148	26.9%
TOP Pressfit HA (Lubinus SP II)	120	16	5	4	1	9	155	4.4%
Reflection HA (Lubinus SP II)	177	10	1	2	11	3	204	3.3%
ABG II HA (Lubinus SP II)	208	0	3	0	0	0	211	3.2%
Biomex HA (Lubinus SP II)	107	0	0	0	0	0	107	3.0%
Trilogy HA (Stanmore mod)	71	8	7	8	2	1	97	2.8%
Trilogy HA (Exeter Polished)	26	5	9	13	17	28	98	2.4%
Allofit (MS30 Polerad)	74	3	2	5	1	3	88	1.9%
Trilogy HA (MS30 Polished)	0	0	3	18	27	19	67	1.9%
Ranawat/Burstein (Lubinus SP II)	0	2	14	9	21	16	62	1.8%
Trident HA (ABG II Cemented)	0	14	21	21	5	0	61	1.7%
Trilogy (Lubinus SP II)	63	4	1	2	2	1	73	1.3%
ABG II HA (Exeter Polished)	66	1	0	0	0	0	67	1.2%
Trident HA (Lubinus SP II)	0	5	15	6	3	13	42	1.2%
Others (245)	5,597	38	39	36	32	71	5,813	
Total	8,357	267	273	203	206	228	9,534	

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)	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
Lubinus all-poly (Corail stem)	1	4	14	69	170	406	664	9.1%
Contemporary Hooded Duration (ABG II HA)	1	56	94	85	100	156	492	6.8%
Charnley Elite (CLS Spotorno)	68	47	80	90	90	19	394	5.4%
Charnley Elite (ABG uncem)	369	1	0	0	0	0	370	5.1%
Charnley Elite (Corail stem)	11	6	43	70	147	79	356	4.9%
Lubinus helplast (CLS Spotorno)	8	27	41	100	100	54	330	4.5%
ZCA XLPE (Bi-Metric HA lat)	0	0	0	43	118	102	263	3.6%
Lubinus all-poly (Bi-Metric HA lat)	25	34	34	37	51	72	253	3.5%
Charnley Elite (ABG II HA)	76	19	22	20	61	41	239	3.3%
Charnley (ABG II HA)	93	78	34	22	7	0	234	3.2%
ZCA XLPE (CLS Spotorno)	0	1	19	82	64	58	224	3.1%
Biomet Müller (Bi-Metric HA lat)	37	45	58	28	19	23	210	2.9%
Charnley Elite (Bi-Metric HA lat)	4	12	74	77	31	1	199	2.7%
Marathon XLPE (Corail stem)	0	0	0	0	15	173	188	2.6%
Biomet Müller (Bi-Metric HA uncem)	175	14	6	2	2	1	200	2.7%
Others (208)	812	379	351	415	428	624	3,009	
Total	1,680	723	870	1,140	1,403	1,809	7,625	

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)	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
BHR Acetabular Cup (BHR Femoral Head)	188	119	117	111	112	137	784	49.9%
ASR Cup (ASR Head)	1	22	50	94	118	82	367	23.4%
Durom (Durom)	81	75	66	70	34	28	354	22.6%
Durom studiecup (Durom)	0	0	3	5	5	2	15	1.0%
Adept (Adept Resurfacing Head)	0	0	5	9	1	0	15	1.0%
BHR Dysplasia Cup (BHR Femoral Head)	2	1	3	4	0	1	11	0.7%
ReCap Cup (ReCap Head)	0	1	0	0	6	0	7	0.4%
BHR Acetabular Cup (BMHR)	0	0	0	2	4	0	6	0.4%
Cormet 2000 resurf (Cormet 2000 resurf)	5	0	0	0	0	0	5	0.2%
ReCap HA Cup (ReCap Head)	0	0	3	0	0	0	3	0.2%
Cormet 2000 resurf (Cormet 2000 HA resurf)	2	0	0	0	0	0	2	0.1%
BHR Acetabular Cup (BMHR VS)	0	0	0	0	0	1	1	0.1%
ASR Cup (BHR Femoral Head)	0	0	1	0	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	285	218	248	295	280	251	1,577	

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	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
Lubinus helplast	73,074	5,829	5,701	5,547	5,309	5,555	101,015	37.5%
Charnley Elite	8,358	1,408	1,640	1,658	1,513	713	15,290	9.8%
Exeter Duration	8,577	1,264	1,282	912	243	229	12,507	8.6%
Contemporary Hooded Duration	1,424	694	846	1,040	1,612	1,959	7,575	5.6%
Charnley	60,159	636	330	239	88	4	61,456	5.5%
Reflection	6,938	832	709	316	182	167	9,144	4.5%
FAL	2,973	618	558	472	441	480	5,542	4.1%
Trilogy HA	2,855	460	567	619	753	828	6,082	3.9%
ZCA XLPE	2	10	269	774	1,680	1,995	4,730	3.5%
Biomet Müller	5,008	211	174	106	45	39	5,583	1.5%
Weber all-poly cup	1,075	197	153	262	18	0	1,705	1.2%
Trident HA	69	167	294	374	299	439	1,642	1.2%
OPTICUP	3,732	64	37	21	7	4	3,865	1.2%
Allofit	420	146	145	145	307	241	1,404	1.0%
Reflection XLPE	0	5	7	251	490	573	1,326	1.0%
Others (177)	67,969	1,418	1,349	1,566	1,467	2,420	76,189	
Total	242,633	13,959	14,061	14,302	14,454	15,646	315,055	

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

15 most common stem components

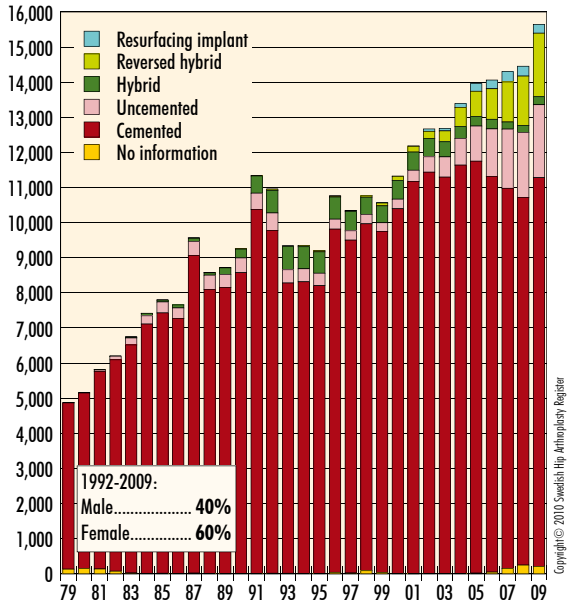
most used during the past 10 years

Stem	1979-2004	2005	2006	2007	2008	2009	Total	Share [1]
Lubinus SP II	60,566	6,823	6,491	6,163	5,835	6,115	91,993	44.0%
Exeter Polerad	32,610	3,223	3,231	3,057	2,888	3,247	48,256	22.3%
Spectron EF Primary	7,373	929	825	614	742	740	11,223	6.5%
CLS Spotorno	1,750	699	927	1,259	1,250	1,007	6,892	4.7%
Charnley	56,622	9	2	4	1	0	56,638	3.4%
MS30 Polerad	595	269	297	496	922	1,030	3,609	2.6%
Corail stam	20	15	123	259	619	1,180	2,216	1.6%
ABG II HA	272	215	221	276	278	371	1,633	1.2%
Bi-Metric lat	24	104	281	344	382	453	1,588	1.2%
Bi-Metric HA lat	139	186	242	273	352	371	1,563	1.2%
Straight-stem standard	805	208	175	256	16	0	1,460	1.0%
Scan Hip II Krage	2,280	0	1	0	0	0	2,281	0.9%
CPT (CoCr)	288	315	204	188	102	128	1,225	0.9%
Stanmore mod	1,033	50	71	32	37	11	1,234	0.8%
CPT (stål)	1,481	3	1	0	0	0	1,485	0.8%
Others (183)	76,775	911	969	1,081	1,030	993	81,759	
Total	242,633	13,959	14,061	14,302	14,454	15,646	315,055	

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

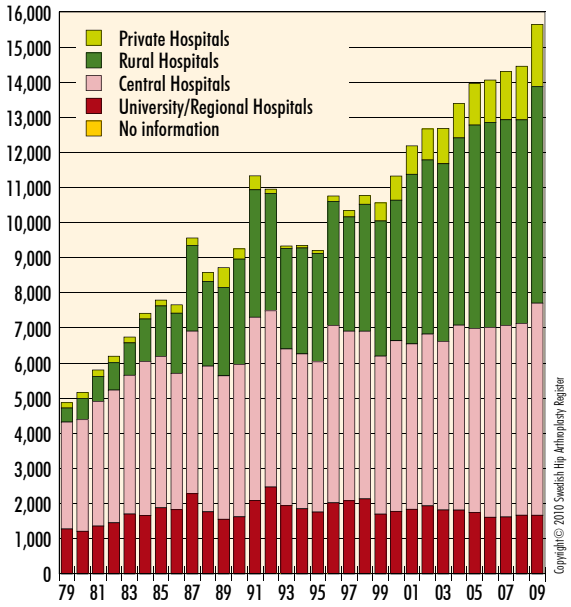
Number of primary THRs

per type of fixation



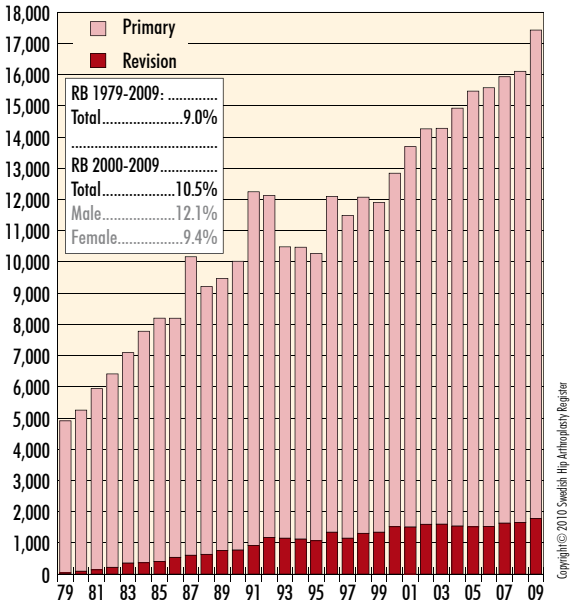
Number of primary THRs

per type of hospital, 1979-2009



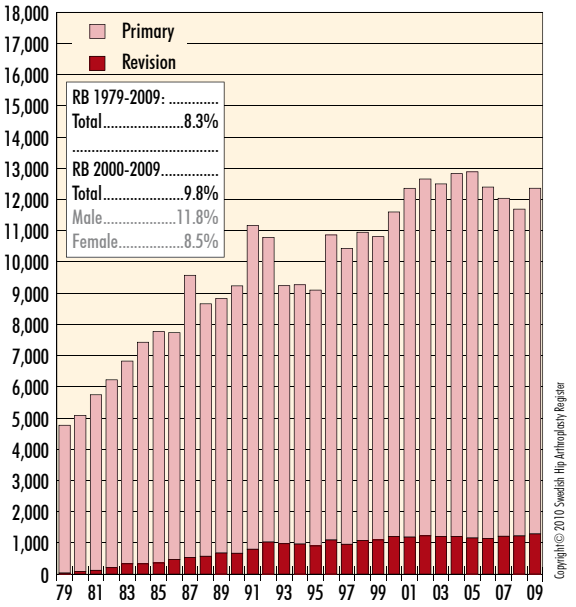
All THRs

315,055 primary THRs, 31,312 revisions, 1979-2009



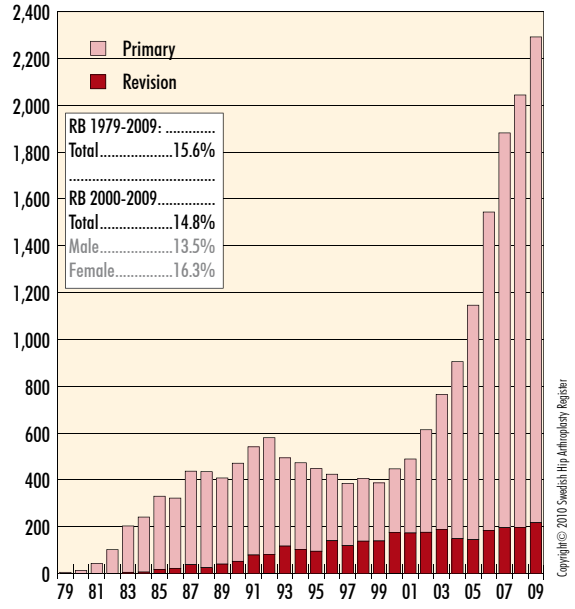
THR with cemented implants

278,544 primary THRs, 25,276 revisions, 1979-2009



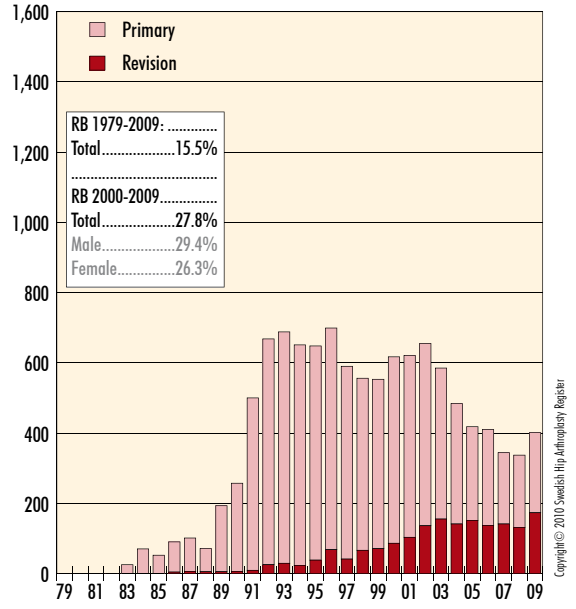
THR with uncemented implants

16,260 primary THRs, 3,016 revisions, 1979-2009



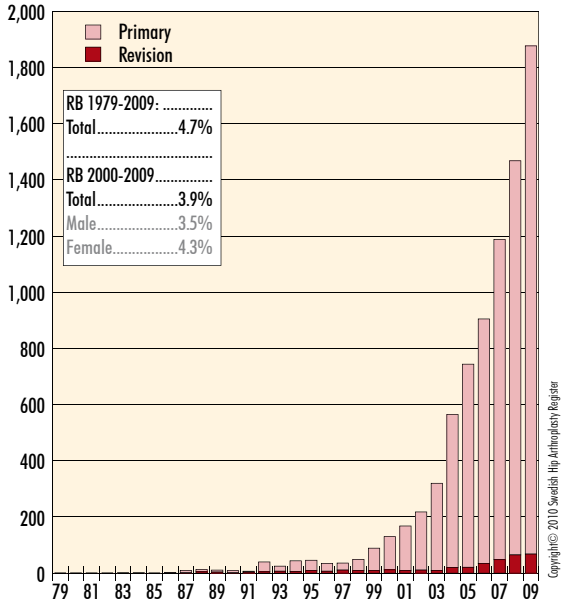
THR with hybrid implants

9,534 primary THRs, 1,750 revisions, 1979-2009



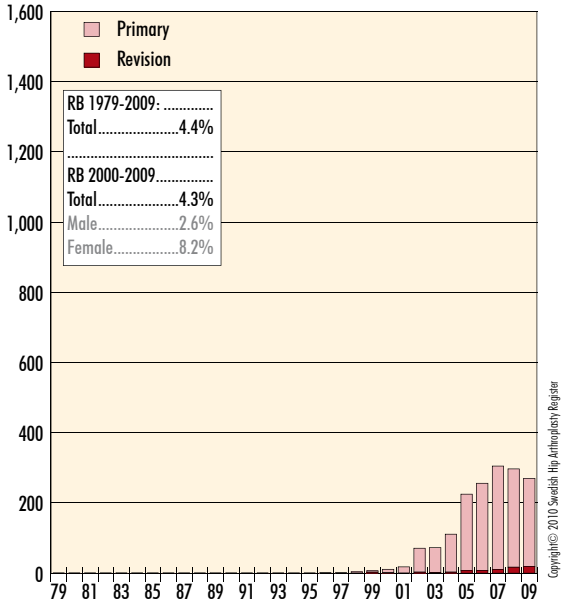
THR with reversed hybrid implants

7,625 primary THRs, 377 revisions, 1979-2009



THR with resurfacing implant

1,577 primary THRs, 73 revisions, 1979-2009



Number of primary THRs per diagnosis and year

Diagnosis	1992-2004	2005	2006	2007	2008	2009	Total	Share
Primary osteoarthritis	108,077	11,593	11,769	11,858	11,985	13,179	168,461	78.6%
Fracture	16,506	1,316	1,240	1,414	1,404	1,410	23,290	10.9%
Inflammatory arthritis	6,490	326	308	297	268	282	7,971	3.7%
Idiopathic femoral head necrosis	4,186	342	357	336	393	399	6,013	2.8%
Childhood disease	2,485	271	297	291	290	283	3,917	1.8%
Secundary osteoarthritis	1,295	4	2	1	0	4	1,306	0.6%
Tumor	730	89	67	86	92	78	1,142	0.5%
Secondary arthritis after trauma	382	18	19	18	22	11	470	0.2%
(missing)	1,872	0	2	1	0	0	1,875	0.9%
Total	142,023	13,959	14,061	14,302	14,454	15,646	214,445	100%

Number of primary THRs per diagnosis and age

1992-2009

Diagnosis	< 50		50-59		60-75		> 75		Total	Share
Primary osteoarthritis	6,021	58.0%	23,267	81.6%	92,053	83.8%	47,120	71.7%	168,461	78.6%
Fracture	304	2.9%	1,182	4.1%	8,766	8.0%	13,038	19.8%	23,290	10.9%
Inflammatory arthritis	1,439	13.9%	1,523	5.3%	3,754	3.4%	1,255	1.9%	7,971	3.7%
Idiopathic femoral head necrosis	664	6.4%	767	2.7%	2,231	2.0%	2,351	3.6%	6,013	2.8%
Childhood disease	1,552	15.0%	1,203	4.2%	968	0.9%	194	0.3%	3,917	1.8%
Secundary osteoarthritis	100	1.0%	113	0.4%	474	0.4%	619	0.9%	1,306	0.6%
Tumor	125	1.2%	231	0.8%	515	0.5%	271	0.4%	1,142	0.5%
Secondary arthritis after trauma	67	0.6%	67	0.2%	166	0.2%	170	0.3%	470	0.2%
(missing)	109	1.0%	170	0.6%	888	0.8%	708	1.1%	1,875	0.9%
Total	10,381	100%	28,523	100%	109,815	100%	65,726	100%	214,445	100.0%

Number of primary THRs with uncemented implants per diagnosis and age

1992-2009

Diagnosis	< 50		50-59		60-75		> 75		Total	Share
Primary osteoarthritis	2,094	60.4%	4,673	86.8%	3,513	91.4%	173	75.2%	10,453	80.9%
Childhood disease	661	19.1%	347	6.4%	91	2.4%	6	2.6%	1,105	8.5%
Inflammatory arthritis	320	9.2%	117	2.2%	82	2.1%	7	3.0%	526	4.1%
Idiopathic femoral head necrosis	240	6.9%	125	2.3%	66	1.7%	4	1.7%	435	3.4%
Fracture	64	1.8%	81	1.5%	72	1.9%	38	16.5%	255	2.0%
Secundary osteoarthritis	34	1.0%	8	0.1%	4	0.1%	1	0.4%	47	0.4%
Secondary arthritis after trauma	23	0.7%	4	0.1%	1	0.0%	1	0.4%	29	0.2%
Tumor	2	0.1%	7	0.1%	4	0.1%	0	0.0%	13	0.1%
(missing)	29	0.8%	21	0.4%	11	0.3%	0	0.0%	61	0.5%
Total	3,467	100%	5,383	100%	3,844	100%	230	100%	12,924	100%

Number of primary THRs per type of fixation and age

1992-2009

Type of fixation	< 50		50-59		60-75		> 75		Total	Share
Cemented	3,489	33.6%	16,461	57.7%	99,182	90.3%	64,183	97.7%	183,315	85.5%
Uncemented	3,467	33.4%	5,383	18.9%	3,844	3.5%	230	0.3%	12,924	6.0%
Hybrid	1,411	13.6%	3,105	10.9%	3,106	2.8%	499	0.8%	8,121	3.8%
Reversed hybrid	983	9.5%	2,629	9.2%	3,267	3.0%	701	1.1%	7,580	3.5%
Resurfacing implant	732	7.1%	650	2.3%	193	0.2%	2	0.0%	1,577	0.7%
(missing)	299	2.9%	295	1.0%	223	0.2%	111	0.2%	928	0.4%
Total	10,381	100%	28,523	100%	109,815	100%	65,726	100%	214,445	100%

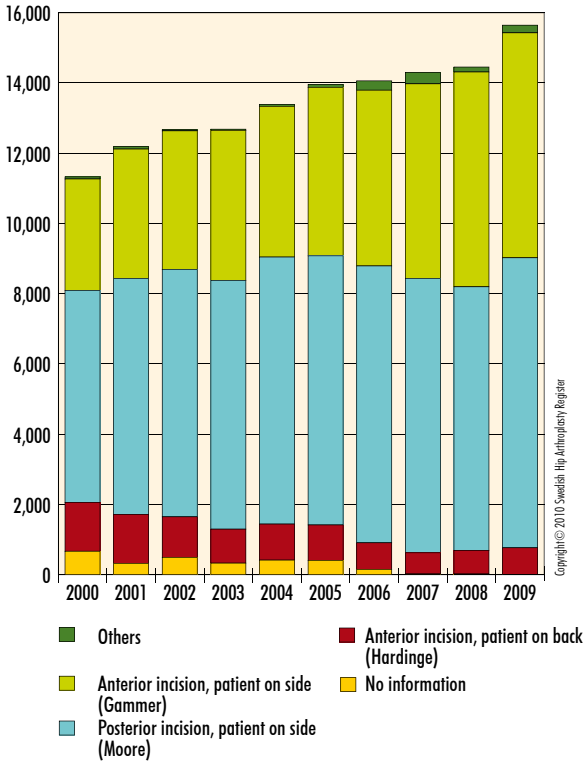
Number of primary THRs per type of incision and year

Type of incision	2000-2004	2005	2006	2007	2008	2009	Total	Share
Posterior incision, patient on side (Moore)	34,478	7,664	7,884	7,812	7,509	8,258	73,605	54.7%
Anterior incision, patient on side (Gammer)	19,378	4,789	5,004	5,543	6,117	6,406	47,237	35.1%
Anterior incision, patient on back (Hardinge)	5,939	1,015	757	603	670	760	9,744	7.2%
(missing)	2,209	399	149	18	17	4	2,796	2.1%
Others	253	92	267	326	141	218	1,297	1.0%
Total	62,257	13,959	14,061	14,302	14,454	15,646	134,679	100%

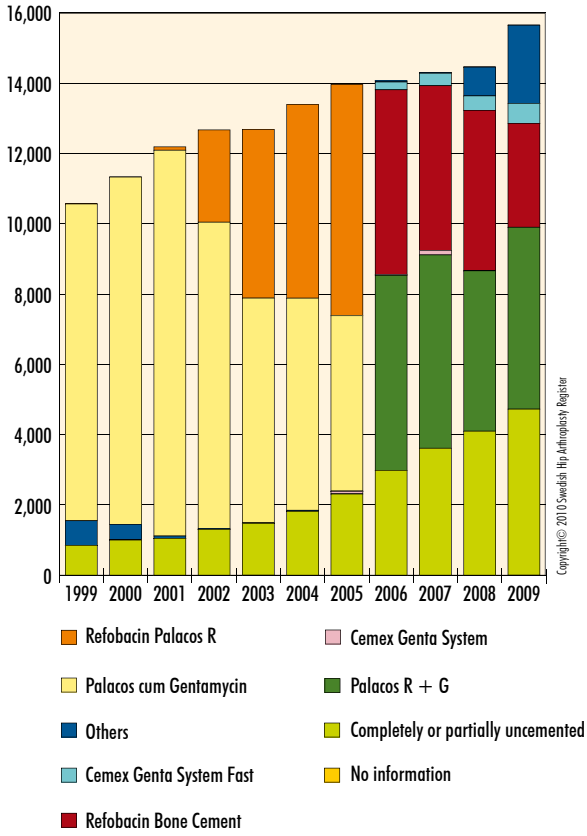
Number of primary THRs per type of cement and year

Brand of cement	1999-2004	2005	2006	2007	2008	2009	Total	Share
Palacos cum Gentamycin	50 999	4 986	0	0	0	0	55 985	38.5%
Refobacin Palacos R	13 032	6 576	0	0	0	0	19 608	13.5%
Palacos R + G	0	0	5 549	5 500	4 561	5 172	20 782	14.3%
Refobacin Bone Cement	0	0	5 256	4 693	4 563	2 949	17 461	12.0%
Cemex Genta System Fast	0	1	221	354	413	570	1 559	1.1%
Cemex Genta System	17	69	25	120	0	0	231	0.2%
Others	1 289	16	30	22	818	2 229	4 404	3.0%
(Completely or partially uncemented)	7 481	2 311	2 980	3 613	4 099	4 724	25 208	17.4%
(missing)	2	0	0	0	0	2	4	0.0%
Total	72 820	13 959	14 061	14 302	14 454	15 646	145 242	100.0%

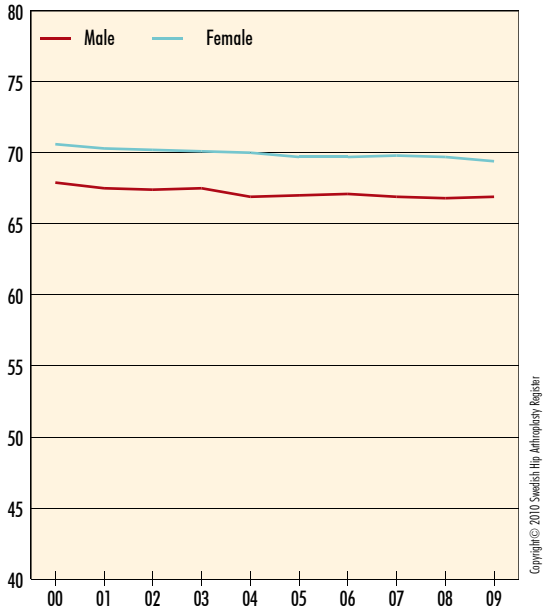
Type of incision
2000-2009



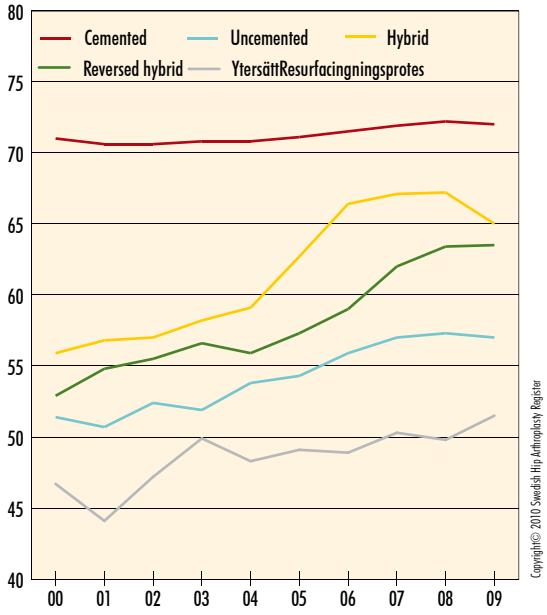
Type of cement
1999-2009



Mean age per gender
the past 10 years, 134,679 primary THRs



Mean age per type of fixation
the past 10 years, 133,983 primary THRs



Average age per diagnosis and gender
the past 10 years

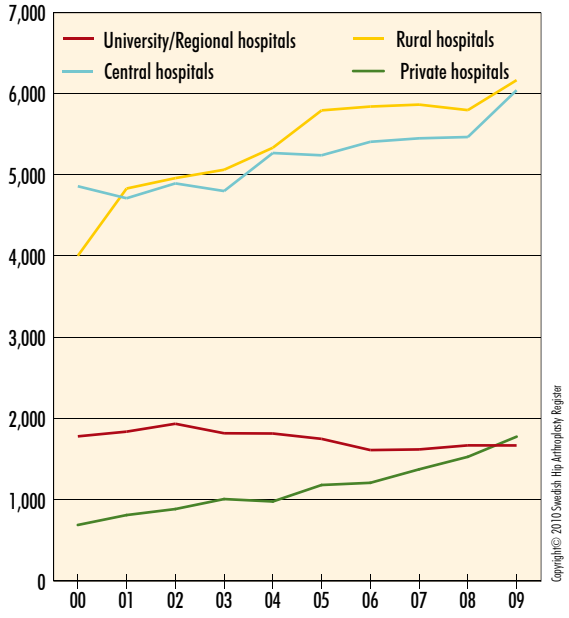
Diagnosis	Male	Female	Total
Fracture	73.5	75.8	75.2
Secondary arthritis after trauma	68.9	73.5	70.9
Primary osteoarthritis	67.2	69.8	68.7
Idiopathic femoral head necrosis	61.7	71.0	67.8
Tumor	70.0	62.6	66.1
Secundary osteoarthritis	64.2	65.8	65.0
Inflammatory arthritis	59.3	62.0	61.2
Childhood disease	54.4	53.4	53.7
(missing)	75.0	70.6	72.3
Total	67.2	69.9	68.8

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

Type of hospital	Male	Female	Total
Central Hospitals	67.7	70.8	69.6
Rural Hospitals	68.0	70.2	69.3
University/Regional Hospitals	64.2	68.3	66.7
Private Hospitals	64.9	67.6	66.5
Total	67.2	69.9	68.8

Trend in number of primary THRs

the past 10 years divided by type of hospital

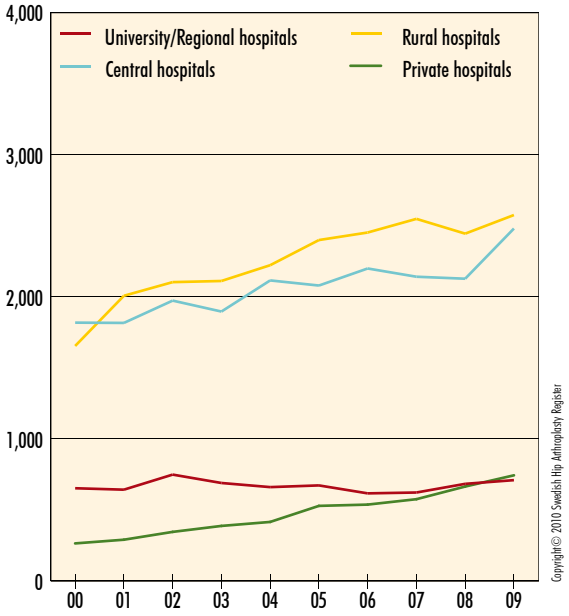


The structural change in Swedish elective orthopaedics is shown clearly in the Figure opposite. In 2009 the Swedish private hospitals performed for the first time more primary arthroplasties than the university and regional hospitals. This trend has both clear advantages and clear disadvantages. It may be that the productivity of arthroplasties increases for certain patient groups. Since county district hospitals and above all private hospitals operate on 'healthier' patients with less co-morbidity and technically simpler cases this may, however, mean that accessibility for the 'iller' and more serious cases is reduced. Other disadvantages in the long term:

- Possibilities for ongoing training of physicians and theatre staff suffer since training is concentrated to university and regional hospitals.
- Material for clinical studies of primary arthroplasties decreases dramatically. This may in the long term brake the development of hip arthroplasty in Sweden.
- It seems that relatively more men than women undergo surgery at private clinics.

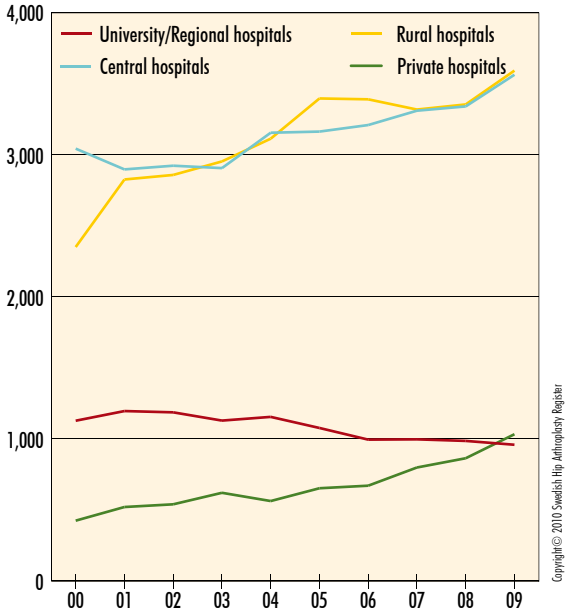
Trend in number of primary THRs

the past 10 years – only male



Trend in number of primary THRs

the past 10 years – only female



Notes

Re-operation

The term re-operation covers all types of surgical intervention that can be related directly to an inserted hip prosthesis. It may either be that the prosthesis is left untouched or a revision is performed in which the prosthesis or at least one of its parts is replaced or extracted. For the years 2005-2009 'major surgical intervention' without replacement of prosthesis components refers to one or more of the following measures: fracture reconstruction, supplementation of cup with augment, open repositioning, synovectomy, muscle/soft-tissue surgery and cement extraction. Minor surgical interventions commonly involve some form of wound revision or secondary suturing.

Related to the number of primary prostheses inserted, the proportion of re-operations has varied between 13.5 and 15.8% over the past 10 years. During the past three years the relative proportion has been fairly constant which, against the background of an increased number of primary prostheses inserted, means a corresponding increase in the number of re-operations (Figures 1-2). Between 2008 and 2009 an increase by over 100 operations was noted. The reason is that the measure cup/liner revision (+83) and combined cup/liner and stem revision (+42), and to a lesser extent definitive extraction (+7), increased while surgical interventions not affecting the prosthesis (-24) and stem revision (-5) showed a small decrease.

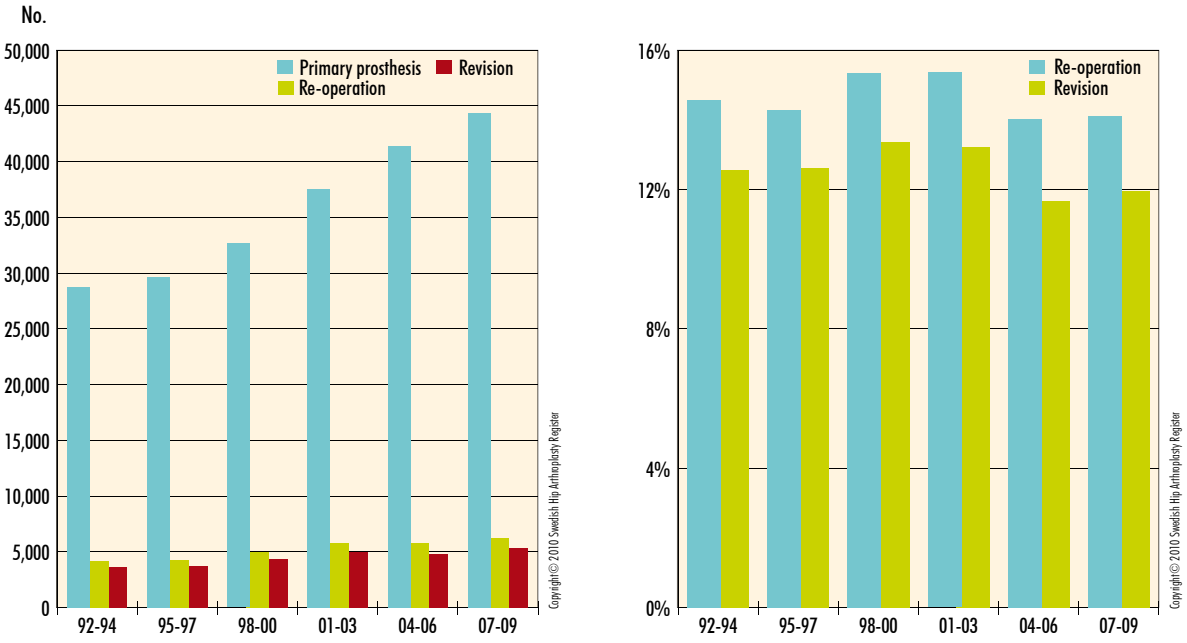


Figure 1-2 The number of primary prostheses, re-opererations och revisions in 3-year intervals (left) and their relative share with respect to the number of primary operations performed (right).

- **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 1979–2009

Procedure at reoperation	1979-2004	2005	2006	2007	2008	2009	Total	Share
Revision	24,418	1,606	1,596	1,712	1,725	1,873	32,930	85.0%
Major surgical intervention	2,963	157	139	147	152	146	3,704	9.6%
Minor surgical intervention	1,252	159	158	170	181	163	2,083	5.4%
(missing)	1	0	0	0	0	2	3	0.0%
Total	28,634	1,922	1,893	2,029	2,058	2,184	38,720	100%

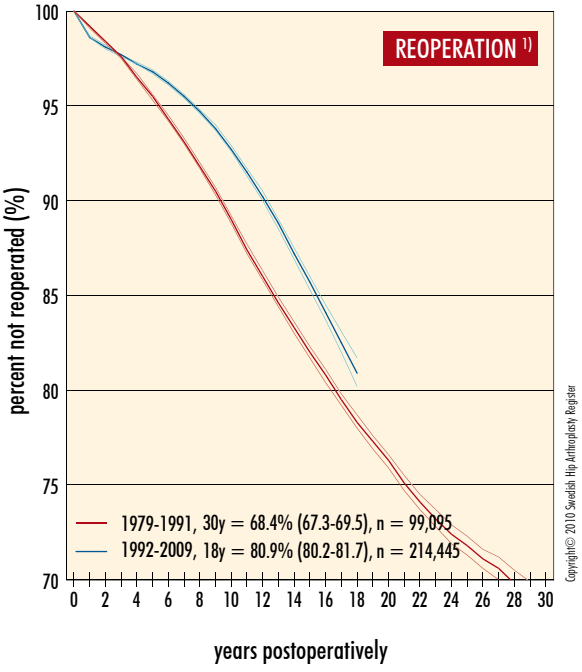
Number of reoperations per reason and year

primary THRs performed 1979–2009

Reason for reoperation	1979-2004	2005	2006	2007	2008	2009	Total	Share
Aseptic loosening	17,009	998	1,024	1,003	1,002	1,092	22,128	57.1%
Dislocation	3,176	268	262	302	299	272	4,579	11.8%
Deep infection	2,731	286	291	320	371	382	4,381	11.3%
Fracture	2,035	182	169	209	213	209	3,017	7.8%
2-stage procedure	1,209	102	78	83	73	94	1,639	4.2%
Technical error	873	21	15	37	43	54	1,043	2.7%
Miscellaneous	861	31	15	35	20	34	996	2.6%
Implant fracture	406	23	23	24	18	35	529	1.4%
Pain only	299	9	16	13	18	12	367	0.9%
Secondary infection	1	1	0	3	0	0	5	0.0%
(missing)	34	1	0	0	1	0	36	0.1%
Total	28,634	1,922	1,893	2,029	2,058	2,184	38,720	100%

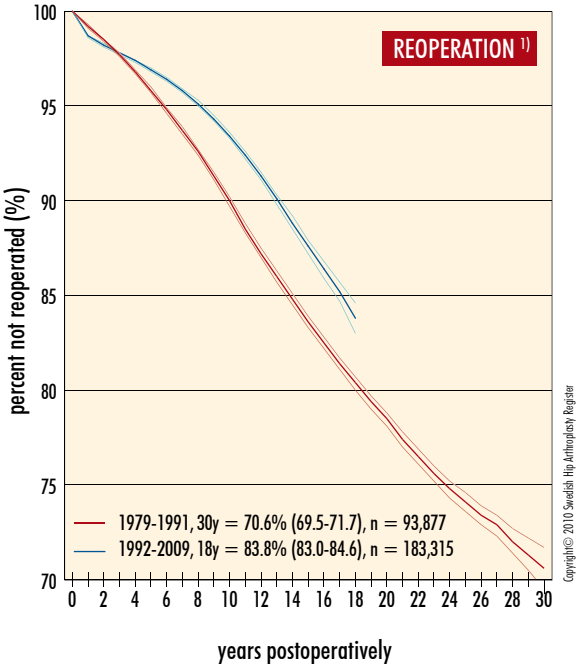
All implants

All diagnoses and all reasons



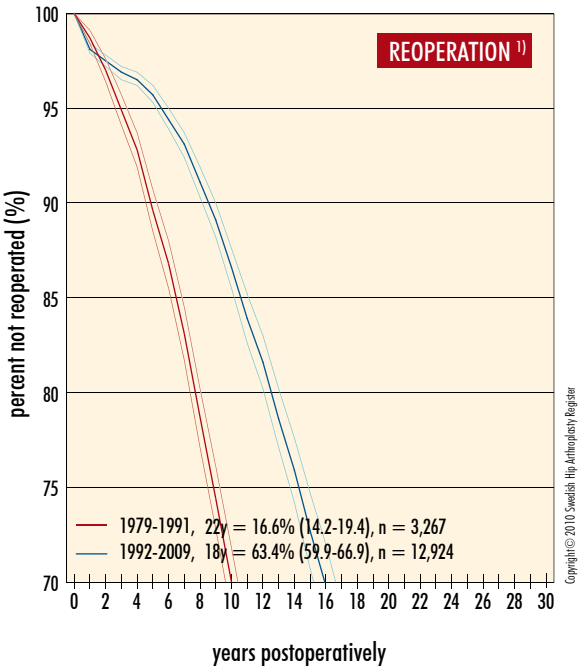
All cemented implants

All diagnoses and all reasons

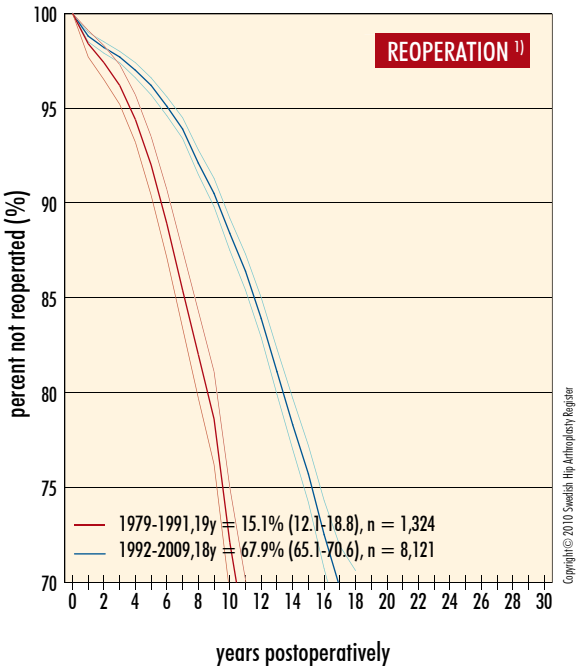


1) Survival statistics according to Kaplan-Meier with reoperation (all form of further surgery, including revision) as end-point definition.

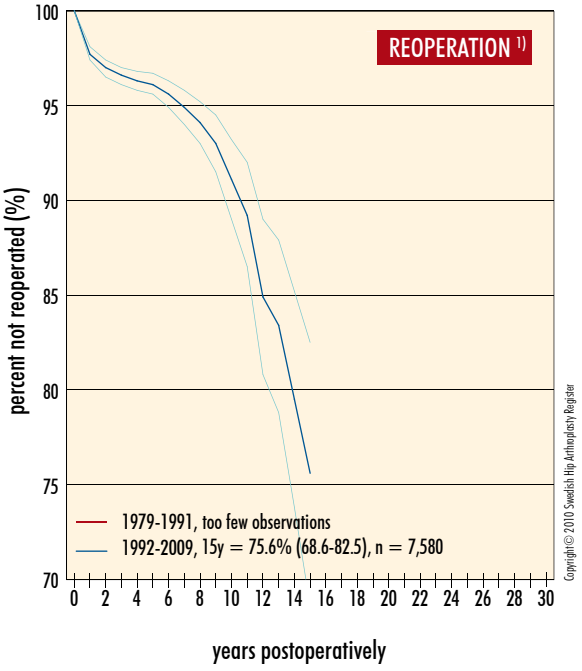
All uncemented implants
All diagnoses and all reasons



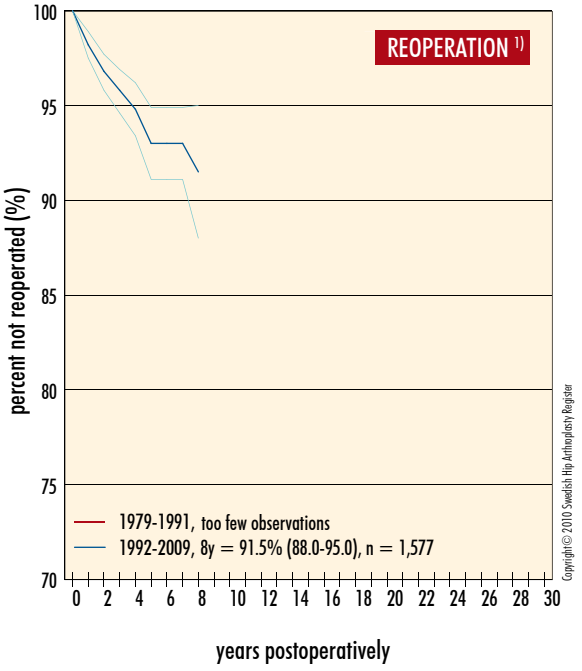
All hybrid implants
All diagnoses and all reasons



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 – re-operation within 2 years

In traditional survival statistics (Kaplan-Meier), exchange of some prosthesis component or removal of the whole prosthesis is the definition of failure. Five- or ten-year survival illustrates the long-term result regarding primarily aseptic loosening. Re-operation within 2 years, on the other hand, refers to all forms of further surgery (not only interventions where prosthesis components are exchanged) to the hip following insertion of total hip prosthesis. This variable reflects mainly early and serious complications such as deep infection and revision owing to repeated dislocations. This variable is therefore a faster indicator and easier to use for clinical improvement work than is ten-year survival, which is an important but slow and to some extent historical indicator.

Re-operation within two years has been selected by the Swedish Association of Local Authorities and Regions (SALAR) and the National Board of Health and Welfare (SoS) as national quality indicator for this type of surgery and is included in Open Comparisons. This indicator may be seen as perhaps the most important and most affectable measure of results reported by the Swedish Hip Arthroplasty Register.

Definition

By short-term complication is meant all forms of open surgery within two years of primary operation. The most recent 4-year period is studied – in this Report 2006 up to and including 2009. Note that the Report concerns only complications dealt with surgically. Infections treated with antibiotics and non-surgically-treated dislocations are not captured by the Register. Patients undergoing repeated surgery for the same complication are given as one complication. A number of patients, however, undergo re-operation for different reasons (are then registered as several complications) within a short time. Patients re-operated at a department other than the primary one are nevertheless ascribed to the primary department.

Results

Results by department are given in the following table. Hospital types, numbers undergoing primary surgery during the observation period and numbers undergoing re-operation are given. The national mean value during the observation period was 1.8%. The complication rate varied from 0 to 4.9%. Departments with frequencies one SD over the mean value are shown in red. Thirteen (13/79) departments exceeded this value. The hospitals reporting the highest re-operation frequency during the observation period showed alternately predominating infections or dislocations. In earlier years, chiefly problems of dislocation dominated among the hospitals reporting high complications figures, but it is now more common that infections dominate, which can be an ominous sign. During the past few years a number of local improvement schemes have been devoted to dislocation problems.

Between 2006–2009 a number of units reported extremely low complication figures, and two of these departments reported a zero result. Aleris, which started up during that year, reported no complications, which may be because this group had not yet come up to a complete observation period. Växjö department also reported zero complications which appears low among 504 interventions. The same department reported the worst national degree of coverage regarding primary arthroplasties, which can suggest a problem of registration. That certain high-output units should have no more than one or two, or even no, complications according to the definition above – and that during four years – appears improbable. The reporting of re-operations earlier suffered a somewhat poorer degree of coverage than the reporting of primary arthroplasties. The current analysis of degree of coverage does not include re-operations owing to coding problems in the Patient Register at the National Board of Health and Welfare (See Degree of coverage, page 6). The Registry management would urge all units to review their routines for reporting of re-operations, which is thus a broader concept than revision – see above.

Discussion

When interpreting results only units of the same hospital type should be compared in view of varying patient demography. Units that undertake the most serious cases with greater risks of complication may naturally have a higher frequency. Apart from the hospitals' differing risk profiles, the following should also be included in the interpretation of these results.

- Complication rates are generally low and random variability has a greater effect on the results. This variable can really only be evaluated over time, i.e. if there are clear trends.
- Departments with a wait-and-see attitude (non-surgical treatment of for example infection and dislocation), i.e. those that avoid operating for these complications, are not registered in the database.
- Conversely, departments that are surgically 'aggressive' both on suspicion of early infection and on first-time dislocation have higher frequencies of early complications. The treatment algorithm in early suspected deep infection has, both for knee and hip arthroplasty, changed during the past few years. It is increasingly common to intervene surgically early

When interpreting the variable re-operation within 2 years, the following factors must be observed:

- **Hospital type**
- **Patient demography.**
- **The complication rates are generally low and random variability has great influence on the results.**
- **This variable can only be evaluated over time, that is if clear trends are present**
- **Note that the Report refers only to complications for which surgical measures have been taken.**

on with 'debridement' with or without exchange of modular components. It is therefore of great importance to report not only classical revisions but also re-operations of all types. Validation is currently taking place via a matching of the Hip Arthroplasty Register and the Pharmaceuticals Register at the National Board of Health and Welfare with the aim of mapping the 'true' incidence of implant-related infections throughout the country.

- Should a department have a persistently high proportion of short-term complications, an in-depth analysis should be started with a review of indications, routines, surgical technique and possibly selection of implants. Since the study covers patients undergoing surgery during a 4-year period, 1-2 years may pass before successful improvement is reflected in the results table.

Registry management have completely avoided ranking the various hospitals on the basis of this important result indicator. Since complication rates in general are low, a drop in registration can strongly affect a unit's result. Several county councils, however, are seeking to rank and 'accredit' various departments. Registry management are critical of this development, partly because some departments do not report all re-operations, partly because of the problems of interpretation that can arise as above.

Irrespective of hospital category and result, departments should analyse their complications and investigate whether there are systematic shortcomings – all this to achieve the best possible result for the individual patient.

Reoperation within 2 years per hospital - trend

2002–2009

Hospital	2002-2005	2003-2006	2004-2007	2005-2008	2006-2009
University/Regional Hospitals	%	%	%	%	%
Karolinska/Huddinge	2.3%	2.8%	3.0%	3.2%	2.8%
Karolinska/Solna	3.6%	3.9%	3.4%	3.1%	3.2%
Linköping	1.2%	1.6%	1.4%	0.9%	0.9%
Lund	3.1%	4.1%	4.6%	3.8%	2.9%
Malmö	2.9%	2.1%	2.2%	1.6%	1.2%
SU/Mölndal	1.4%	2.4%	3.4%	4.5%	4.0%
SU/Sahlgrenska	2.2%	1.5%	1.2%	1.1%	0.6%
SU/Östra	0.4%	1.1%	2.3%	2.5%	2.8%
Umeå	2.0%	1.0%	1.3%	0.9%	1.1%
Uppsala	3.9%	3.6%	3.4%	3.4%	2.5%
Örebro	1.4%	1.0%	1.5%	1.1%	1.2%
Central Hospitals					
Borås	3.5%	3.4%	2.7%	2.3%	2.2%
Danderyd	2.4%	2.4%	1.9%	2.3%	2.6%
Eksjö	2.3%	2.4%	2.0%	2.5%	2.8%
Eskilstuna	1.1%	1.3%	1.9%	1.4%	1.5%
Falun	1.0%	0.8%	0.8%	1.2%	1.3%
Gävle	3.3%	4.2%	5.8%	5.0%	4.2%
Halmstad	2.8%	2.7%	2.0%	2.5%	2.3%
Helsingborg	0.4%	1.7%	2.5%	3.4%	3.4%
Hässleholm-Kristianstad	1.2%	1.3%	1.4%	1.7%	1.6%
Jönköping	2.1%	2.1%	1.4%	1.3%	1.5%
Kalmar	1.8%	2.8%	2.7%	2.5%	2.8%
Karlskrona	2.4%	3.3%	4.1%	5.1%	3.0%
Karlstad	3.0%	2.6%	2.7%	2.9%	3.1%
Norrköping	0.9%	0.6%	0.5%	1.1%	1.1%
S:t Göran	3.0%	2.6%	1.8%	1.3%	0.9%
Skövde	1.3%	1.4%	1.0%	0.7%	0.6%
Sunderby (Boden included)	3.3%	4.0%	4.8%	5.4%	4.9%
Sundsvall	5.4%	4.7%	4.5%	4.9%	4.0%
Södersjukhuset	2.1%	2.4%	2.6%	2.2%	1.9%
Uddevalla	2.3%	2.6%	2.1%	2.1%	1.6%
Varberg	2.5%	2.7%	2.7%	1.4%	1.5%
Västerås	0.8%	0.8%	1.8%	2.5%	2.6%
Växjö	0.9%	0.6%	0.4%	0.4%	0.0%
Östersund	2.2%	1.8%	2.1%	2.3%	1.8%
Länsdelsjukhus					
Alingsås	0.7%	1.2%	1.3%	1.4%	1.6%
Arvika	2.4%	2.5%	2.4%	2.5%	1.6%
Bollnäs	1.5%	1.4%	1.7%	1.4%	1.2%
Enköping	2.3%	1.9%	1.6%	2.8%	2.9%

(continued on next page.)

Reoperation within 2 years per hospital - trend (cont.)

2002–2009

Hospital	2002-2005	2003-2006	2004-2007	2005-2008	2006-2009
Falköping	0.7%	0.4%	0.2%	0.2%	0.2%
Frölunda Specialistsjukhus	1.4%	1.0%	2.1%	2.0%	1.7%
Gällivare	2.5%	2.2%	1.7%	0.9%	0.5%
Hudiksvall	3.1%	3.7%	3.1%	3.2%	2.9%
Karlshamn	1.5%	1.9%	1.9%	1.7%	1.4%
Karlskoga	1.4%	1.5%	1.5%	1.3%	1.1%
Katrineholm	0.8%	0.9%	1.0%	0.6%	0.6%
Kungälv	0.4%	1.0%	1.6%	2.0%	1.8%
Köping	0.6%	1.0%	1.3%	1.8%	1.9%
Lidköping	0.2%	0.6%	0.7%	0.7%	0.6%
Lindesberg	1.6%	1.8%	2.4%	1.9%	2.0%
Ljungby	0.7%	0.7%	1.1%	0.9%	0.7%
Lycksele	0.1%	0.2%	0.5%	0.6%	0.7%
Mora	1.0%	1.2%	1.4%	1.7%	1.1%
Motala	1.5%	1.8%	1.8%	1.8%	2.1%
Norrtälje	2.2%	2.1%	1.0%	1.2%	2.0%
Nyköping	2.5%	2.1%	1.6%	1.7%	1.5%
Oskarshamn	0.4%	0.4%	0.5%	0.9%	0.9%
Piteå	1.8%	1.9%	1.8%	1.4%	1.2%
Skellefteå	1.5%	1.0%	0.7%	0.7%	0.5%
Skene	0.3%	0.6%	1.3%	1.3%	1.6%
Sollefteå	1.3%	1.4%	1.5%	1.8%	1.0%
Södertälje	0.0%	0.2%	0.6%	0.9%	1.0%
Torsby	0.4%	1.5%	2.6%	2.2%	2.6%
Trelleborg	2.2%	1.9%	1.9%	1.6%	1.4%
Visby	3.8%	4.2%	3.0%	2.7%	1.7%
Värnamo	1.1%	0.8%	0.7%	0.7%	1.0%
Västervik	2.6%	2.3%	3.4%	2.8%	3.1%
Ängelholm	0.8%	1.0%	1.3%	0.0%	3.9%
Örnsköldsvik	1.3%	0.9%	0.6%	0.6%	0.7%
Private Hospitals					
Aleris Specialistvård Sabbatsberg	0.5%	0.6%	0.7%	0.0%	0.0%
Carlanderska	0.0%	0.5%	0.9%	1.4%	1.9%
Elisabethsjukhuset	1.2%	0.6%	0.5%	0.5%	0.4%
GMC	3.3%	2.7%	2.5%	1.9%	1.6%
Movement	0.0%	2.8%	2.0%	1.6%	1.7%
Nacka Närsjukhus Proxima	0.0%	4.1%	3.7%	4.2%	2.5%
Ortho Center Stockholm	3.0%	3.5%	3.2%	3.5%	2.2%
OrthoCenter IFK-kliniken	0.0%	0.0%	0.0%	0.0%	0.5%
Ortopediska Huset	0.8%	1.1%	1.8%	2.0%	2.0%
Sophiahemmet	1.1%	1.1%	1.1%	1.7%	2.0%
Spenshult	0.0%	0.0%	2.7%	2.6%	2.1%
Nation	1.8%	1.9%	1.9%	1.9%	1.8%

Reoperation within 2 years per hospital

2006–2009

	Prim. THRs	Patients [1]		Infection		Dislocation		Loosening		Others	
Hospital	number	number	%	number	%	number	%	number	%	number	%
University/Regional Hospitals											
Karolinska/Huddinge	1,040	29	2.8%	5	0.5%	11	1.1%	1	0.1%	16	1.5%
Karolinska/Solna	820	26	3.2%	15	1.8%	5	0.6%	0	0.0%	9	1.1%
Linköping	218	2	0.9%	0	0.0%	2	0.9%	0	0.0%	0	0.0%
Lund	342	10	2.9%	2	0.6%	4	1.2%	0	0.0%	4	1.2%
Malmö	405	5	1.2%	1	0.2%	1	0.2%	0	0.0%	3	0.7%
SU/Mölndal	898	36	4.0%	16	1.8%	10	1.1%	0	0.0%	15	1.7%
SU/Sahlgrenska	167	1	0.6%	0	0.0%	1	0.6%	0	0.0%	0	0.0%
SU/Östra	431	12	2.8%	5	1.2%	4	0.9%	1	0.2%	5	1.2%
Umeå	351	4	1.1%	1	0.3%	2	0.6%	0	0.0%	1	0.3%
Uppsala	1,162	29	2.5%	12	1.0%	14	1.2%	2	0.2%	9	0.8%
Örebro	729	9	1.2%	5	0.7%	2	0.3%	0	0.0%	3	0.4%
Central Hospitals											
Borås	820	18	2.2%	9	1.1%	6	0.7%	0	0.0%	5	0.6%
Danderyd	1,553	40	2.6%	8	0.5%	13	0.8%	3	0.2%	19	1.2%
Eksjö	792	22	2.8%	15	1.9%	7	0.9%	0	0.0%	2	0.3%
Eskilstuna	395	6	1.5%	3	0.8%	2	0.5%	0	0.0%	1	0.3%
Falun	1,114	14	1.3%	11	1.0%	3	0.3%	0	0.0%	2	0.2%
Gävle	571	24	4.2%	8	1.4%	6	1.1%	1	0.2%	10	1.8%
Halmstad	923	21	2.3%	8	0.9%	10	1.1%	0	0.0%	4	0.4%
Helsingborg	267	9	3.4%	5	1.9%	1	0.4%	0	0.0%	5	1.9%
Hässleholm-Kristianstad	3,349	53	1.6%	30	0.9%	7	0.2%	7	0.2%	17	0.5%
Jönköping	797	12	1.5%	7	0.9%	4	0.5%	0	0.0%	4	0.5%
Kalmar	714	20	2.8%	11	1.5%	7	1.0%	0	0.0%	4	0.6%
Karlskrona	101	3	3.0%	0	0.0%	3	3.0%	0	0.0%	0	0.0%
Karlstad	1,111	34	3.1%	24	2.2%	4	0.4%	1	0.1%	8	0.7%
Norrköping	704	8	1.1%	3	0.4%	2	0.3%	0	0.0%	3	0.4%
S:t Göran	1,519	13	0.9%	3	0.2%	4	0.3%	2	0.1%	7	0.5%
Skövde	496	3	0.6%	0	0.0%	1	0.2%	1	0.2%	1	0.2%
Sunderby (Boden included)	226	11	4.9%	3	1.3%	8	3.5%	0	0.0%	0	0.0%
Sundsvall	593	24	4.0%	17	2.9%	6	1.0%	0	0.0%	7	1.2%
Södersjukhuset	1,697	32	1.9%	24	1.4%	3	0.2%	0	0.0%	10	0.6%
Uddevalla	1,346	22	1.6%	9	0.7%	7	0.5%	2	0.1%	7	0.5%
Varberg	915	14	1.5%	5	0.5%	1	0.1%	2	0.2%	6	0.7%
Västerås	1,010	26	2.6%	11	1.1%	9	0.9%	0	0.0%	8	0.8%
Växjö	504	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Östersund	819	15	1.8%	5	0.6%	6	0.7%	1	0.1%	5	0.6%
Rural Hospitals											
Alingsås	850	14	1.6%	6	0.7%	6	0.7%	1	0.1%	1	0.1%
Arvika	500	8	1.6%	6	1.2%	0	0.0%	1	0.2%	3	0.6%
Bollnäs	1,073	13	1.2%	5	0.5%	4	0.4%	0	0.0%	4	0.4%
Enköping	825	24	2.9%	7	0.8%	16	1.9%	1	0.1%	5	0.6%
Falköping	981	2	0.2%	1	0.1%	0	0.0%	1	0.1%	0	0.0%
Frölunda Specialistsjukhus	287	5	1.7%	1	0.3%	1	0.3%	0	0.0%	4	1.4%
Gällivare	395	2	0.5%	0	0.0%	2	0.5%	0	0.0%	0	0.0%
Hudiksvall	511	15	2.9%	8	1.6%	3	0.6%	0	0.0%	5	1.0%

Reoperation within 2 years per hospital (cont.)

2006–2009

	Prim. THRs	Patients [1]		Infection		Dislocation		Loosening		Others	
Hospital	number	number	%	number	%	number	%	number	%	number	%
Karlshamn	763	11	1.4%	1	0.1%	8	1.0%	0	0.0%	3	0.4%
Karlskoga	447	5	1.1%	1	0.2%	1	0.2%	0	0.0%	3	0.7%
Katrineholm	875	5	0.6%	3	0.3%	1	0.1%	0	0.0%	1	0.1%
Kungälv	763	14	1.8%	10	1.3%	2	0.3%	1	0.1%	3	0.4%
Köping	467	9	1.9%	3	0.6%	5	1.1%	1	0.2%	1	0.2%
Lidköping	530	3	0.6%	0	0.0%	2	0.4%	0	0.0%	1	0.2%
Lindesberg	655	13	2.0%	5	0.8%	2	0.3%	0	0.0%	8	1.2%
Ljungby	545	4	0.7%	0	0.0%	3	0.6%	0	0.0%	1	0.2%
Lycksele	1,033	7	0.7%	6	0.6%	1	0.1%	0	0.0%	4	0.4%
Mora	696	8	1.1%	3	0.4%	2	0.3%	0	0.0%	3	0.4%
Motala	1,525	32	2.1%	13	0.9%	11	0.7%	1	0.1%	12	0.8%
Norrtälje	443	9	2.0%	1	0.2%	5	1.1%	1	0.2%	2	0.5%
Nyköping	604	9	1.5%	6	1.0%	2	0.3%	0	0.0%	2	0.3%
Oskarshamn	906	8	0.9%	6	0.7%	2	0.2%	0	0.0%	0	0.0%
Piteå	1,386	17	1.2%	10	0.7%	3	0.2%	2	0.1%	4	0.3%
Skellefteå	379	2	0.5%	1	0.3%	1	0.3%	0	0.0%	0	0.0%
Skene	318	5	1.6%	4	1.3%	1	0.3%	0	0.0%	2	0.6%
Sollefteå	482	5	1.0%	2	0.4%	2	0.4%	0	0.0%	2	0.4%
Södertälje	487	5	1.0%	4	0.8%	1	0.2%	0	0.0%	3	0.6%
Torsby	342	9	2.6%	7	2.0%	0	0.0%	0	0.0%	5	1.5%
Trelleborg	2,316	33	1.4%	9	0.4%	5	0.2%	4	0.2%	18	0.8%
Visby	515	9	1.7%	2	0.4%	2	0.4%	0	0.0%	5	1.0%
Värnamo	574	6	1.0%	1	0.2%	3	0.5%	0	0.0%	2	0.3%
Västervik	426	13	**3.1%**	10	2.3%	2	0.5%	0	0.0%	1	0.2%
Ängelholm	51	2	**3.9%**	1	2.0%	0	0.0%	1	2.0%	0	0.0%
Örnsköldsvik	711	5	0.7%	1	0.1%	3	0.4%	0	0.0%	1	0.1%
Private Hospitals											
Aleris Specialistvård Sabbatsberg	122	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Carlanderska	207	4	1.9%	1	0.5%	2	1.0%	0	0.0%	1	0.5%
Elisabethsjukhuset	550	2	0.4%	0	0.0%	0	0.0%	0	0.0%	2	0.4%
GMC	61	1	1.6%	1	1.6%	1	1.6%	0	0.0%	0	0.0%
Movement	593	10	1.7%	5	0.8%	4	0.7%	0	0.0%	2	0.3%
Nacka Närsjukhus Proxima	201	5	2.5%	1	0.5%	1	0.5%	2	1.0%	2	1.0%
Ortho Center Stockholm	990	22	2.2%	6	0.6%	10	1.0%	2	0.2%	8	0.8%
OrthoCenter IFK-kliniken	216	1	0.5%	1	0.5%	0	0.0%	0	0.0%	0	0.0%
Ortopediska Huset	1,859	38	2.0%	9	0.5%	14	0.8%	4	0.2%	15	0.8%
Sophiahemmet	751	15	2.0%	4	0.5%	1	0.1%	2	0.3%	9	1.2%
Spenshult	332	7	2.1%	3	0.9%	3	0.9%	0	0.0%	4	1.2%
Nation	58,463	1,043	1.8%	456	0.8%	314	0.5%	49	0.1%	352	0.6%

Red mark denotes values one standard deviation below national average.

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.. Units with less than 50 primary THRs are excluded.

Readmission within 30 days

During the past few years the Swedish Hip Arthroplasty Register has established co-operation with the Patient Register at the National Board of Health and Welfare. In Open Comparisons, a national quality indicator has been created via the Patient Register: 'Adverse Events following Hip and Knee Arthroplasty'. The Registry has used this analysis to run a separate analysis for hip arthroplasty only, which is presented at county-council level.

A number of foreign studies have shown that the number of 'adverse events' (complications) within 30 days following discharge varies between hospitals and that an increase associated with shorter care times has been seen. In Sweden, too, mean care times during the past 10 years have shortened from about 10 days (1998) to 5.2 days (2009). The endeavour to lower care times has both a productivity incentive and an accessibility incentive. Any cost reduction, would disappear directly, however, if readmissions were to increase at the same time owing to shorter periods in hospital.

Material and method

All patients undergoing total hip arthroplasty during 2007–2009 (NFB 29, 39, 49, 62 and 99) constituted the basic material. 'Adverse events' (complications) comprised all local complications (depending on the hip surgery performed) and general complications (cardiovascular, pneumonia, stroke, ulcers, urinary retention) and death within 30 days.

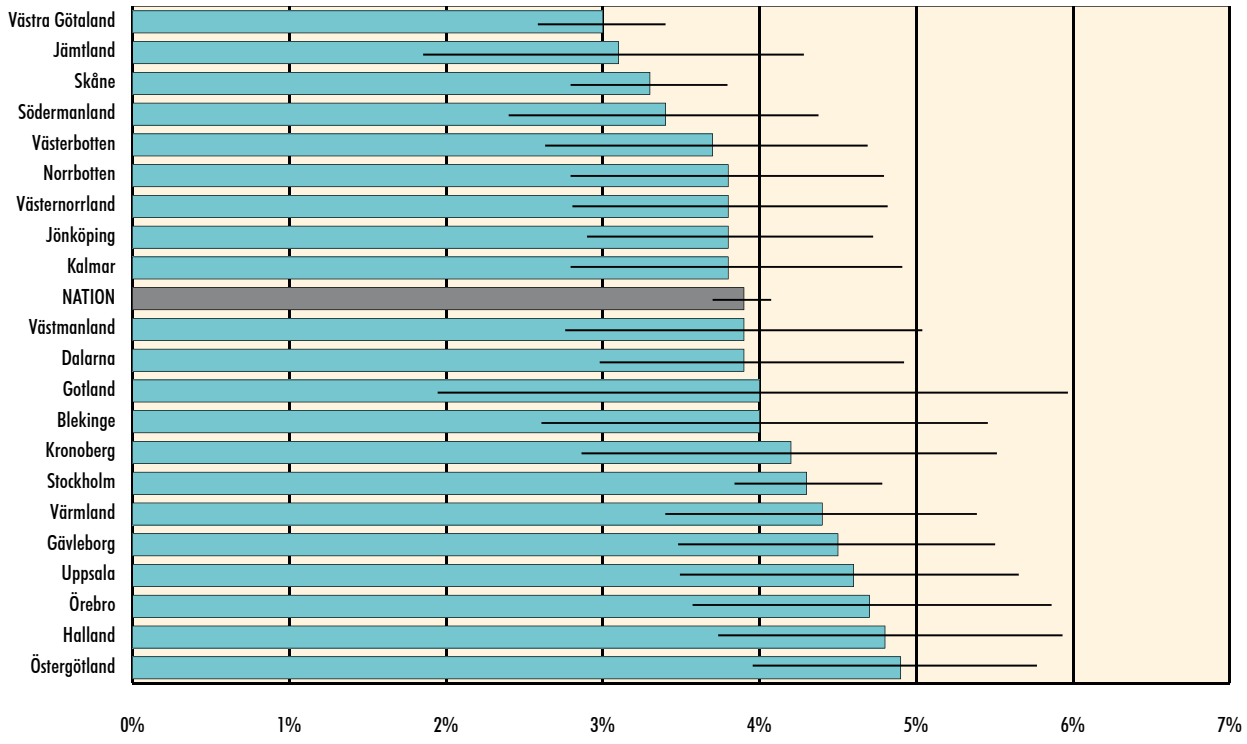
Result

See bar diagram below. The national mean average was 3.9%, i.e. 4 of 100 operated patients readmitted with some form of complication or died (a few promille). There was a relatively large spread between county councils, 3.0%-4.9%. In the analysis we found, as a discrepancy with other studies, no clear connection between shorter care time and readmission frequency. However, the patients needing readmission had a primary care time exceeding the mean by 1-2 days (constant for the whole 10-year period). This indicates that the population requiring re-admission within 30 days was 'iller' from the start. In current comprehensive matching between the Patient Register and the Hip Arthroplasty Register we intend to calculate a co-morbidity index ad modum Charlson for a large number of patients, and to correlate this with outcome. This index should be included in pre-operative screening and it is hoped that the analysis may identify predictors that can be attended to in the pre-operative optimisation for this particular intervention, which is most often elective. An in-depth analysis down to hospital level, in the form of a research project, is in hand.

Problems

This type of analysis from the Patient Register (PAR) may in the future be of great significance for continued quality development for Swedish hip arthroplasty. In the PAR we can capture variables not registered in our normal Registry routines. However there are some sources of error, discussed under Degree of coverage (page 8). The Patient Register has a lower degree of coverage than the Hip Arthroplasty Register (93.3% and 97.4%, respectively) and a number of hospital amalgamations have been carried out, with joint reporting to the Patient Register even though the surgery has been performed at different hospitals. However, the greatest source of error is probably 'carelessness' with the ICD-10-coding and the fact that many patients have numerous secondary diagnoses when discharged, where the most relevant diagnosis for the care occasion is not always given as the first diagnosis. These factors probably mean that the analysis shows values that are somewhat too low.

Readmission within 30 days after total hip replacement surgery
2006-2009



Notes

Revision

Trends

Revision means a new operation on a previously inserted prosthesis where one or more of its components are replaced or extracted. Since 2006 the total number of revisions has grown from 1,596 to 1,873, an increase of 17%. During 2009, 251 more first-time revisions were done than in 2006. The relative proportion of multiple operations increased from 19.9% (n=301) in 2006 to 22.8% (n=427) in 2009.

Compared with 2008, 2009 saw the greatest increase in revisions for aseptic loosening (+88 change in percentual proportion: ±0%). Thus the increase here corresponds to what is generally seen between the two years (from 1,725 to 1,873). Revision for infection increased (+38, +1.3%), which is a long-term trend (Figure 1). The number of revisions for fracture was unchanged (-1, -0.7%) and the number for dislocation declined (-24, -2.5%). Compared with 2000, however, the relative proportion of revisions for dislocation increased by 2.5%. In addition, an increase in the insertion of prostheses in connection with the two-stage procedure (+20, -0.7%) was noted, probably as an effect of the increasing number of revisions for deep infection. The group 'revision for technical reasons' increased since 2006 from 9 to 44 operations in 2009 (from 0.6 to 2.3% of the total number). The reason for this is a tendency to use, instead of the causal group 'dislocation and early loosening', the term 'technical cause' where the dislocation was obviously caused by one or more prosthesis components being misaligned or not fixed adequately during surgery.

Gender

Compared with the gender distribution for primary operations, the proportion of women undergoing revision was fewer than expected. Between 2000 and 2009, 59% of those receiving primary arthroplasty were women. In the group revised for the first time, 52.2% were women. Among the six commonest causes of revision during the same period, the difference was particularly clear for the causal group 'deep infection' (n=905, 56.7% men). For the diagnoses loosening (n=8,708), fracture (n=1,019) and implant fracture (n=179) the proportion of men was 47.7-49.7%, while the proportion of women undergoing first-time revision for dislocation (n=1,455) and technical reasons (n=141) exceeded 60% (Figure 2).

Gender distribution among the patients undergoing more than one revision of the same hip during the period and regardless of reason for revision (n=3,636) was about the same as for first-time revision (51.5% women). Regarding how the risk varied between the genders after adjustment for co-variation among different risk factors, see Gender perspective.

BMI and ASA

Registration of BMI and ASA had its breakthrough in 2008. In that year, they were registered for about 90% of the primary prostheses. Up to and including 2009 this information was available for 25,380 primary and 2,694 revision prosthesis operations. After statistical adjustment for age, gender and diagnosis (logistic regression) and class division of BMI into underweight (<18.50), normal weight (18.5-24.99), overweight (25.00-29.99) and obesity (30 or more), patients with obesity (compared with normal weight) had an increased risk of revision irrespective of cause (RR: 1.13, CI: 1.01-1.26). The risk of revision for loosening was lower for underweight patients (RR: 0.44, CI: 0.25-0.78) but there was no clear increase for those with obesity (RR: 1.13, CI: 0.98-1.31).

The corresponding analysis of ASA class shows that patients undergoing revision (irrespective of cause) had a higher ASA degree, i.e. greater morbidity, than those undergoing primary arthroplasties. The probability for a patient undergoing revision to be placed in ASA class 2 compared to a primary-arthroplasty patient was greater by about 30% (RR: 1.31, CI: 1.16-1.47). 'The

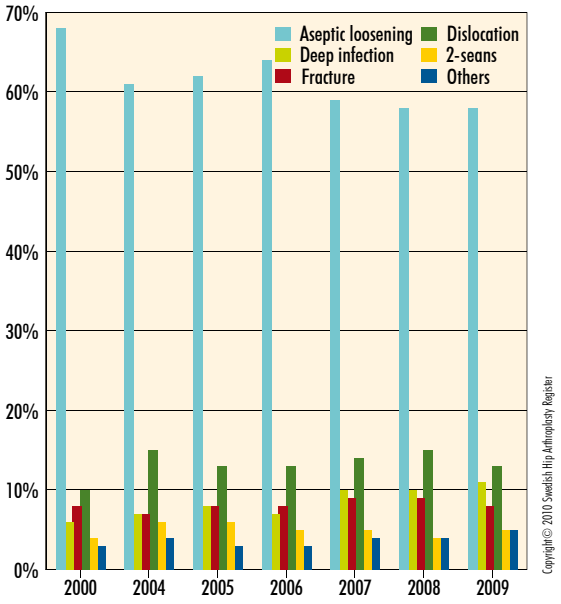


Figure 1. Reason for revision, regardless of the number of previous revisions, 2000 and 2004-2009.

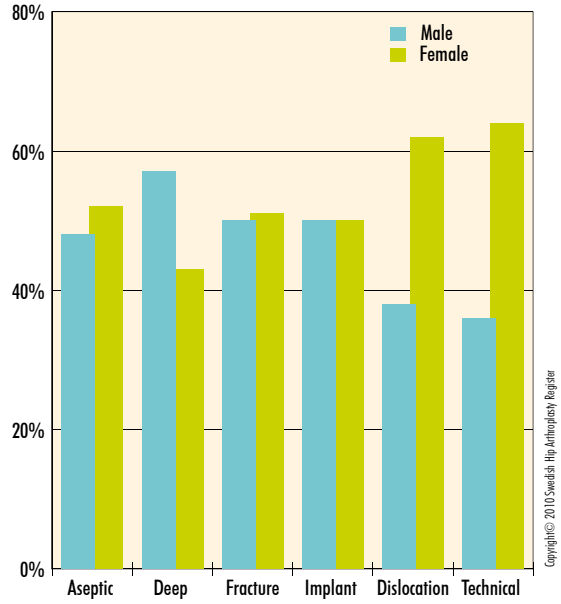


Figure 2. Distribution of sex related to the six most common reasons for revision, 2000-2009 (excl. reinserting prosthesis at two-stage procedure).

risk' of being placed in class 3 was approximately doubled (RR: 2.05, CI: 1.79-2.35) and in class 4 quadrupled 300% (RR: 4.10, CI: 2.84-5.90).

In summary, patients undergoing revision were often more overweight and more frequently had serious associated diseases than those receiving primary prostheses.

Choice of implant

In revision, uncemented fixation is being used more and more frequently (Figures 3-4). For an idea of how choice of prosthesis has changed during the past ten years we started with the four most used cemented and uncemented components in 2009 and their relative proportions during the three immediately preceding years and during 2000.

During 2009, 52% of the cups were cemented and 48% uncemented. The four most used cemented implants during these years were the Contemporary Hooded Duration (21%), Lubinus wholly plastic (20.4%), Charnley, Charnley Elite, Marathon (18.9%) and Avantage (10.9%). These represented about 70% of the total number (Figures 5-8). The four most used uncemented implants for that year were Trabecular metal cup (TMT, all variants: 43%), Trilogy ±HA (25.5%), Trident HA (14.6%) and Mallory Head (6.3%).

During 2009 somewhat over half the stems were cemented (54%). The four most used during that year were Exeter (41.6%), Lubinus SP II (31.5%), CPT (13.6%) and Spectron Revision (6.2%), which together represented 92.9% of the total using this type of fixation. Corresponding uncemented were MP (42%), Restoration (20.6%), Revitan (15.6%) and Corail (7.7%), representing about 86% of the total number. In the Registry database it is noted whether the patient was treated with bone transplantation. The technique used is, however, often unclear. During 2006-2009 homologous bone grafting was used in about one quarter of cases, 22-31%, depending on year of operation; and in uncemented revision in 3-5% of cases.

Apart from design change of the Exeter cup to Contemporary Hooded Duration (which did not exist in Sweden in 2000) it is noted among the cemented implants that Avantage increased to address dislocation problems. Also noted was the arrival of a further polished stem CPT. Among the uncemented cups the reduction for Trilogy and the arrival and increasing use of the TMT cup were a clear trend. Several manufacturers now offer similar concepts in which, through modifying the porous surface, the porosity and/or friction against the bone tissue are increased. Among the uncemented stems the modular variants increased in popularity. In 2000 105 stems of this type were inserted. In 2009 the number was up to 390.

In summary we find a clear trend to more use of uncemented revision prostheses. The reason for this is multifactorial. Uncemented prostheses and particularly modular prostheses facilitate reconstruction of the anatomic circumstances and the absence of cement can simplify healing of the bone tissue, especially in revision of fractures near the prosthesis. Several studies have shown good results for cementing, especially if the bone destruction is not excessive. Exceptionally good results have also been shown from some centres when cementing is combined with bone-packing technique. Revision surgery is often extremely complex, for which reason the surgeon's experience of different types of technique is often decisive and in many cases is as important as the choice of fixation type.

Modular MP stems or cemented long stems

In a project of collaboration with Karolinska University Hospital we have evaluated the risk of re-revision subsequent to insertion of MP stems. Patients undergoing revision with cemented

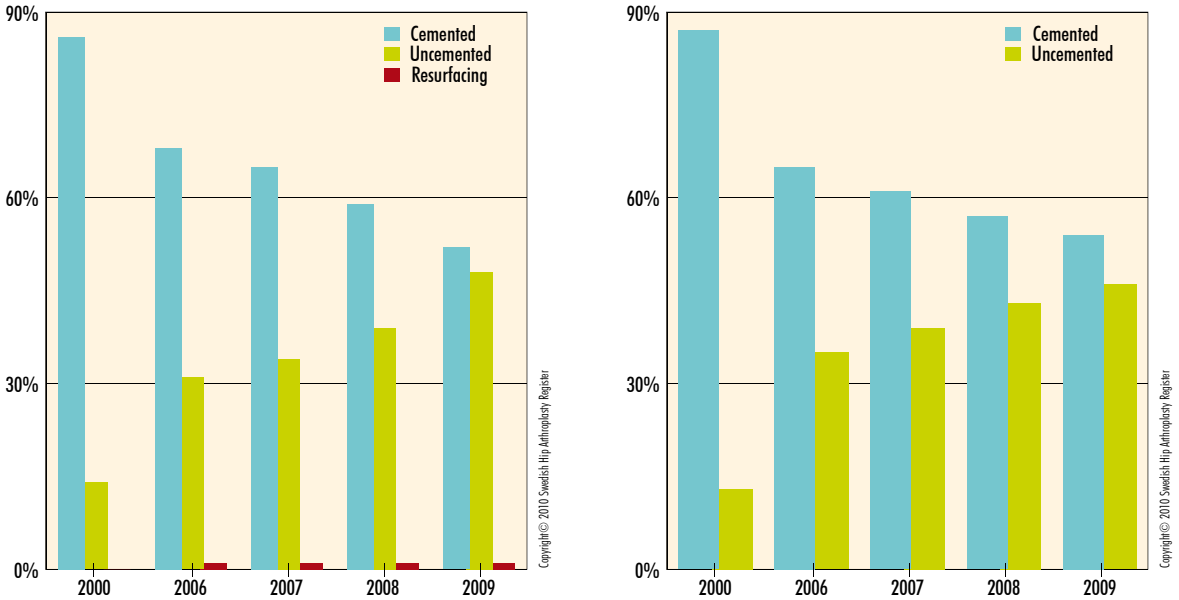
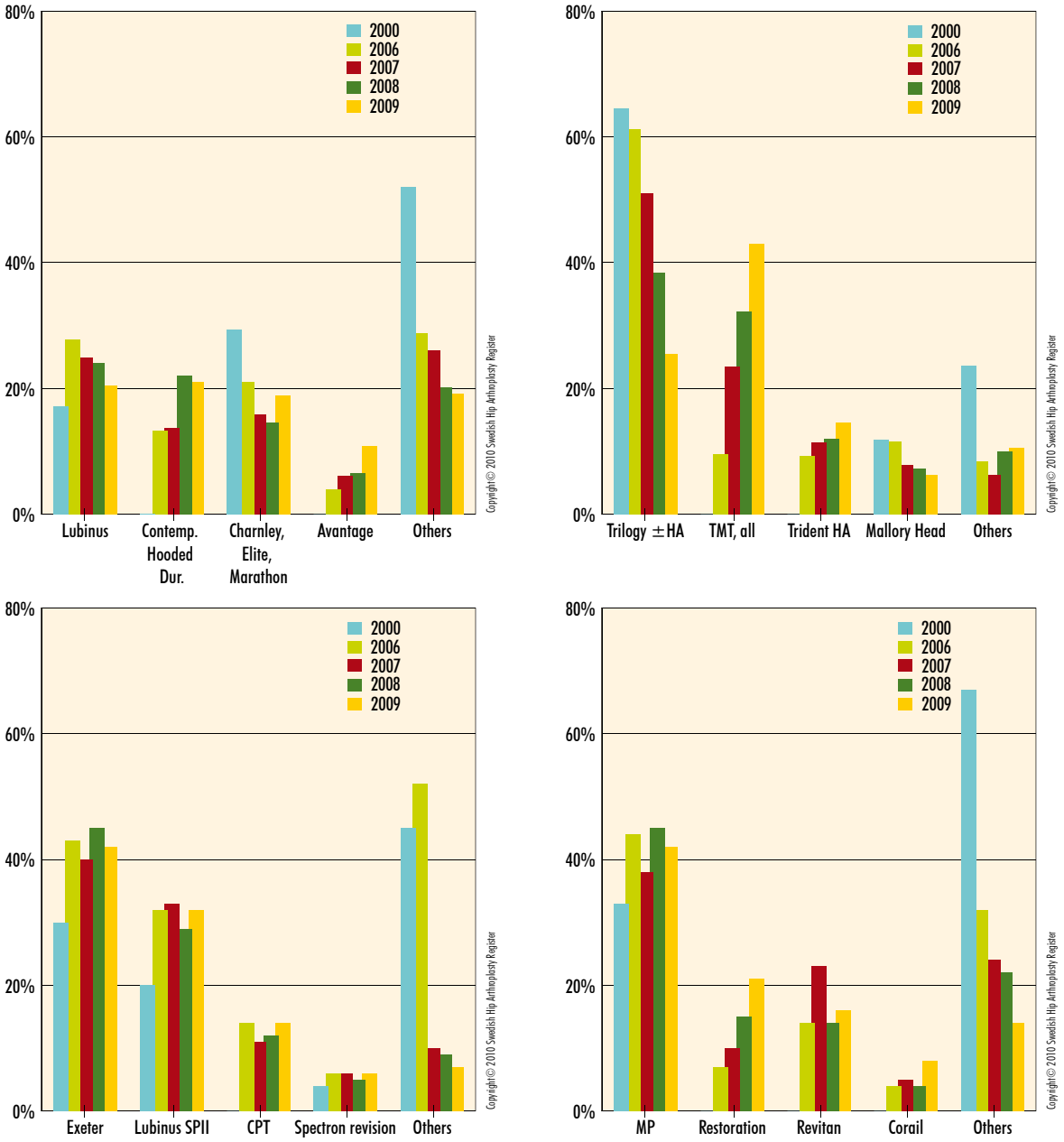


Figure 3-4. Distribution of cemented/uncemented revision cup (left) and stem (right) for the years 2000 and 2006-2009. Resurfacing cup (uncementerad) is separated from the others (left).



Figur 5-8. Trend of development (year 2000, 2006-2009) for the four most common prosthetic components used at revision during 2009. Cemented fixation to the left, uncemented to the right. Cups on top, stems below.

long stem constituted a comparison group. MP was chosen since this type was the most used during the period of study (1999-2007). The control group was reduced to the three most used cemented stems (Exeter, Lubinus or Spectron, all over standard length). Patients treated with bone packing were excluded. A total of 812 operations with MP stems (787 patients, mean age 72, SD=11 years, 45% women) and 1,073 operations with cemented stems (1,056 patients, mean age 76 SD=9 years, 49% women) were included. Mean follow-up times were 3.4 (SD=2.9) and 4.2 (SD=2.5) years, respectively.

Ninety-three (11%) cases with MP stems underwent re-operation. Some form of stem revision was carried out in 39 cases. The commonest cause of stem revision was dislocation (n=17), followed by loosening (n=6), deep infection (n=5), periprosthetic fracture (n=3), technical (n=3), implant fracture (n=1) and other (n=4). In 32 cases, only the proximal part was exchanged or adjusted and in 16 cases the whole implant was replaced or extracted. In 18 cases, only the cup or liner was replaced and in eight cases only the joint head.

In a first analysis of the MP stem group, low age (RR:1.1, CI: 1.0-1.1), multiple earlier revisions (RR: 2.6, CI: 1.1-6.2), short stem (RR: 2.4, CI: 1.1-5.2), standard offset of the neck of the proximal part (RR: 5.0, CI: 1.5-16.9) and short neck (RR: 5.3, CI: 1.4-20.6) were risk factors for re-operation. The risk of stem revision (replacement or extraction of the prosthesis or of one of its parts) increased with increasing age (RR: 1.1, CI: 1.0-1.2),

multiple earlier revisions (RR: 3.8, CI: 1.0-14.7) and short stem length (RR: 4.1, CI: 1.4-12.0).

Compared with the cemented alternative and after adjustment for age, gender, diagnosis and number of earlier operations, we found that operations performed with MP stems had an increased risk of re-operation (RR: 1.7, CI: 1.3-2.4) and revision (RR: 1.9, CI: 1.2-3.1). Reasons for revision in the cemented group were chiefly loosening (19 of 32 revisions, MP group: 6 of 39 revisions). In the MP group revisions were carried out for early loosening while revisions for the same reason in the uncemented group were more equally distributed over the observation period.

In summary the risk of early revision was lower for cemented long stems. During the latter part of the observation interval (after 2 years) this difference decreased.

Number of revisions per diagnosis and number of previous revisions

primary THRs1979-2009

Diagnosis at primary THR	0		1		2		>2		Total	Share
Primary osteoarthritis	18,967	73.8%	3,113	70.1%	603	65.7%	165	60.9%	22,848	73.0%
Fracture	2,279	8.9%	368	8.3%	66	7.2%	12	4.4%	2,725	8.7%
Inflammatory arthritis	2,004	7.8%	429	9.7%	116	12.6%	37	13.7%	2,586	8.3%
Childhood disease	1,300	5.1%	321	7.2%	77	8.4%	35	12.9%	1,733	5.5%
Idiopathic femoral head necrosis	565	2.2%	97	2.2%	26	2.8%	8	3.0%	696	2.2%
Secondary arthritis after trauma	213	0.8%	64	1.4%	20	2.2%	13	4.8%	310	1.0%
Secundary osteoarthritis	94	0.4%	13	0.3%	3	0.3%	0	0.0%	110	0.4%
Tumor	47	0.2%	9	0.2%	4	0.4%	1	0.4%	61	0.2%
(missing)	215	0.8%	25	0.6%	3	0.3%	0	0.0%	243	0.8%
Total	25,684	100%	4,439	100%	918	100%	271	100%	31,312	100%

Number of revisions per reason and number of previous revisions

primary THRs 1979-2009

Reason for revision	0		1		2		>2		Total	Share
Aseptic loosening	18,785	73.1%	2,701	60.8%	488	53.2%	107	39.5%	22,081	70.5%
Dislocation	2,184	8.5%	635	14.3%	165	18.0%	76	28.0%	3,060	9.8%
Deep infection	1,954	7.6%	543	12.2%	142	15.5%	62	22.9%	2,701	8.6%
Fracture	1,659	6.5%	360	8.1%	75	8.2%	12	4.4%	2,106	6.7%
Technical error	554	2.2%	93	2.1%	22	2.4%	4	1.5%	673	2.1%
Implant fracture	380	1.5%	76	1.7%	18	2.0%	7	2.6%	481	1.5%
Pain only	96	0.4%	18	0.4%	4	0.4%	2	0.7%	120	0.4%
Miscellaneous	72	0.3%	12	0.3%	3	0.3%	1	0.4%	88	0.3%
Secondary infection	0	0.0%	1	0.0%	1	0.1%	0	0.0%	2	0.0%
Total	25,684	100%	4,439	100%	918	100%	271	100%	31,312	100%

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

primary THRs 1979-2009

Year of revision	0		1		2		>2		Total	Share
1979-2004	19,298	75.1%	3,171	71.4%	585	63.7%	156	57.6%	23,210	74.1%
2005	1,177	4.6%	250	5.6%	63	6.9%	24	8.9%	1,514	4.8%
2006	1,241	4.8%	205	4.6%	55	6.0%	19	7.0%	1,520	4.9%
2007	1,286	5.0%	265	6.0%	58	6.3%	22	8.1%	1,631	5.2%
2008	1,295	5.0%	252	5.7%	80	8.7%	27	10.0%	1,654	5.3%
2009	1,387	5.4%	296	6.7%	77	8.4%	23	8.5%	1,783	5.7%
Total	25,684	100%	4,439	100%	918	100%	271	100%	31,312	100%

Number of revisions per reason and year of revision

only the first revision, primary THRs 1979–2009

Reason for revision	1979-2004	2005	2006	2007	2008	2009	Total	Share
Aseptic loosening	14,549	829	870	829	816	892	18,785	73.1%
Dislocation	1,369	134	149	179	190	163	2,184	8.5%
Deep infection	1,432	86	83	111	109	133	1,954	7.6%
Fracture	1,089	95	107	119	125	124	1,659	6.5%
Technical error	456	8	7	19	29	35	554	2.2%
Implant fracture	293	17	15	14	16	25	380	1.5%
Pain only	63	3	7	7	8	8	96	0.4%
Miscellaneous	47	5	3	8	2	7	72	0.3%
Total	19,298	1,177	1,241	1,286	1,295	1,387	25,684	100%

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

only the first revision, primary THRs 1979–2009

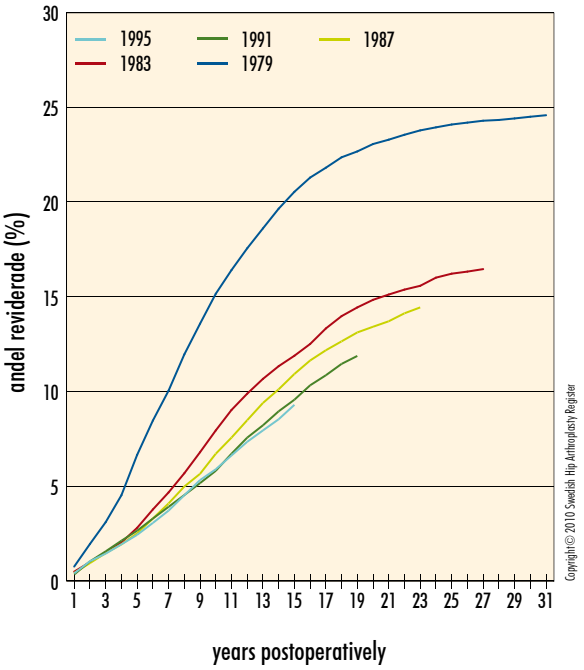
Type of fixation at primary THR	1979-2004	2005	2006	2007	2008	2009	Total	Share
Cemented	16,164	925	927	962	970	1,032	20,980	81.7%
Uncemented	1,674	93	139	146	139	147	2,338	9.1%
Hybrid	827	116	121	115	100	132	1,411	5.5%
Reversed hybrid	111	20	31	39	57	50	308	1.2%
Resurfacing implant	11	7	7	10	16	15	66	0.3%
(missing)	511	16	16	14	13	11	581	2.3%
Total	19,298	1,177	1,241	1,286	1,295	1,387	25,684	100%

Number of revisions per reason and time to revision

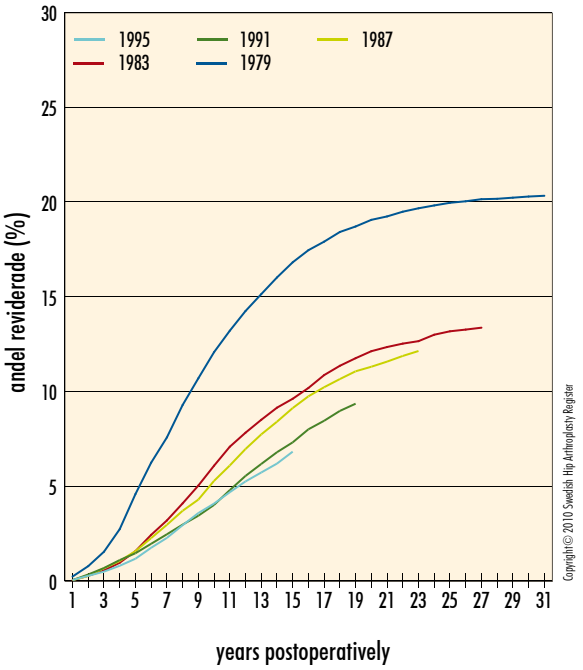
only the first revision, primary THRs 1979-2009

Reason for revision	0-3 years		4-6 years		7-10 years		> 10 years		Total	Share
Aseptic loosening	2,871	41.8%	3,692	81.1%	5,357	85.7%	6,865	85.7%	18,785	73.1%
Dislocation	1,411	20.5%	247	5.4%	225	3.6%	301	3.8%	2,184	8.5%
Deep infection	1,451	21.1%	225	4.9%	161	2.6%	117	1.5%	1,954	7.6%
Fracture	462	6.7%	254	5.6%	368	5.9%	575	7.2%	1,659	6.5%
Technical error	496	7.2%	26	0.6%	18	0.3%	14	0.2%	554	2.2%
Implant fracture	61	0.9%	85	1.9%	111	1.8%	123	1.5%	380	1.5%
Pain only	75	1.1%	11	0.2%	3	0.0%	7	0.1%	96	0.4%
Miscellaneous	47	0.7%	10	0.2%	5	0.1%	10	0.1%	72	0.3%
Total	6,874	100%	4,550	100%	6,248	100%	8,012	100%	25,684	100%

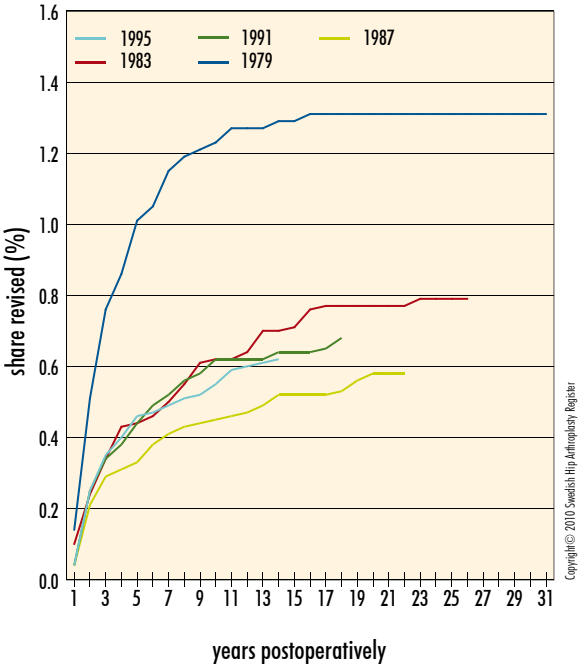
All diagnoses and all reasons
cumulative frequency of revision



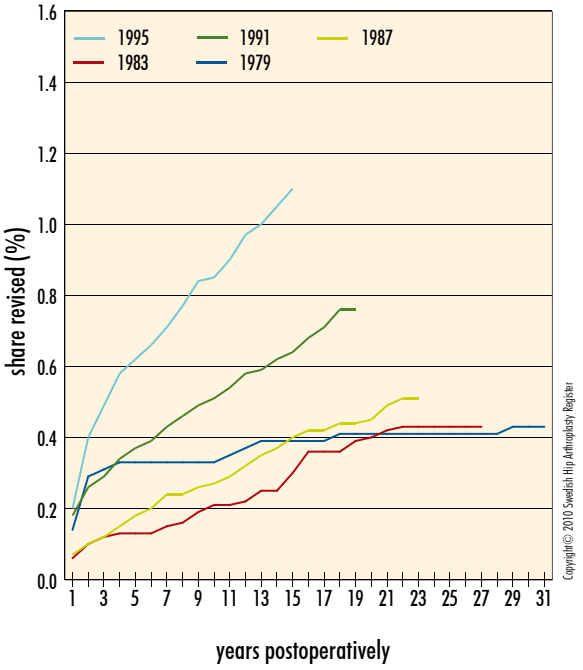
Aseptic loosening
cumulative frequency of revision



Deep infection
cumulative frequency of revision



Dislocation
cumulative frequency of revision



Implant survival as a quality indicator

In calculations of implant survival related to department the result is always referred to the department that performed the primary operation even if the patient was revised at another department. Implant survival is an important quality measure that reflects several factors with more or less pronounced interaction. Risk factors that can be ascribed to patient selection at the department in question are one example. Selection of relatively healthy patients without anatomical anomalies to certain hospitals, and corresponding selection of patients with residual disorders following hip joint diseases and other diseases that may influence the risk of complications. Variations in surgical technique and selection of implant are also important factors. Lastly, the presence of long-term follow-up and the tendency to perform a revision following, for example, an asymptomatic osteolysis play a large part.

Since 1979, 10-year survival measured as the risk of undergoing revision has successively improved. Initially, the rate of improvement was high. During more recent periods and as prosthesis survival approaches 100%, the rate of improvement levels out for natural reasons. No operation is entirely free of complications but the minimal complication frequency leading to revision within a 10-year perspective seen from a national perspective is unknown.

The background to the initially improved prosthesis survival until the early nineties is in all probability a successive improvement of cemented technique, as we have demonstrated earlier in a number of Registry reports. Knowledge of optimal cementing technique spreads relatively rapidly, partly through comprehensive work from the profession and industry in the form of courses, partly through continual feedback to the profession of data from the Hip Arthroplasty Register.

The past few decades have seen comprehensive development of the design of implants. Among other things there have been new types of surface treatment, increased choice of sizes, adaptation of shape to different anatomical circumstances, new types of material and a pronounced tendency to replace monoblock prostheses with modular systems which during the operation are connected to form a final hip prosthesis. The effect of this development has been more equivocal. Many implants have proved to have considerably poorer survival than already established ones. Other innovations, for example certain types of surface treatment used on uncemented implants and their ability to facilitate a biological fixation, has frequently implied a better survival of those particular implants.

Swedish orthopaedic surgeons are highly aware of the problems associated with new implants. Moreover, clinical evaluation takes a long time since revisions for implant-related problems often do not manifest themselves until after 5-10 years of observation. Experience of less successful implant modifications, particularly during the 1980s and early 1990s, has meant that Sweden as a country became one of the most conservative in the world regarding the introduction of new prostheses. This attitude, while generally positive, also involves certain negative effects. The introduction of new technology with documented positive effect may take an unnecessarily long time. To counter this problem we have started co-operation among the Nordic countries. This permits us to survey a greater variation of not only patient demography and surgical technique, but also to increase the observation material for various less common and newly-introduced implants (see NARA – Nordic register co-operation).

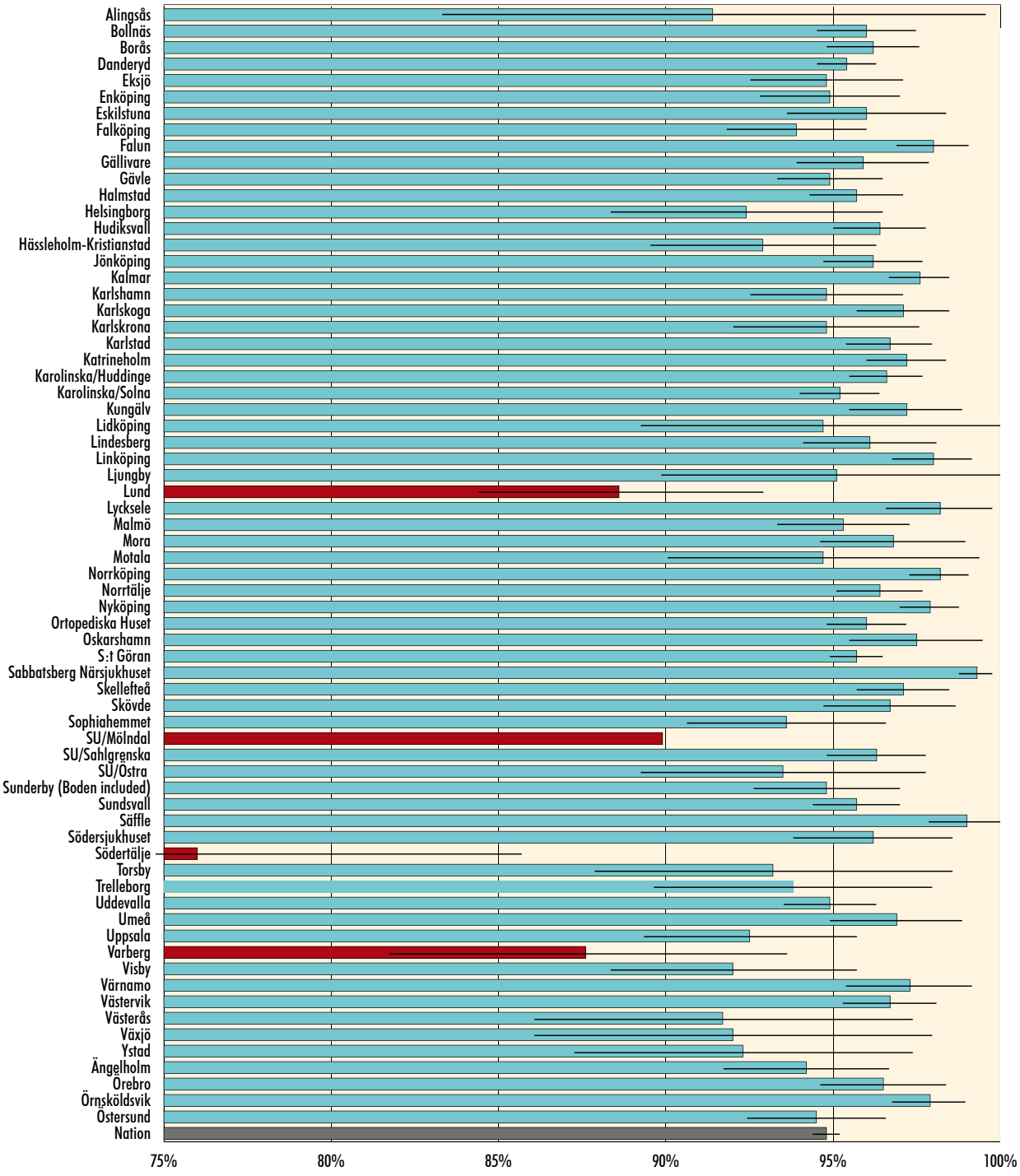
As part of the work of clinical improvement we also publish 10-year survival by department. These figures give a certain insight into the quality of operations performed, but should be treated with some caution. For departments to be considered to perform better or worse than the average, it is necessary that statistically calculated confidence intervals should not overlap. If this is the case the difference may be caused entirely by chance. A further factor is the effects of clinic amalgamations. There are several examples where a smaller department has been absorbed into a larger, where several departments have been combined or where patients on waiting list for a total hip replacement have been transferred from one or several departments to a central operating department for hip prostheses. Such examples are Bollnäs in Hälsingland, Hässleholm in Skåne and Mölndal in Göteborg. The department in which a certain hip operation was performed ten years earlier may also, when evaluated, be of an entirely different character and may even have stopped performing hip arthroplasties.

In this years analysis we found that four of the departments (Lund, SU/Mölndal, Södertälje, Varberg) generated more revisions during a ten-year period than expected. For the two university clinics there was a numerical increase in all the most important cause groups loosening, infection, fracture and dislocation. For the other two the increase represented largely revision owing to loosening. Revision owing to loosening in Lund affected primarily prostheses of the Scan Hip stem and Optimacup type while the other three hospitals revised mainly prosthesis stems of the Spectron EF Primary and cemented Reflection cups owing to loosening. The high frequency of revision in Lund prompted a deeper analysis, which is presented in a separate chapter. The high revision frequency of patients operated at SU/Mölndal also prompted an in-depth analysis as the basis for a local review. We intend to present the result of this analysis in next year's Report.

In summary, implant survival based on the proportion of primary prostheses inserted during the most recent 10-year period and revised within the period has successively improved. Nationally, the risk that patients will need to undergo a further operation, and regardless of whether the implant was replaced, is today about 95%. Variation between departments has decreased over the years but a few departments still show a poorer result. From the Registry, we urge the departments below, or bordering on an outcome that is poorer than, the expected to investigate in more detail the reasons for this and subsequently to decide whether there is a possibility to start working on improvement.

Implant survival after 10 years

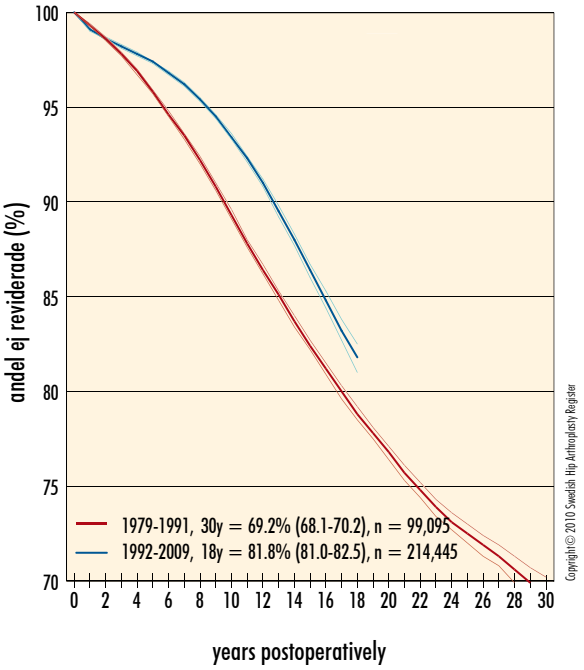
each bar represents a hospital, primary operation 1999–2009



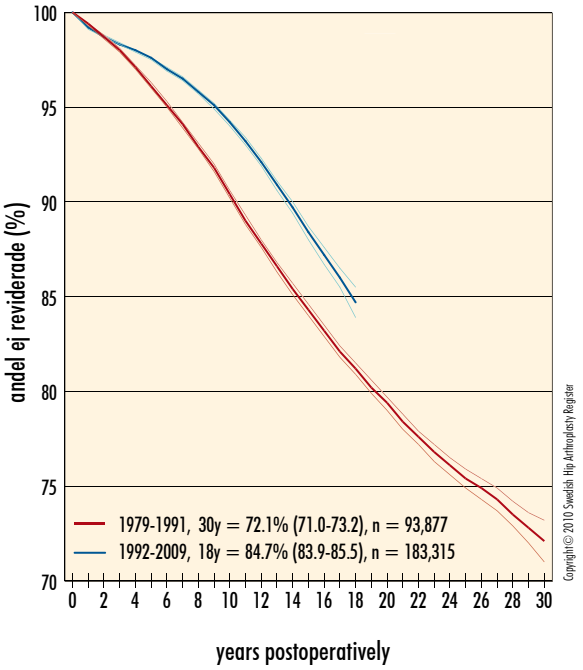
Implant survival after 10 years by department. Grey bar indicates national average. Red bars represent departments whose upper confi dence interval is below the national lower competence interval, i.e. departments which with 95% probability have poorer implant survival after 10 years than the average 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 is concluded when the number of patients 'at risk' is lower than 50.

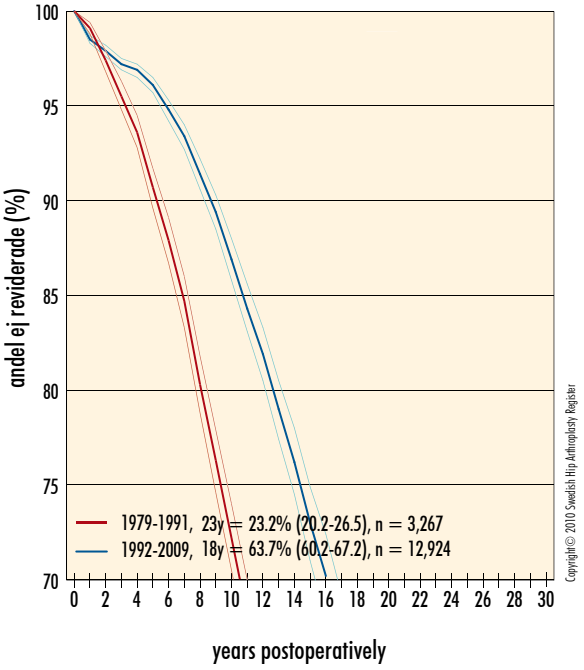
All implants
all diagnoses and all reasons for revision



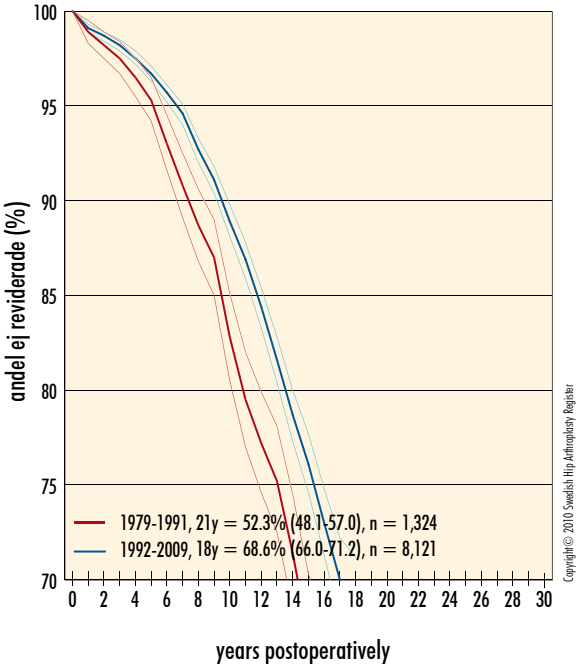
All cemented implants
all diagnoses and all reasons for revision



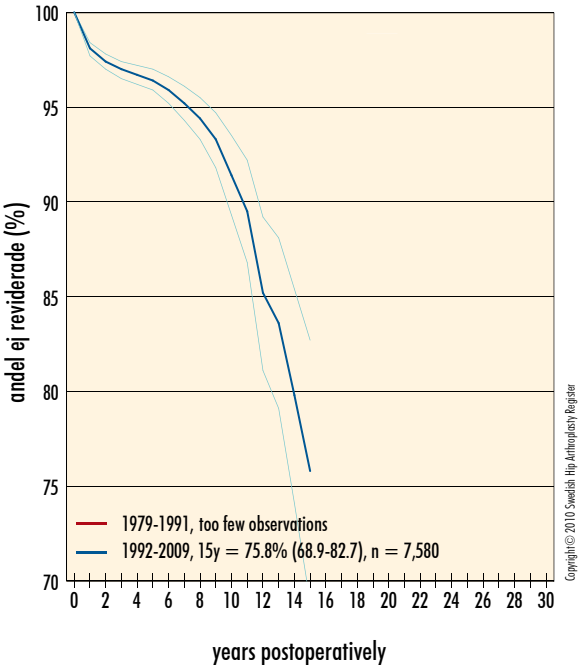
All uncemented implants
all diagnoses and all reasons for revision



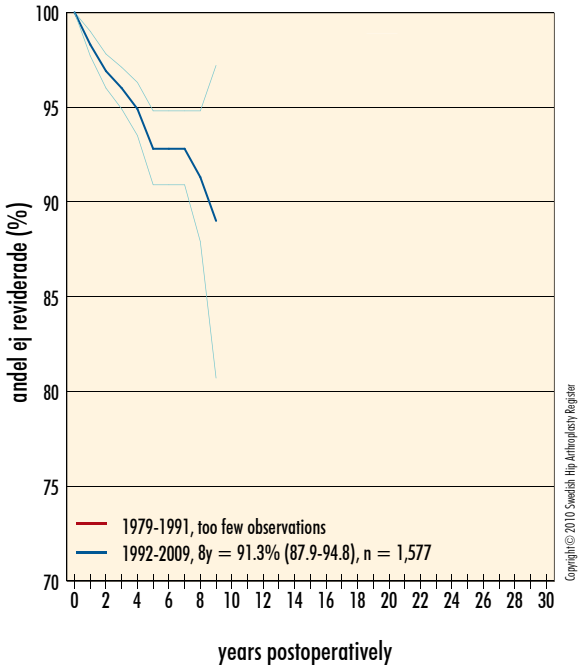
All hybrid implants
all diagnoses and all reasons for revision



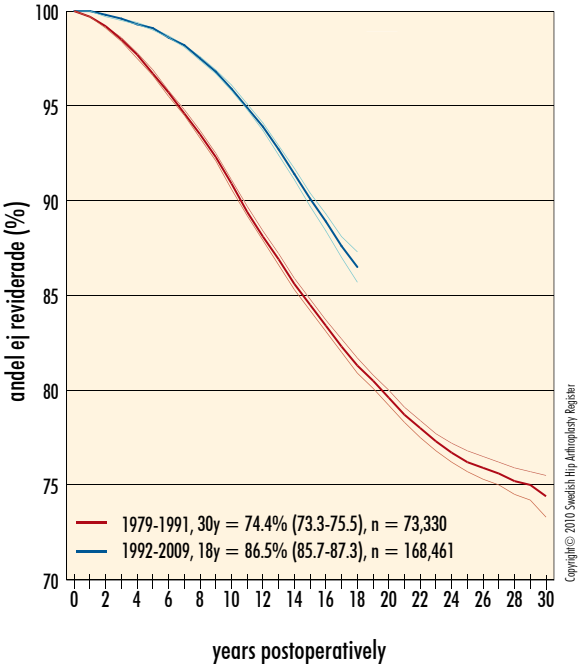
All reversed hybrid implants
all diagnoses and all reasons for revision



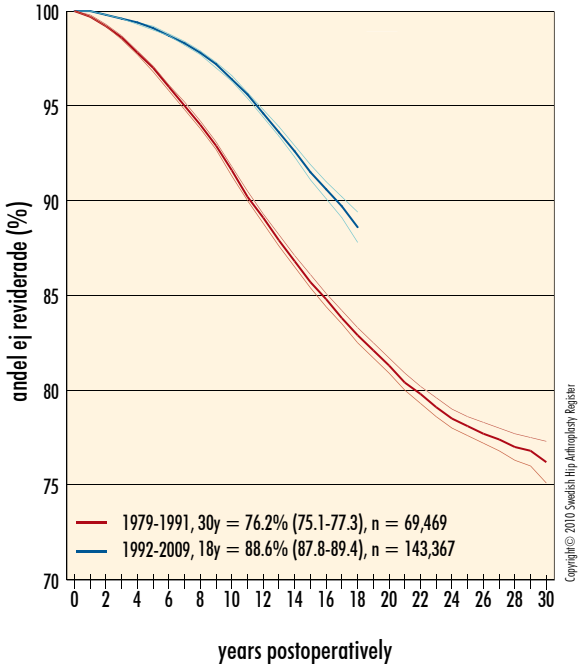
All resurfacing implants
all diagnoses and all reasons for revision



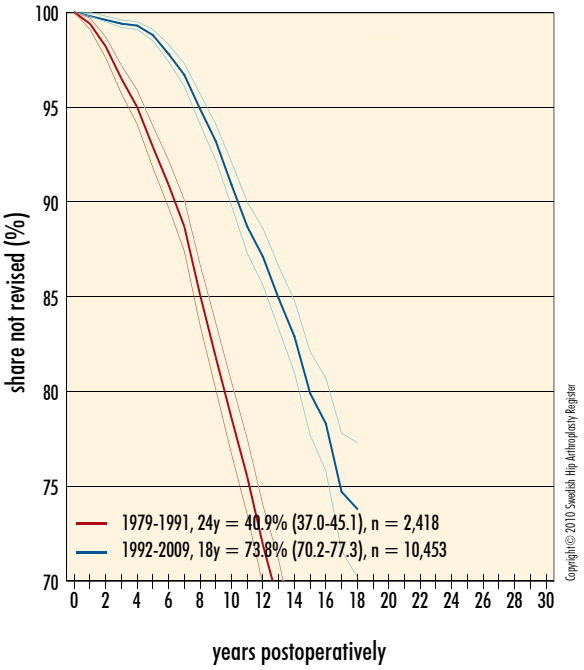
All implants
primary osteoarthritis and aseptic loosening



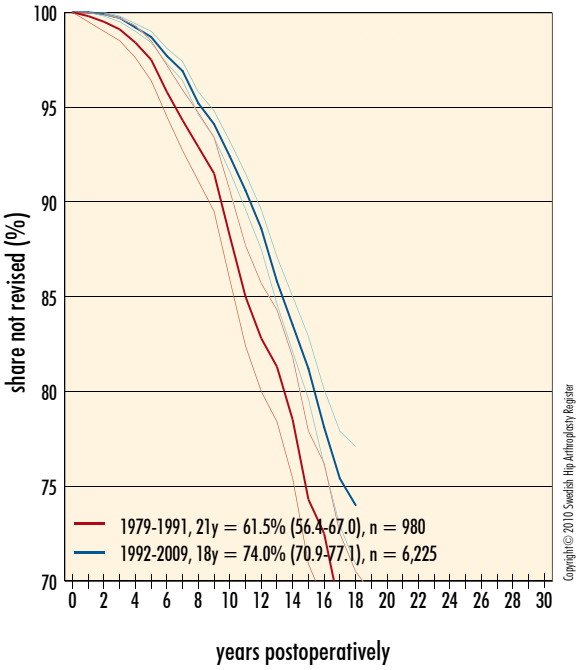
All cemented implants
primary osteoarthritis and aseptic loosening



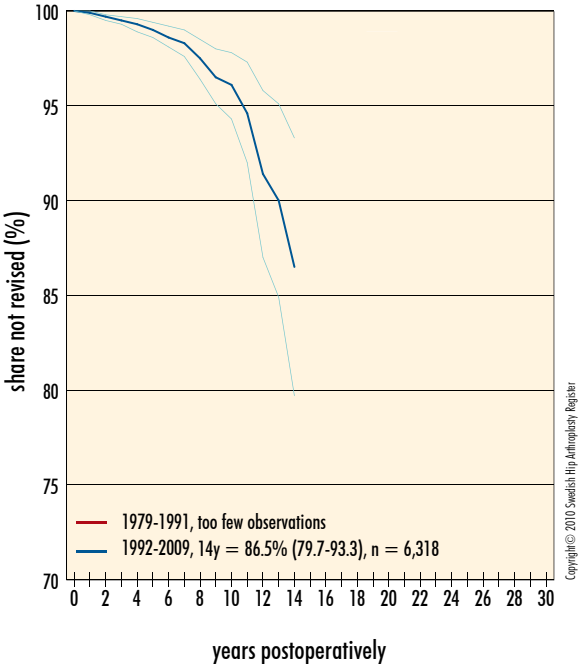
All uncemented implants
primary osteoarthritis and aseptic loosening



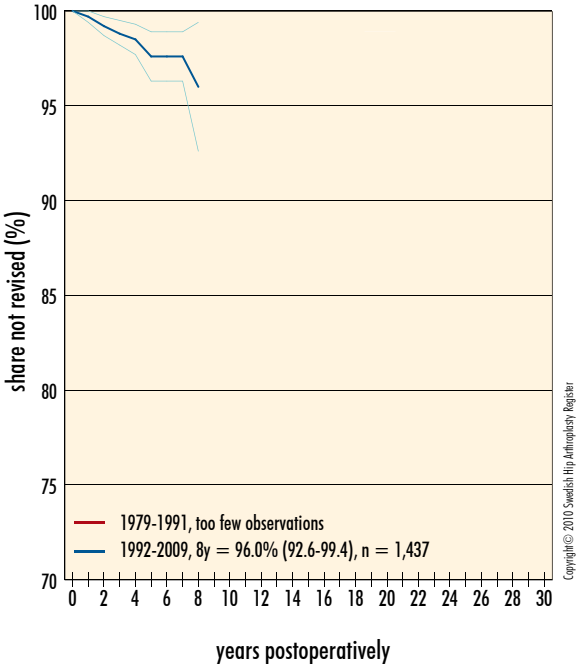
All hybrid implants
primary osteoarthritis and aseptic loosening



All reversed hybrid implants
primary osteoarthritis and aseptic loosening

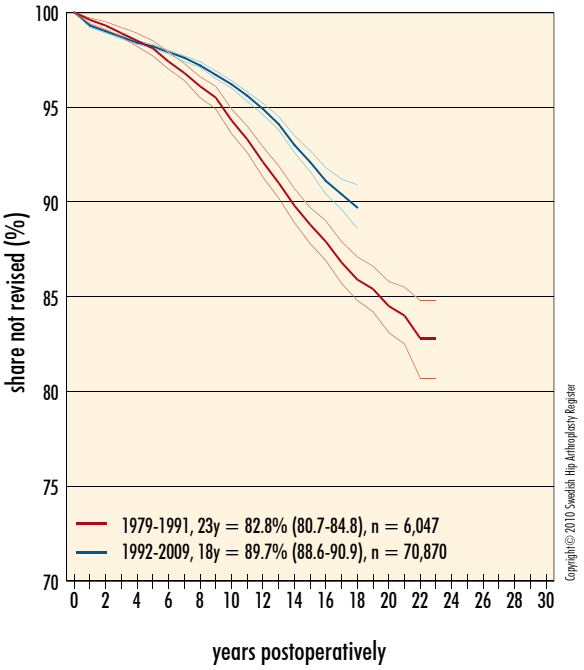


All resurfacing implants
primary osteoarthritis and aseptic loosening



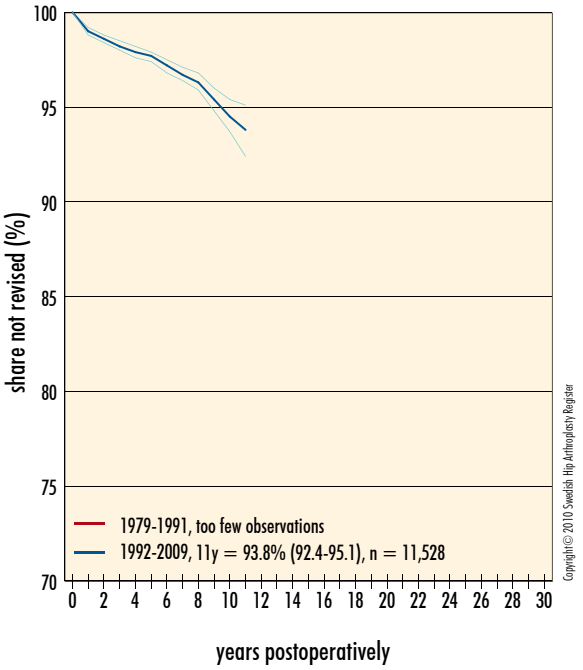
Lubinus SP II

all diagnoses and all reasons for revision



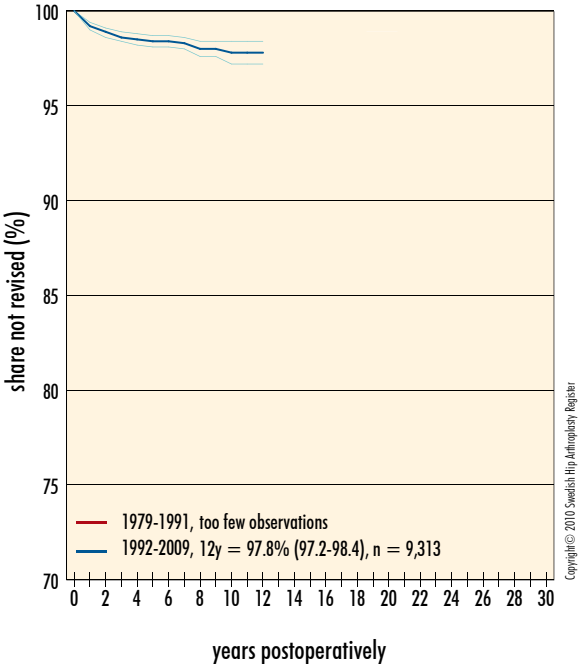
Exeter Duration (Exeter Polished)

all diagnoses and all reasons for revision



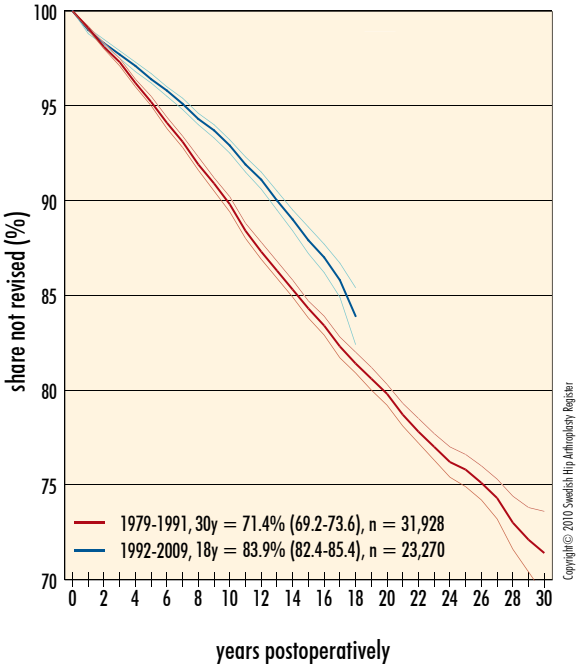
Charnley Elite (Exeter Polished)

all diagnoses and all reasons for revision



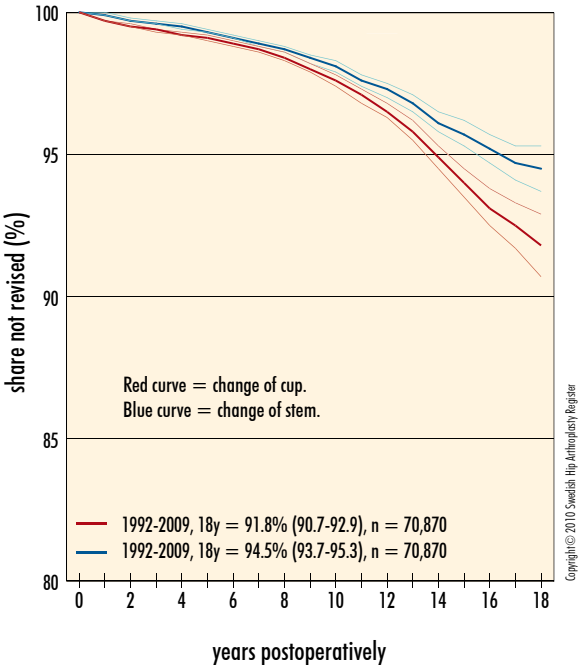
Charnley

all diagnoses and all reasons for revision



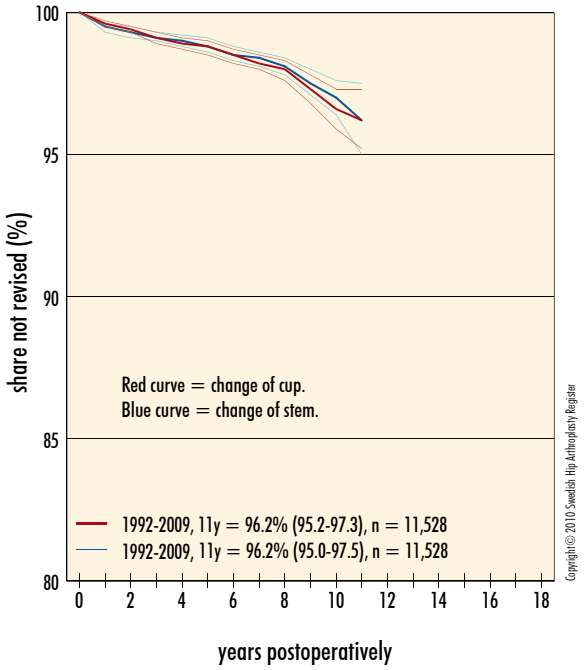
Lubinus SP II

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



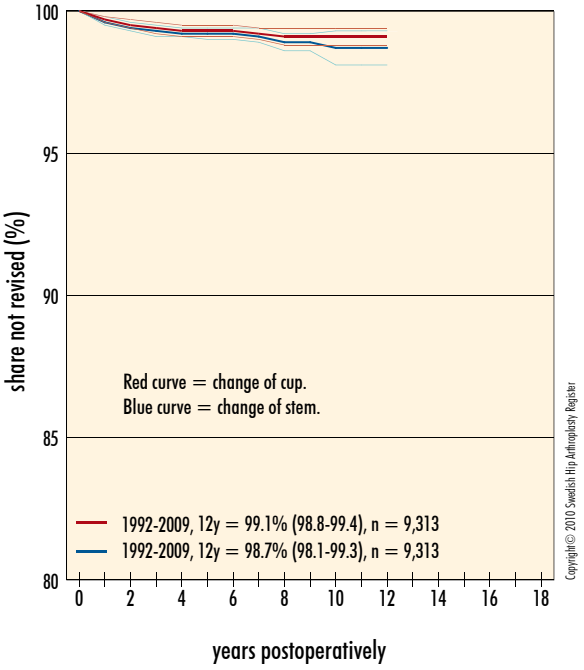
Exeter Duration (Exeter Polished)

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



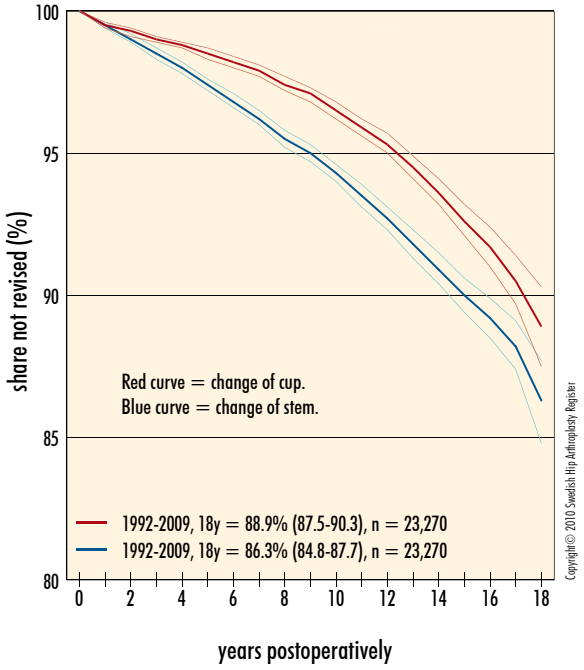
Charnley Elite (Exeter Polished)

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



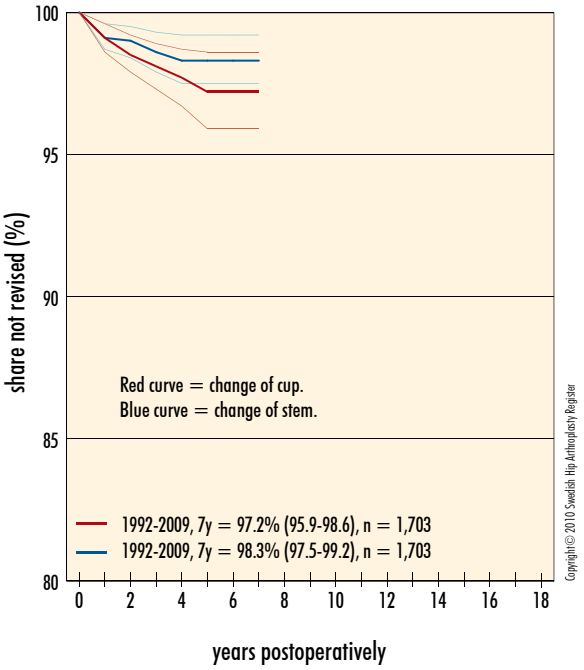
Charnley

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



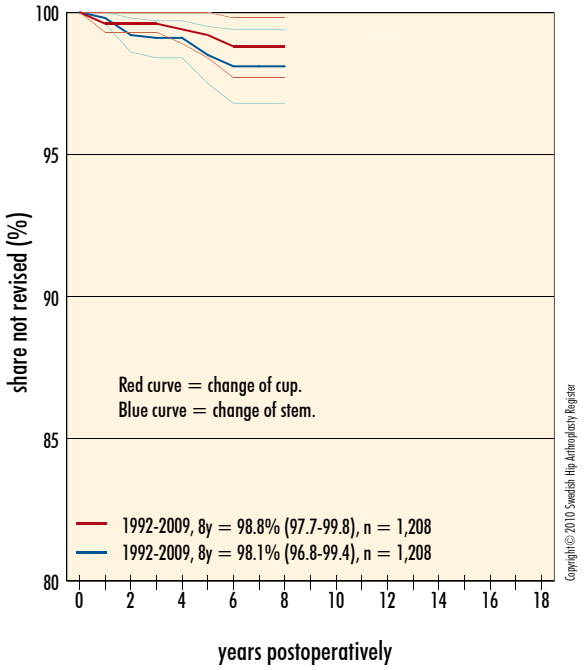
Trilogy HA (CLS Spotorno)

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



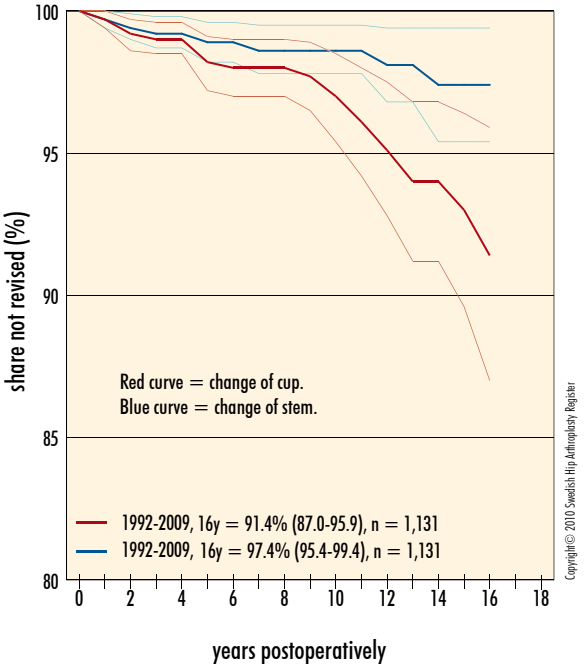
Allofit (CLS Spotorno)

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



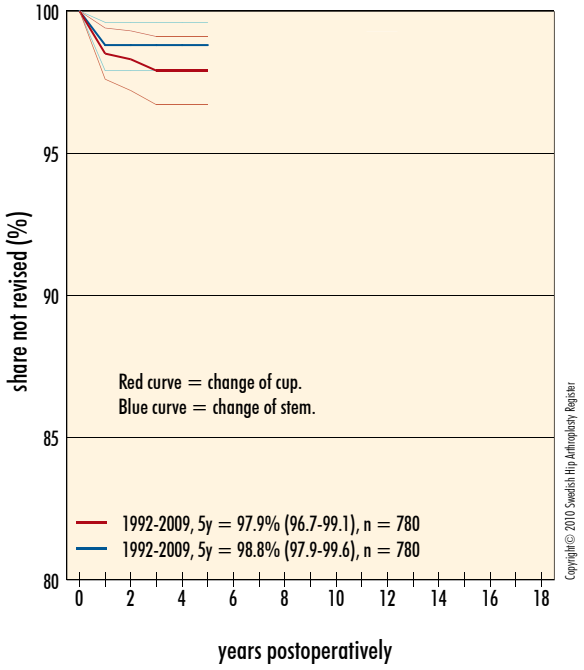
CLS Spotorno

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



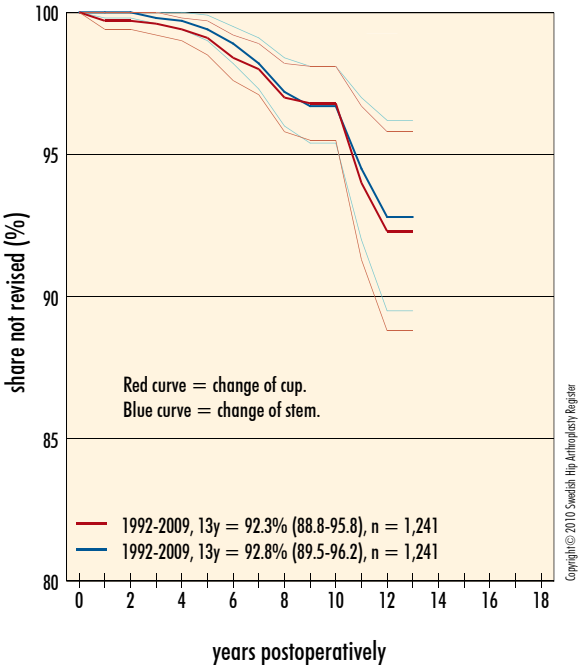
Trident HA (Accolade)

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



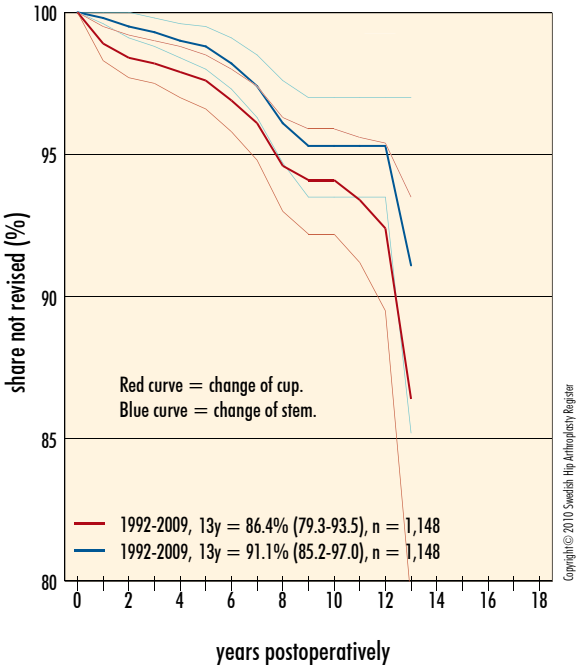
Trilogy HA (Spectron EF Primary)

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



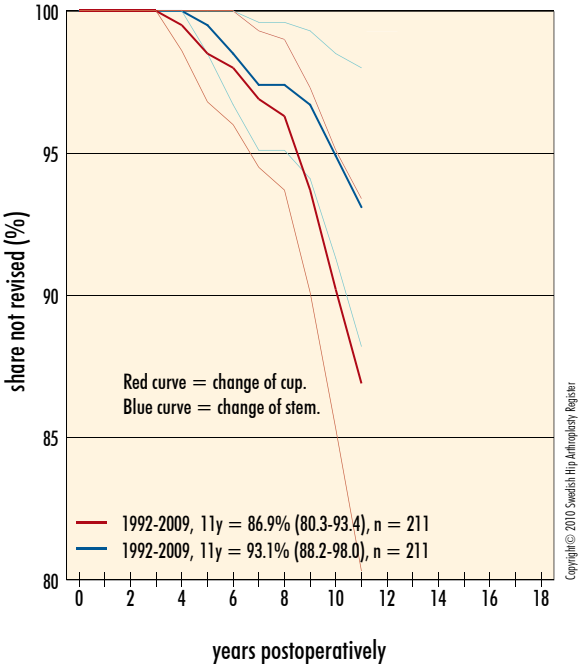
Trilogy HA (Lubinus SP II)

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



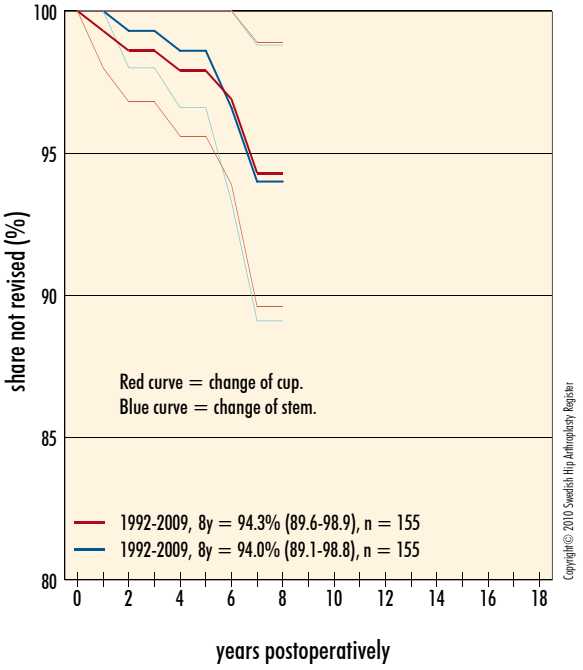
ABG II HA (Lubinus SP II)

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



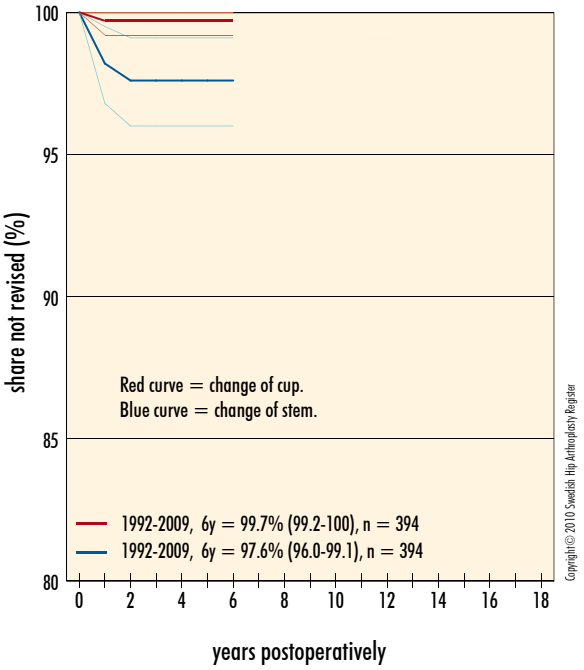
TOP Pressfit HA (Lubinus SP II)

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



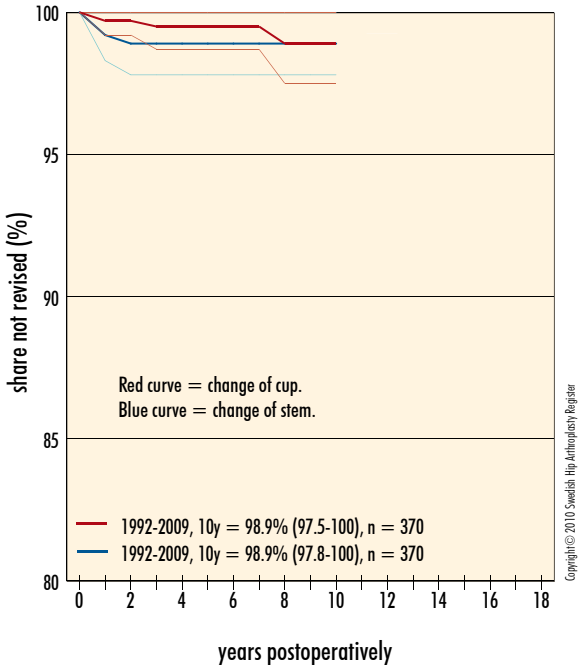
Charnley Elite (CLS Spotorno)

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



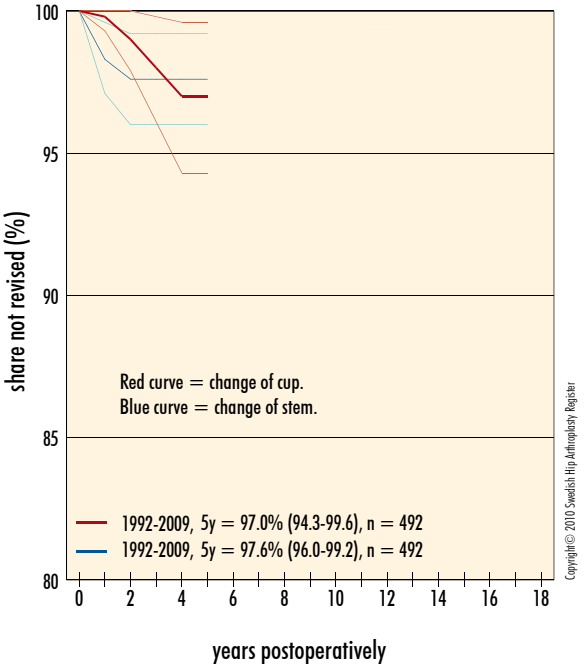
Charnley Elite (ABG)

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



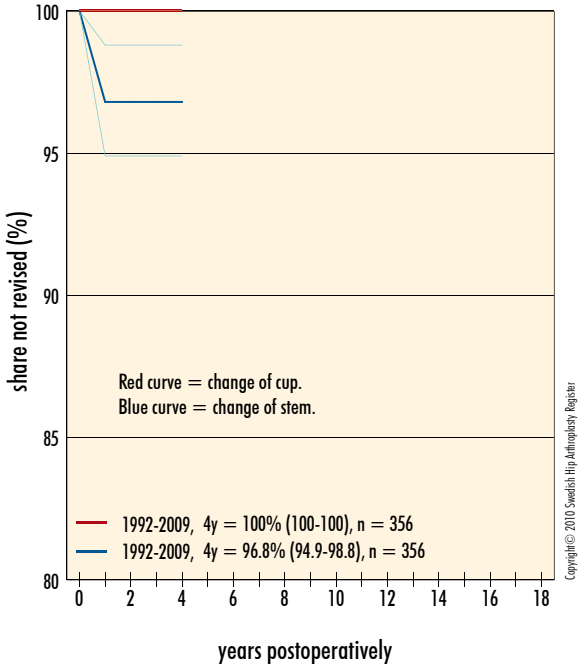
Contemporary H.D. (ABG II HA)

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



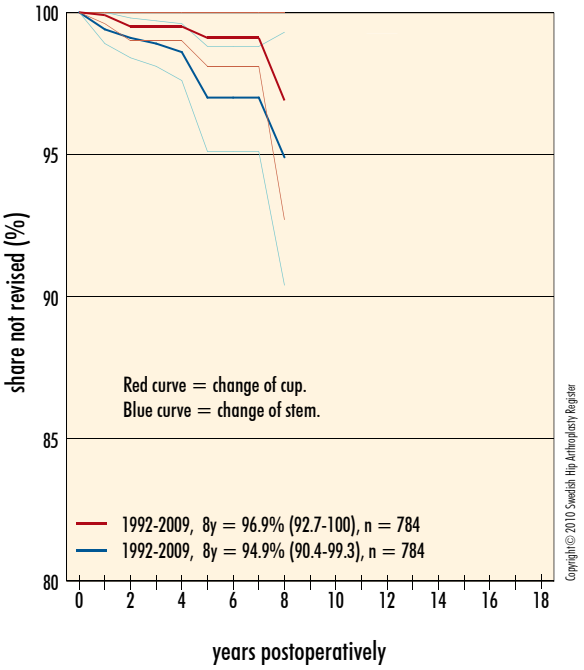
Charnley Elite (Corail)

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



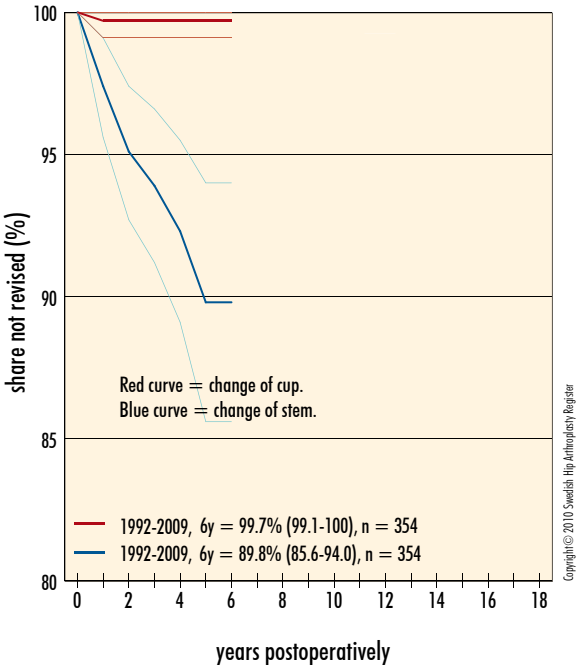
BHR

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



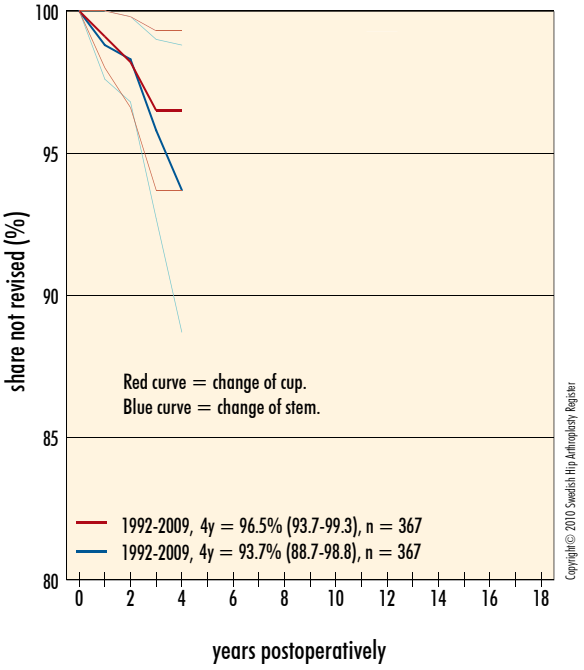
Durom

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



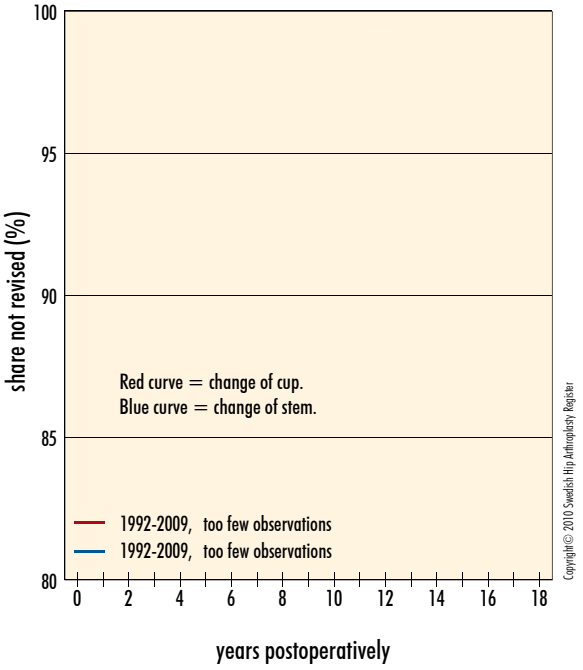
ASR

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

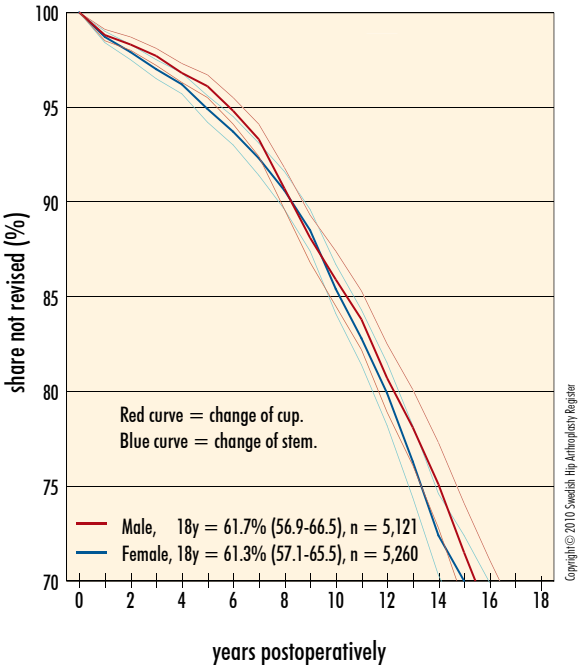


Adept

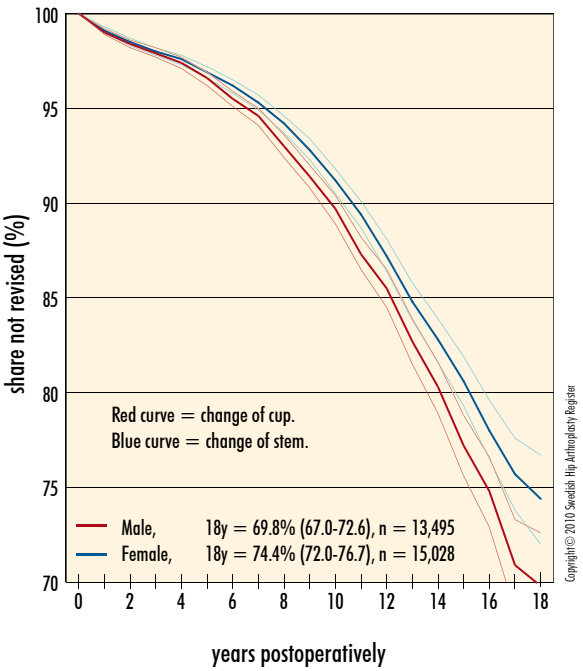
cup-/stemrevision – all diagnoses and all reasons for revision



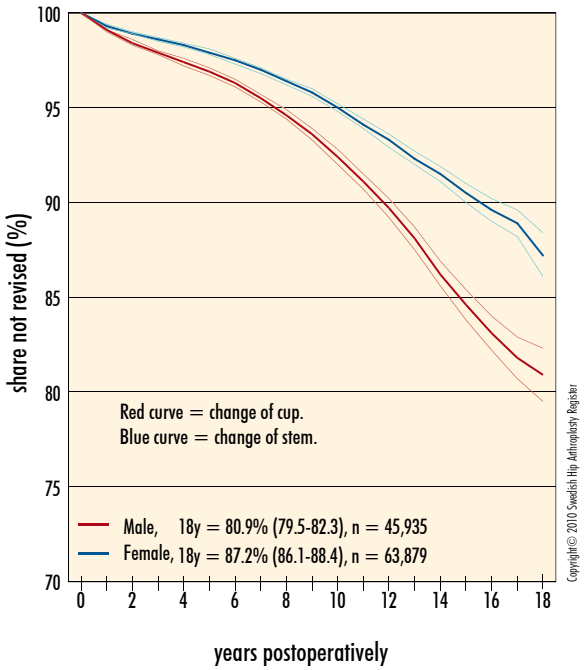
Younger than 50 years
all observations



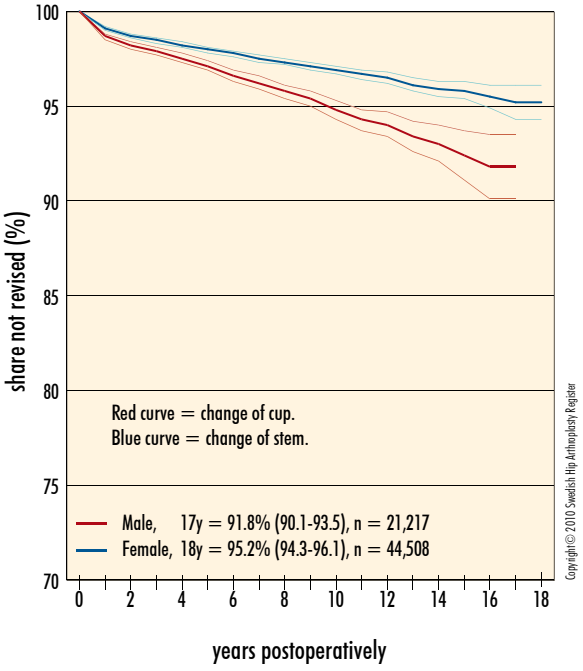
Between 50 and 59 years
all observations



Between 60 and 75 years
all observations



Older than 75 years
all observations



Implant survival per type

all diagnoses and all reasons for revision, 1992–2009

Cup (Stem)	Period [1]	Number [2]	OA [3]	≥= 60 years [4]	Female [5]	5 years	K.I.	10 years	K.I.
ABG HA (ABG cem)	1992–1998	241	64.80%	87.10%	63.10%	98.20%	±1.8%	92.70%	±4.0%
ABG HA (ABG uncem)	1992–1998	280	83.10%	5.70%	53.20%	97.10%	±2.0%	80.70%	±4.6%
ABG HA (Exeter Polished)	1992–1998	55	79.60%	27.30%	58.20%	98.10%	±2.8%		
ABG HA (Lubinus SP II)	1992–1998	337	80.40%	40.70%	48.40%	97.00%	±1.9%	85.90%	±3.9%
ABG II HA (ABG uncem)	1993–2006	198	80.30%	7.60%	41.90%	97.40%	±2.3%	94.30%	±4.2%
ABG II HA (Exeter Polished)	1997–2005	67	80.60%	16.40%	43.30%	97.00%	±3.6%		
ABG II HA (Lubinus SP II)	1997–2006	211	81.50%	32.20%	48.80%	97.60%	±2.1%	88.80%	±5.1%
ABG II HA (Meridian)	1998–2004	116	66.40%	26.70%	47.40%	97.40%	±2.8%		
Allofit (CLS Spotorno)	2001–2009	1,208	92.60%	36.30%	48.20%	97.80%	±1.1%		
Allofit (MS30 Polished)	1998–2009	88	51.10%	19.30%	52.30%	90.40%	±6.8%		
BHR Acetabular Cup (BHR Femoral Head)	1999–2009	784	93.90%	10.20%	31.50%	96.10%	±2.1%		
Biomet Müller (Bi-Metric cem)	1992–1996	1,099	81.30%	90.00%	59.20%	96.20%	±1.1%	90.50%	±2.0%
Biomet Müller (Bi-Metric HA lat)	2003–2009	210	94.30%	69.00%	42.40%	98.30%	±1.9%		
Biomet Müller (Bi-Metric HA uncem)	1993–2009	200	94.50%	35.00%	61.50%	98.50%	±1.6%		
Biomet Müller (CPT (CoCr))	2003–2009	495	75.80%	99.00%	72.90%	95.60%	±2.1%		
Biomet Müller (CPT (steel))	1997–2004	950	94.60%	94.30%	67.90%	96.20%	±1.3%	94.90%	±1.6%
Biomet Müller (RX90-S)	1994–2001	1,452	76.90%	88.10%	61.50%	97.80%	±0.8%	94.50%	±1.4%
Biomet Müller (Stanmore mod)	1997–2002	94	95.70%	90.40%	62.80%	98.90%	±1.6%		
Biomex HA (Lubinus SP II)	2000–2004	107	81.30%	8.40%	59.80%	100.00%	±0.0%		
Cenator (Bi-Metric cem)	1993–1999	293	70.90%	46.80%	48.80%	97.10%	±2.0%	90.10%	±3.7%
Cenator (Cenator)	1993–2000	1,251	58.90%	95.30%	67.00%	92.90%	±1.6%	85.20%	±2.4%
Cenator (Charnley Elite Plus)	1996–2000	320	84.00%	78.80%	60.30%	96.70%	±2.0%	93.80%	±2.9%
Cenator (Exeter Polished)	1997–2003	661	84.60%	78.20%	53.30%	99.50%	±0.5%	98.50%	±1.0%
Cenator (Lubinus SP II)	1997–2000	64	51.60%	76.60%	59.40%	94.30%	±6.0%		
Cenator (Wagner Cone Prosthesis)	1994–2000	56	61.80%	10.70%	71.40%	96.40%	±4.3%	90.90%	±7.6%
Charnley (ABG II HA)	2004–2008	234	96.20%	25.60%	52.10%	97.80%	±1.9%		
Charnley (Bi-Metric cem)	1992–1998	56	48.20%	44.60%	51.80%	96.00%	±4.8%		
Charnley (CAD)	1992–1996	225	79.80%	89.80%	72.40%	97.20%	±2.2%	95.40%	±3.0%
Charnley (Charnley Elite Plus)	1994–2003	1,410	69.50%	77.30%	65.70%	96.40%	±1.0%	91.10%	±1.6%
Charnley (Charnley)	1992–2008	23,270	78.90%	89.20%	65.40%	96.40%	±0.3%	92.90%	±0.4%
Charnley (CPT (steel))	1996–2004	193	72.50%	80.30%	65.80%	98.40%	±1.7%		
Charnley (C-stem)	2001–2003	70	85.70%	70.00%	65.70%	97.10%	±3.5%		
Charnley (Exeter Polished)	1992–2009	2,492	79.60%	87.00%	67.90%	97.70%	±0.6%	96.20%	±1.2%
Charnley (Lubinus SP II)	1992–2007	342	83.00%	85.40%	60.50%	97.50%	±1.7%	94.20%	±2.8%
Charnley (Müller Straight)	1992–1998	104	87.50%	96.20%	47.10%	96.90%	±3.3%	95.70%	±4.1%
Charnley (PCA E-series Textured)	1992–1996	129	82.80%	72.90%	56.60%	96.80%	±3.1%	83.70%	±6.9%
Charnley Elite (ABG II HA)	2003–2009	239	91.60%	36.00%	42.30%	96.20%	±2.9%		
Charnley Elite (ABG uncem)	1994–2005	370	90.50%	22.20%	45.40%	97.80%	±1.5%	97.30%	±1.8%
Charnley Elite (Bi-Metric HA uncem)	1998–2008	152	92.10%	36.20%	57.20%	95.90%	±3.2%		
Charnley Elite (Charnley Elite Plus)	1992–2002	950	67.90%	88.90%	63.10%	94.60%	±1.5%	89.00%	±2.5%
Charnley Elite (Charnley)	1992–2001	341	60.40%	86.20%	63.30%	95.30%	±2.4%	88.40%	±4.0%
Charnley Elite (CLS Spotorno)	2002–2009	394	83.50%	51.00%	48.50%	97.30%	±1.7%		
Charnley Elite (CPT (steel))	1997–2003	115	73.00%	85.20%	68.70%	93.70%	±4.6%		
Charnley Elite (Exeter Polished)	1996–2009	9,313	72.50%	90.80%	66.10%	98.40%	±0.3%	97.80%	±0.6%
Charnley Elite (Lubinus SP II)	1992–2009	1,301	83.10%	83.10%	63.30%	98.40%	±0.8%	95.00%	±2.3%
Charnley Elite (Müller Straight)	1999–2008	306	82.40%	97.70%	58.80%	99.30%	±0.9%		
Charnley Elite (PCA E-series Textured)	1992–1997	214	81.00%	80.80%	58.40%	96.90%	±2.4%	88.40%	±4.8%

(continued on next page.)

Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2009

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Charnley Elite (Spectron EF Primary)	1998–2009	393	92.10%	89.80%	52.20%	97.20%	±1.8%	96.60%	±2.1%
CLS Spotorno (CLS Spotorno)	1992–2009	1,131	90.80%	34.00%	44.50%	97.40%	±1.1%	96.00%	±1.7%
Contemporary (Exeter Polished)	1994–2009	336	87.80%	87.80%	51.20%	96.30%	±2.0%	90.60%	±3.6%
Contemporary (Lubinus SP II)	1994–2001	102	66.70%	75.50%	79.40%	94.80%	±4.5%	89.10%	±6.5%
Contemporary Hooded Duration (ABG II HA)	2004–2009	492	96.10%	50.60%	50.40%	95.30%	±2.9%		
Contemporary Hooded Duration (Exeter Polished)	2000–2009	6,485	88.20%	90.30%	59.00%	97.90%	±0.5%		
Duralock (uncem.) (Spectron EF Primary)	1995–2000	115	87.00%	52.20%	61.70%	97.40%	±2.8%	89.50%	±5.9%
Durom (Durom)	2002–2009	354	88.40%	12.40%	32.20%	89.80%	±4.2%		
Exeter Duration (Exeter Polished)	1999–2009	11,528	83.80%	85.40%	59.30%	97.70%	±0.3%	94.50%	±0.9%
Exeter Duration (Lubinus SP II)	1999–2009	797	78.40%	82.80%	62.10%	99.60%	±0.5%	97.70%	±2.0%
Exeter Metal-backed (Exeter Polished)	1992–1994	590	76.30%	94.40%	55.80%	98.70%	±1.0%	95.20%	±2.0%
Exeter All-Poly (Exeter Polished)	1992–2006	6,458	73.80%	86.70%	60.70%	97.00%	±0.4%	92.00%	±0.8%
Exeter All-Poly (Lubinus SP II)	1992–2002	201	79.90%	76.10%	65.20%	96.70%	±2.6%	89.70%	±4.7%
Exeter Polished (Exeter Polished)	1992–1995	667	73.00%	89.10%	57.60%	95.90%	±1.6%	92.40%	±2.3%
FAL (Lubinus SP II)	1999–2009	5,368	80.50%	88.30%	64.20%	98.30%	±0.4%	96.50%	±2.7%
Harris-Galante I (Lubinus SP II)	1992–1997	74	79.20%	18.90%	36.50%	97.30%	±3.3%	91.50%	±6.5%
Harris-Galante II (Charnley)	1992–1996	145	84.70%	27.60%	51.00%	93.00%	±4.1%	85.70%	±5.8%
Harris-Galante II (Lubinus SP II)	1992–1997	250	75.80%	28.00%	46.80%	95.20%	±2.6%	85.10%	±4.5%
Harris-Galante II (Spectron EF)	1992–1996	172	86.60%	54.70%	51.20%	96.40%	±2.8%	88.10%	±5.0%
HGPII/HATCP (HG III) (Spectron EF)	1992–1995	93	58.30%	48.40%	60.20%	98.90%	±1.6%	95.50%	±4.4%
Inter-op cup (CLS Spotorno)	1999–2001	58	86.20%	22.40%	37.90%	96.60%	±4.0%		
ITH (ITH)	1992–1997	312	62.20%	95.50%	71.80%	98.50%	±1.5%	96.30%	±2.6%
LINK Pressfit (Lubinus SP II)	1996–2000	61	65.50%	8.20%	34.40%	100.00%	±0.0%	89.80%	±7.8%
Lubinus All-Poly (Bi-Metric HA lat)	2004–2009	253	93.70%	20.90%	49.00%	97.50%	±2.2%		
Lubinus All-Poly (Lubinus IP)	1992–2009	827	55.80%	96.50%	66.00%	99.30%	±0.6%	98.40%	±1.0%
Lubinus All-Poly (Lubinus SP II)	1992–2009	70,870	80.40%	89.70%	59.40%	98.20%	±0.1%	96.20%	±0.2%
M2a (Bi-Metric HA lat)	2003–2009	166	83.10%	7.20%	27.10%	95.20%	±3.9%		
Mallory-Head uncem (Lubinus SP II)	1993–2009	113	77.90%	11.50%	53.10%	97.20%	±3.0%	93.30%	±5.3%
Müller All-Poly (BiMetric cem)	1992–1994	63	94.50%	88.90%	66.70%	98.40%	±2.4%		
Müller All-Poly (MS30 Unpolished)	1992–2001	113	59.50%	74.30%	52.20%	93.00%	±5.0%	91.80%	±5.5%
Müller All-Poly (Müller Straight)	1992–2008	1,840	74.90%	93.20%	61.80%	97.50%	±0.8%	96.60%	±1.0%
Müller All-Poly (Straight-stem standard)	1996–2008	295	94.90%	88.10%	72.90%	96.60%	±2.5%	94.50%	±3.8%
Omnifit (Lubinus SP II)	1992–1995	172	80.70%	29.10%	52.90%	95.90%	±3.0%	77.50%	±6.4%
Omnifit (Omnifit)	1992–1996	323	66.80%	12.40%	53.60%	91.50%	±3.0%	65.60%	±5.3%
OPTICUP (Lubinus SP II)	1995–2009	699	54.50%	84.80%	63.70%	97.70%	±1.2%	92.80%	±2.7%
OPTICUP (NOVA Scan Hip)	1993–2000	157	66.00%	75.80%	54.10%	91.10%	±4.6%	72.20%	±7.9%
OPTICUP (Optima)	1993–2000	757	74.10%	87.30%	60.00%	96.60%	±1.4%	88.70%	±2.6%
OPTICUP (Scan Hip II Collar)	1996–2006	1,984	76.80%	82.70%	60.90%	96.70%	±0.8%	89.30%	±1.8%
OPTICUP (Scan Hip Collar)	1995–1996	82	80.20%	84.10%	58.50%	97.00%	±3.5%		
PCA (PCA)	1992–1994	70	71.60%	22.90%	42.90%	95.70%	±4.5%	85.00%	±8.6%
Press-Fit cup (CLS Spotorno)	1999–2008	122	39.30%	4.10%	55.70%	93.10%	±5.2%		
Reflection (Spectron EF Primary)	1996–2009	7,519	75.40%	92.10%	65.50%	97.30%	±0.4%	90.60%	±1.2%
Reflection (Spectron EF)	1992–1996	890	69.50%	97.90%	66.50%	98.60%	±0.8%	95.90%	±1.5%
Reflection HA (Lubinus SP II)	1995–2009	204	87.20%	20.60%	43.60%	95.70%	±2.9%	92.20%	±4.4%
Reflection HA (Spectron EF Primary)	1996–2009	104	80.60%	25.00%	44.20%	92.00%	±5.3%	77.90%	±8.4%
Romanus (Bi-Metric cem)	1992–1998	354	83.40%	30.80%	47.50%	95.90%	±2.1%	86.20%	±3.7%
Romanus (Bi-Metric HA uncem)	1992–1999	136	84.60%	16.90%	53.70%	99.30%	±1.1%	91.50%	±4.8%

(continued on next page.)

Implant survival per type (cont.)

all diagnoses and all reasons for revision, 1992–2009

Cup (Stem)	Period [1]	Number [2]	OA [3]	>=60years [4]	Female [5]	5 years	K.I.	10 years	K.I.
Romanus (Bi-Metric uncem)	1992–1997	243	75.40%	11.50%	51.40%	97.10%	±2.1%	87.00%	±4.4%
Romanus (Lubinus SP II)	1992–1996	87	70.90%	19.50%	29.90%	98.80%	±1.8%	90.20%	±6.4%
Romanus (RX90-S)	1994–2000	181	90.10%	39.80%	51.90%	96.10%	±2.9%	85.90%	±5.1%
Romanus HA (Bi-Metric HA uncem)	1992–2005	275	72.30%	10.90%	60.00%	96.00%	±2.4%	90.30%	±3.6%
Romanus HA (Bi-Metric uncem)	1992–1999	79	64.60%	10.10%	51.90%	93.70%	±5.4%	80.60%	±8.8%
Scan Hip Cup (Lubinus SP II)	1992–2007	92	61.40%	84.80%	75.00%	95.30%	±4.4%		
Scan Hip Cup (Optima)	1993–2001	509	71.20%	89.60%	67.40%	98.50%	±1.1%	94.30%	±2.3%
Scan Hip Cup (Scan Hip II Collar)	1996–2001	206	77.30%	89.80%	63.10%	96.80%	±2.5%	90.20%	±4.8%
Scan Hip Cup (Scan Hip Collar)	1992–2000	2,882	72.70%	88.90%	61.80%	97.80%	±0.6%	91.90%	±1.1%
Scan Hip Cup (Scan Hip Collarless)	1992–1999	142	77.60%	91.50%	65.50%	98.50%	±1.8%	91.20%	±5.6%
Secur-Fit (Omnifit)	1996–1999	115	73.90%	2.60%	51.30%	90.10%	±5.6%	75.40%	±8.1%
SHP (Lubinus SP II)	1994–2007	617	80.70%	88.00%	54.90%	99.30%	±0.8%	96.90%	±1.6%
SL Ti cup (CLS Spotorno)	1999–2009	107	87.90%	52.30%	25.20%	97.00%	±3.2%		
SLS (CLS Spotorno)	1992–1998	66	83.10%	33.30%	33.30%	96.90%	±3.6%	93.70%	±6.0%
Spectron Metal-backed (Spectron EF)	1992–1993	113	82.10%	98.20%	61.90%	99.10%	±1.3%	99.10%	±1.3%
Stanmore (Stanmore mod)	1994–2007	636	50.00%	92.00%	70.80%	98.30%	±1.1%	97.50%	±1.4%
Stanmore (Stanmore)	1992–1998	105	89.30%	96.20%	70.50%	96.80%	±3.4%	89.80%	±6.8%
TOP Pressfit HA (Lubinus SP II)	2000–2009	155	84.50%	34.20%	41.30%	97.90%	±2.2%		
Trident HA (Accolade)	2004–2009	780	79.90%	59.20%	54.70%	97.00%	±1.5%		
Trilogy (CLS Spotorno)	1998–2009	586	81.40%	42.80%	47.80%	96.00%	±1.8%		
Trilogy (Lubinus SP II)	1996–2009	73	86.30%	34.20%	37.00%	97.20%	±3.3%		
Trilogy (SL plus stem uncem)	1997–2006	135	70.40%	11.10%	35.60%	99.10%	±1.4%		
Trilogy (Wagner Cone Prosthesis)	1998–2009	240	52.50%	24.60%	64.60%	95.80%	±2.8%		
Trilogy HA (Anatomic HA/HATCP (HG V))	1994–1999	57	80.70%	22.80%	43.90%	94.70%	±5.6%		
Trilogy HA (Bi-Metric HA uncem)	1998–2009	196	85.20%	11.20%	50.50%	98.50%	±1.6%		
Trilogy HA (CLS Spotorno)	2000–2009	1,703	83.10%	35.60%	44.80%	95.80%	±1.5%		
Trilogy HA (Epoch HA)	1994–2007	60	85.00%	18.30%	28.30%	96.70%	±4.0%		
Trilogy HA (Lubinus SP II)	1995–2009	1,148	79.80%	54.00%	51.20%	97.00%	±1.0%	93.30%	±2.0%
Trilogy HA (Optima)	1995–1999	95	94.70%	47.40%	37.90%	96.80%	±3.4%	92.40%	±5.4%
Trilogy HA (Spectron EF Primary)	1996–2009	1,241	75.70%	58.30%	57.20%	98.70%	±0.6%	95.50%	±1.6%
Trilogy HA (Stanmore mod)	2001–2009	97	94.80%	68.00%	40.20%	99.00%	±1.5%		
Trilogy HA (Versys stam)	1999–2006	257	75.10%	13.60%	45.90%	99.20%	±1.0%		
Weber all-poly cup (MS30 Polished)	1999–2008	441	91.80%	88.70%	60.10%	99.30%	±0.8%		
Weber all-poly cup (Straight-stem standard)	1999–2008	1,163	99.40%	91.20%	65.90%	97.70%	±1.0%	96.90%	±1.4%
Weber poly Metasul cup (MS30 Polished)	1999–2006	100	73.00%	16.00%	52.00%	95.90%	±3.9%		
ZCA (CPT (CoCr))	2003–2007	383	78.10%	98.70%	71.80%	97.20%	±1.8%		
ZCA (CPT (steel))	1993–2005	114	80.00%	85.10%	62.30%	94.50%	±4.3%		
ZCA (MS30 Polished)	2004–2007	275	97.80%	92.00%	60.00%	98.00%	±1.7%		
ZCA (Stanmore mod)	2000–2008	249	75.50%	97.20%	64.30%	98.20%	±1.8%		

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.

The patient-reported outcome model – the PROM database

The main indications for hip arthroplasty are experienced pain and low health-related quality of life. For this reason it is important to measure these variables prospectively during the course of the disease. For many years there has been increased focus on patient-reported outcome (PROM = patient-reported outcome measure) both in operational analysis and in clinical research. The British Department of Health has since 1 January 2010 enjoined all National Health Service (NHS)-related hospitals in England to follow all patients receiving hip and knee prostheses with PROM.

The PROM database after eight years

The Swedish Hip Arthroplasty Register started to include patient-reported variables via what is termed the PROM database starting on 1 January 2002 in the Region Västra Götaland. The routine has since been successfully introduced in all county councils/regions. On 31 December 2009, 78 hospitals were connected (78 of 79 active departments). Only Sophiahemmet in Stockholm has so far refrained from joining this national follow-up routine. One variable (health-related quality of life gained after surgery) from the PROM database was selected by the National Board of Health and Welfare and SALAR as a national quality indicator in their report Open Comparisons.

Logistics and method

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

Overall objectives

- To include patient-reported outcome in the register.
- To increase the sensitivity of the register analysis.
- To create an opportunity for the departments to work on improving their activities starting with the patient's needs and reported outcome.
- To create a methodologically adequate health-economic instrument for cost effectiveness analysis and resource allocation.
- To reduce the number of routine visits after hip arthroplasty.

Result

On 17 September 2010 the pre-operative database (78 departments, three more reported but are no longer active) contained 61,931 patients. The 1-year follow-up contained 53,767 patients and the 6-year ditto 5,297. The mean national value for the entry variables varied very little over the years for which we have collected data. The variation between the hospitals, however, is strikingly large.

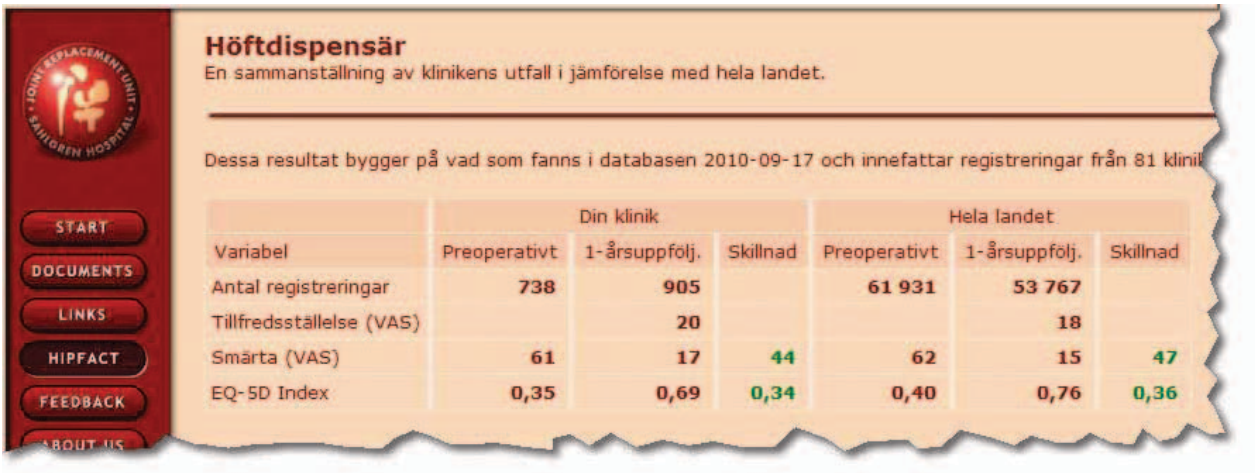
The reason for the variability is many-faceted: patient demography including socioeconomic parameters, gender distribution, age distribution, different indications for surgery, accessibility and the department's competence are factors that may affect these individual-based variables. To be able to analyse this in more depth, extensive matching (197,000 operations) with Statistics Sweden and the Patient Register at the National Board of Health and Welfare is currently in hand. The goal of this matching is to be able to include at individual level socioeconomic variables such as country of birth, education and medical co-morbidity. We know from other studies that these variables are very significant for patient-reported outcome and a national comparison becomes more relevant and fair when we have access to these parameters. Data from this investigation will be presented during spring 2011.

Six-year follow-up

The PROM database scheme started in the Region Västra Götaland (VGR) in 2002 so that 2008 was the first year that the 6-year questionnaire was distributed to the patients for the prospective follow-up. It will take two more years before we have 6-year data from all participating departments.

In-depth analysis of PROM data

On 10 December 2010 a doctoral thesis was defended based entirely on the Register's patient-reported outcome (Patient-repor-



	Din klinik			Hela landet		
Variabel	Preoperativt	1-årsuppfölj.	Skillnad	Preoperativt	1-årsuppfölj.	Skillnad
Antal registreringar	738	905		61 931	53 767	
Tillfredsställelse (VAS)		20			18	
Smärta (VAS)	61	17	44	62	15	47
EQ-5D Index	0,35	0,69	0,34	0,40	0,76	0,36

ted Outcome Measures and Health-economic Aspects of Total Hip Arthroplasty. A study from the Swedish Hip Arthroplasty Register, Ola Rolfson). What follows is a summarising extract from this analysis.

Patient-reported outcome one year after hip arthroplasty

Traditional outcome variables such as implant survival and complication frequency give an incomplete picture of the utility of the operation for individual patients. Figure 1 shows how the number of departments and registered PROM database protocols increased over the years in relation to the total number of hip arthroplasties.

Health-related quality of life and pain

The analysis includes 34,960 registrations with completed EQ-5D protocols pre-operatively and one-year post operatively with dates of primary operation between 1 January 2002 and 31 December 2008. Operations for acute hip fracture or malignity were excluded. During the first postoperative year the mean value for the EQ-5D index rose by 0.37. Women reported lower EQ-5D indices but had on average a greater gain in health-related quality of life than men had. The same circumstance applied to pain. In the follow-up the patient was asked to indicate satisfaction with the operation on a 100-grade VAS going from satisfied (0) to dissatisfied (100). The mean value for satisfaction was 17.

EQ-5D index in various age groups compared with the normal population

In the 'Health on Equal Terms' population surveys during 2006-2008 a reference material for EQ-5D index regarding the normal population was collected in the Western Götaland Region. Using data from this survey we determined individual age- and gender-adjusted EQ-5D indices for the individuals included in the relevant analysis of the PROM data base. In table 2 the study population is divided into 10-year groups. Clearly, the two youngest groups do not achieve the expected EQ-5D index one year after their operation. In the other age groups, health-related quality of life is better than in the normal population.

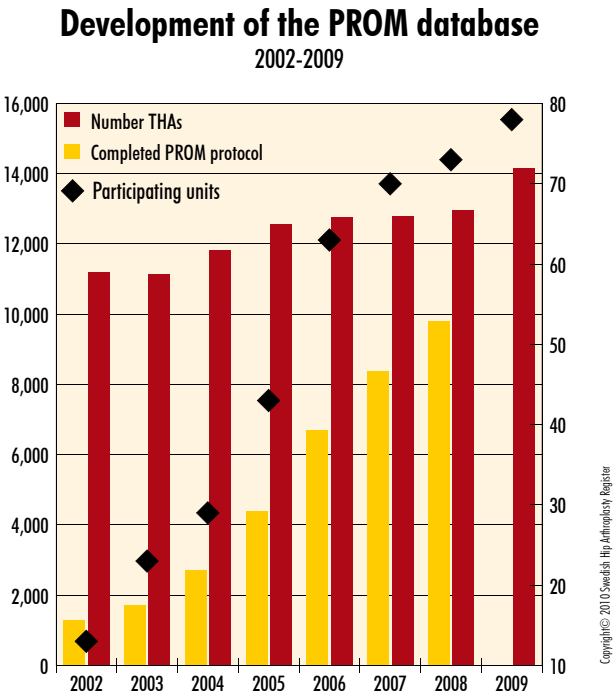


Figure 1. The nation-wide implementation of the PROM routine.

Response frequency

We also conducted a special analysis of response frequency regarding the PROM database. All 12,300 hip arthroplasties during 2008 that were performed at the departments connected to the PROM on 1 January 2008 were included in this analysis. The pre-operative questionnaire was answered by 86% and the questionnaire for the 1-year follow-up by 90%. Seventy-nine percent answered both questionnaires. That the pre-operative answer frequency is lower probably reflects various local logistic problems of reaching all patients pre-operatively. In addition, the whole distribution process for the 1-year follow-up, including reminders, was organised so that the questionnaire probably reached more patients. Table 3 shows the response frequency by region. The dropout rate was also analysed and it was primarily older patients with higher co-morbidity and ASA classifications who did not answer the survey.

Health related quality of life and pain before and one year after hip arthroplasty surgery

		Preoperative	Postoperativte	Δ	CI_{95}
EQ-5D index	All (n=34 960)	0.41	0.78	0.371*	0.368 – 0.375
	Female (n=20 220)	0.37†	0.76†	0.385*†	0.380 – 0.390
	Male (n=14 740)	0.45†	0.81†	0.353*†	0.347 – 0.358
Pain (VAS)	All (n=34 953)	62	14	-47.4*	-47.2 – -47.7
	Female (n=20 214)	64†	15†	-48.7*†	-49.0 – -48.4
	Male (n=14 739)	59†	13†	-45.6*†	-46.0 – -45.3

Table 1. Mean values for EQ-5D index and pain (VAS) preoperatively, one year post-operatively and the difference (Δ) between them. In the last column, the 95% confidence interval (CI_{95}) for the delta value (Δ) is shown. The symbols represents significant differences between each group (*) and between sexes (†), (p<0.001 for them all).

EQ-5D index pre- och postoperatively compared to the normal population

		EQ-5D-index			Percent of expected
Age	No.	Preop.	Postop.	Normal population	EQ-5D-index
< 30 years	57	0.24	0.71	0.87	81%
30 - 39 years	317	0.33	0.76	0.84	90%
40 - 49 years	1,299	0.35	0.80	0.79	101%
50 - 59 years	4,961	0.38	0.78	0.74	104%
60 - 69 years	11,684	0.42	0.80	0.75	106%
70 - 79 years	11,965	0.43	0.78	0.72	108%
80 - 89 years	4,544	0.38	0.73	0.67	109%
≥ 90 years	133	0.28	0.66	missing value	

Table 2. EQ-5D-index pre- och postoperatively in different age groups compared to age and gender adjusted EQ-5D index in a normal population (from population survey in Western Region 2006-2008 including 63,349 individuals). Percent of expected EQ-5D-index calculated by dividing mean value of EQ-5D index postoperatively with the mean value of the the normal population. Differences in the EQ-5D index at the one year follow-up and the normal population is significant (p≤0.001).

The utility of the PROM database?

The results from the patient-related outcome measure database supplement the traditional outcome measures and constitute an important quality indicator. We now have a practically national follow-up of patient-reported outcome measures with a good response rate.

For the EQ-5D index, the minimally important difference for the individual has been estimated to ±0.074 (Walters et al, Qual Life Res 2005; 14-6:1523-32). On this definition, the EQ-5D index remains unchanged for one-fifth of the patients and 5% had even worsened at the 1-year follow-up. The corresponding definition for pain measured with VAS (Kelly et al, Emerg Med J 2001; 18-3:205-7) show that only 90% report improvement. Further, only 89% were satisfied with the operation (VAS < 40). We conclude from these results that a significant proportion of those undergoing hip arthroplasty have not achieved the intended effect of the operation after one year. This prompts reflection on the indications for surgery, the quality of non-surgical treatment during the course of the disease, the information the patient receives before the operation, discussion of the patient's expectations of the intervention, and surgical technique. In these areas, there is probably great scope for improvement in hip arthroplastic surgery.

Lastly, the PROM database, which is now very comprehensive, offers great opportunities for future health-economic analyses.

Response frequency in different regions

Region	Preoperative (%)	Postoperative (%)	Both (%)
Stockholm & Gotland	87.2	88.3	78.5
Southeast	89.6	91.1	84.6
South	86.3	88.9	79.2
Western	87.4	91.5	80.9
Uppsala-Örebro	84.3	92.4	78.6
Northern	81.4	88.6	72.3
All	86.1	90.2	79.1

Table 3.

Patient-reported outcome per hospital

2008-2009

Hospital	Preoperative				Follow-up after 1 year				Gain [3]	Follow-up after 6 years				Gain [3]
	No.	C-kat. [1]	EQ-5D	Pain	No.	EQ-5D	Pain	Satisf. [2]		No.	EQ-5D	Pain	Satisf. [2]	
University/Regional Hospitals														
Karolinska/Huddinge	402	60%	0.39	76	259	0.70	16	17	0.31					
Karolinska/Solna	335	49%	0.37	63	419	0.73	16	19	0.36					
Lund	58	59%	0.28	67	261	0.64	22	25	0.36					
Malmö	40	53%	0.32	65	233	0.66	21	23	0.34					
SU/Mölndal	412	67%	0.31	65	434	0.69	20	25	0.38	172	0.69	19	22	0.38
SU/Östra	125	44%	0.4	62	218	0.68	17	21	**0.28**	176	0.64	19	20	0.24
Umeå	130	48%	0.29	68	144	0.75	14	15	0.46	12	0.76	21	16	0.47
Uppsala	324	54%	0.42	57	404	0.72	16	20	**0.30**					
Örebro	287	56%	0.4	57	353	0.76	13	14	0.36					
Central Hospitals														
Borås	281	46%	0.36	61	393	0.69	18	21	0.33	195	0.72	16	19	0.36
Danderyd	602	45%	0.35	64	733	0.75	15	19	0.40					
Eksjö	381	34%	0.42	61	370	0.79	13	15	0.37					
Eskilstuna	103	56%	0.3	64	152	0.71	15	19	0.41					
Falun	576	48%	0.42	58	525	0.78	13	14	0.36					
Gävle	230	47%	0.34	64	233	0.69	15	21	0.35					
Halmstad	279	38%	0.4	64	407	0.78	15	18	0.38					
Hässleholm-Kristianstad	1,672	40%	0.4	62	1,480	0.80	14	15	0.40					
Jönköping	322	51%	0.37	64	344	0.76	14	17	0.39					
Kalmar	312	42%	0.4	63	315	0.78	13	17	0.38					
Karlstad	319	38%	0.39	61	500	0.70	17	22	0.31					
Norrköping	263	42%	0.4	62	68	0.77	16	22	0.37					
S:t Göran	613	48%	0.41	61	519	0.74	17	21	0.33					
Skövde	143	51%	0.32	63	177	0.72	14	17	0.40	199	0.67	17	19	0.35
Sundsvall	290	50%	0.34	65	237	0.72	15	19	0.38	12	0.82	15	13	0.48
Södersjukhuset	548	43%	0.39	61	728	0.72	17	20	0.33					
Uddevalla	518	50%	0.39	61	566	0.76	15	19	0.37	341	0.67	18	19	0.28
Varberg	403	37%	0.44	63	412	0.80	13	16	0.36					
Västerås	366	43%	0.33	67	266	0.74	16	18	0.41					
Växjö	124	56%	0.46	53	258	0.78	13	16	0.32					
Östersund	357	39%	0.38	63	349	0.77	13	15	0.39	72	0.75	13	13	0.37
Rural Hospitals														
Alingsås	422	45%	0.43	59	389	0.78	13	16	0.35	170	0.74	14	17	0.31
Arvika	315	46%	0.45	62	216	0.79	14	15	0.34					
Bollnäs	558	37%	0.4	64	511	0.76	14	17	0.36					
Enköping	401	40%	0.44	60	362	0.77	16	20	0.33					
Falköping	473	39%	0.47	61	425	0.81	13	15	0.34	396	0.77	14	15	0.30
Frölunda Specialistsjukhus	161	40%	0.47	58	150	0.77	16	21	**0.30**	29	0.8	19	20	0.33
Gällivare	121	36%	0.43	63	162	0.75	15	18	0.32	32	0.71	18	18	0.28
Hudiksvall	187	49%	0.4	61	250	0.73	15	19	0.33					
Karlshamn	357	38%	0.41	61	337	0.78	14	17	0.37					
Karlskoga	211	40%	0.39	62	169	0.77	15	18	0.38					
Katrineholm	436	50%	0.37	63	447	0.80	14	17	0.43					
Kungälv	315	44%	0.43	58	388	0.74	17	21	0.31	295	0.73	15	17	0.30

(continued on next page.)

Patient-reported outcome per hospital (cont.)

2008-2009

Hospital	Preoperative				Follow-up after 1 year				Gain [3]	Follow-up after 6 years				Gain [3]
	No.	C-kat. [1]	EQ-5D	Pain	No.	EQ-5D	Pain	Satisf. [2]		No.	EQ-5D	Pain	Satisf. [2]	
Köping	50	34%	0.46	62	14	0.82	8	17	0.36					
Lidköping	243	49%	0.37	61	221	0.75	16	20	0.38	163	0.74	16	18	0.37
Lindesberg	377	38%	0.45	61	293	0.80	10	11	0.35					
Ljungby	269	41%	0.48	59	207	0.83	10	13	0.35					
Lycksele	431	44%	0.39	65	425	0.80	16	16	0.41	49	0.72	20	15	0.33
Mora	353	43%	0.35	68	249	0.76	15	20	0.41					
Motala	623	48%	0.48	58	629	0.76	16	18	**0.28**					
Norrtälje	213	40%	0.46	63	101	0.79	14	17	0.33					
Nyköping	152	40%	0.4	64										
Oskarshamn	406	33%	0.53	56	494	0.81	11	13	**0.28**					
Piteå	602	39%	0.38	65	716	0.80	13	15	0.42	34	0.73	18	24	0.35
Skellefteå	160	49%	0.41	62	151	0.74	16	18	0.33	29	0.77	15	13	0.36
Skene	148	44%	0.39	62	145	0.79	18	22	0.40	138	0.76	13	17	0.37
Sollefteå	237	38%	0.45	62	142	0.80	16	15	0.35					
Södertälje	209	33%	0.41	63	194	0.73	18	21	0.32					
Torsby	153	39%	0.35	64	131	0.76	15	19	0.41					
Trelleborg	1174	39%	0.41	64	1082	0.79	16	17	0.38					
Visby	184	48%	0.4	64	184	0.76	15	19	0.36					
Värnamo	245	35%	0.49	59	256	0.77	16	18	**0.28**					
Västervik	217	42%	0.47	60	211	0.77	16	18	**0.30**					
Örnsköldsvik	277	46%	0.38	65	340	0.77	14	18	0.39	21	0.84	11	14	0.46
Private Hospitals														
Aleris Specialistvård Sabbatsberg	79	25%	0.39	65										
Elisabethsjukhuset	226	29%	0.46	62	295	0.84	12	11	0.38					
Movement	349	28%	0.44	62	254	0.83	11	14	0.39					
Nacka Närsjukhus Proxima	99	43%	0.44	66	42	0.82	15	18	0.38					
Ortho Center Stockholm	609	40%	0.38	66	249	0.78	14	17	0.40					
OrthoCenter IFK-kliniken	197	28%	0.4	65	90	0.84	9	13	0.44					
Ortopediska Huset	948	34%	0.43	62	500	0.80	12	14	0.37					
Spenshult	187	40%	0.47	58	113	0.79	10	11	0.32					
Nation	24,351	43%	0.41	62	23,512	0.76	15	18	0.35	2,888	0.71	16	18	0.30

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 activity after total hip arthroplasty

The Swedish Hip Arthroplasty Register started to report hospital results openly in 1999. The number of variables reported in this way has increased over the years and is presented in table form in different places in this Report. These tables are necessarily comprehensive and sometimes hard to interpret. Moreover, it is hard via the tables to obtain a rapid overview of the departments' results in several dimensions. We are now using what is termed the value compass for the fourth year. This contains eight variables (compass points). The compasses have been produced with the sole intention of obtaining a rapid and easily graspable overview. A deviant result in a value compass only states whether a department has a problem area. The compass may be seen as a simplified signal system.

This year this follow-up model is used to present results for all the departments linked to the PROM database for more than one year and with at least 50 patients followed (64 departments). Limit values have been set for the largest and the smallest value plus/minus one standard deviation for all the variables in question. This means that the norm values (red area) vary from year to year. The worst value (0.0) for the variables was assigned origo and the best value (1.0) is at the periphery. This value compass may be viewed as a balanced control card. The greater the area, the better the many-dimensioned result that clinic achieved.

The national mean value is given in each figure and each department can thus compare itself with the national result for that operational year. Note that the observation times for the variables differ.

Result variables

- **Patient satisfaction.** Measured with VAS. Can only, like variables pain alleviation and health-related quality of life gained, be stated if the department has worked with the PROM routine for more than 1 year.
- **Pain relief.** Measured by subtracting the pre-operative VAS value from the follow-up value, i.e. the value gained after 1 year.
- **Gained health-quality of life (gain in EQ-5D index).** The prospective gained value on the EQ-5D index, i.e. health gain after 1 year.
- **90-day mortality.** In international literature this variable is used to illustrate mortality following hip arthroplasty.
- **Completeness.** Completeness at individual level according to the latest matching with the National Board of Health and Welfare Patient Register.
- **Re-operation within 2 years.** Gives all forms of re-operation within 2 years for the most recent 4-year period.
- **5-year implant survival.** Implant survival after 5 years using Kaplan-Meier statistics.
- **10-year implant survival.** Same variable as above but with a longer follow-up time.

Linked to each department's value compass there is also a graphic presentation of that department's 'case-mix'. This part is designed in the same way as the value compass and includes those variables that on analysis of the Registry's database have proved to be decisive democratic parameters for both patient-reported outcome and long-term results regarding need for revision. The larger the surface in this figure the more favourable a patient profile that department has.

Charnley classification. This figure gives the department's proportion of patients who have classified themselves as Charnley class A or B, i.e. patients without multiple joint disease and/or intercurrent diseases affecting their walking ability.

Proportion of primary arthroses. The more patients with diagnosed primary arthrosis a department operates on, the better the long-term result becomes according to the Registry's regression analysis of the database.

Proportion of patients 60 years or older. Departments operating on many patients over 60 years obtain better results in the same way as on the above variable.

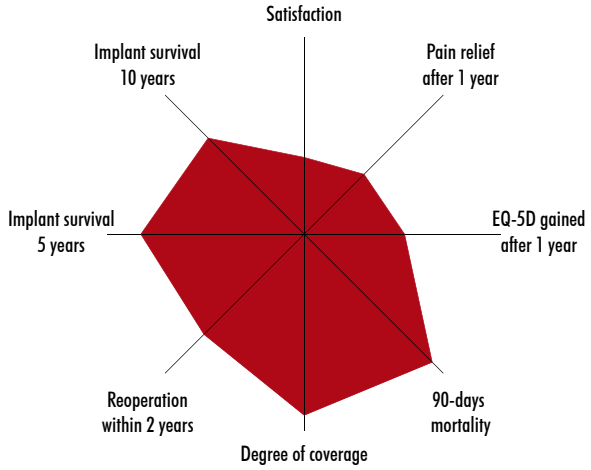
Proportion of women. Women have generally better long-term results than men regarding need for revision chiefly because of aseptic loosening.

Discussion

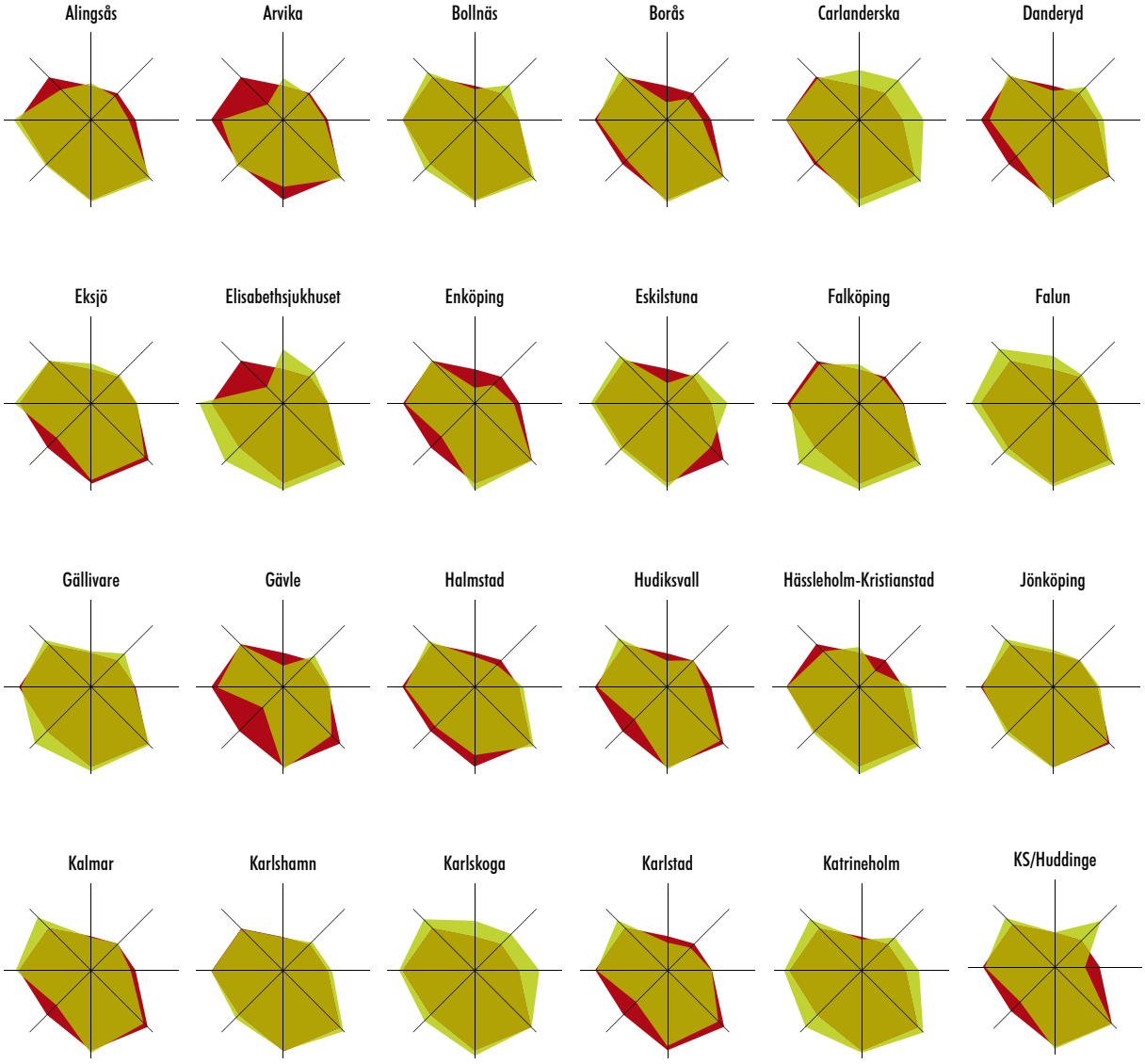
There is a strong desire among decision-makers in medical care for access to easily-available and summarising presentations of departments/county council results for use in follow-up of activities. A different way of fulfilling this desire is to create an index as a total sum embracing a number of variables. The greatest risk associated with indexing is that good results on one variable can be cancelled out by poor results on another. An index of this type thus represents no incentive for in-depth analysis and improvement work. Different degrees of coverage of reported variables may also affect indexing, with misleading results as a consequence.

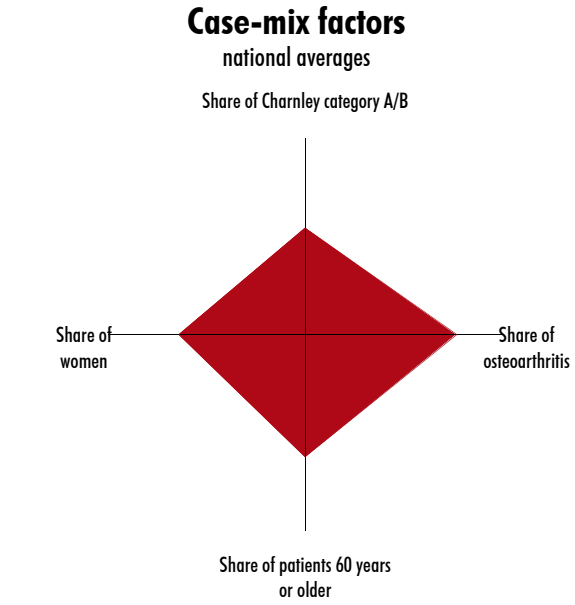
Quality indicators

clinical value compass - national averages

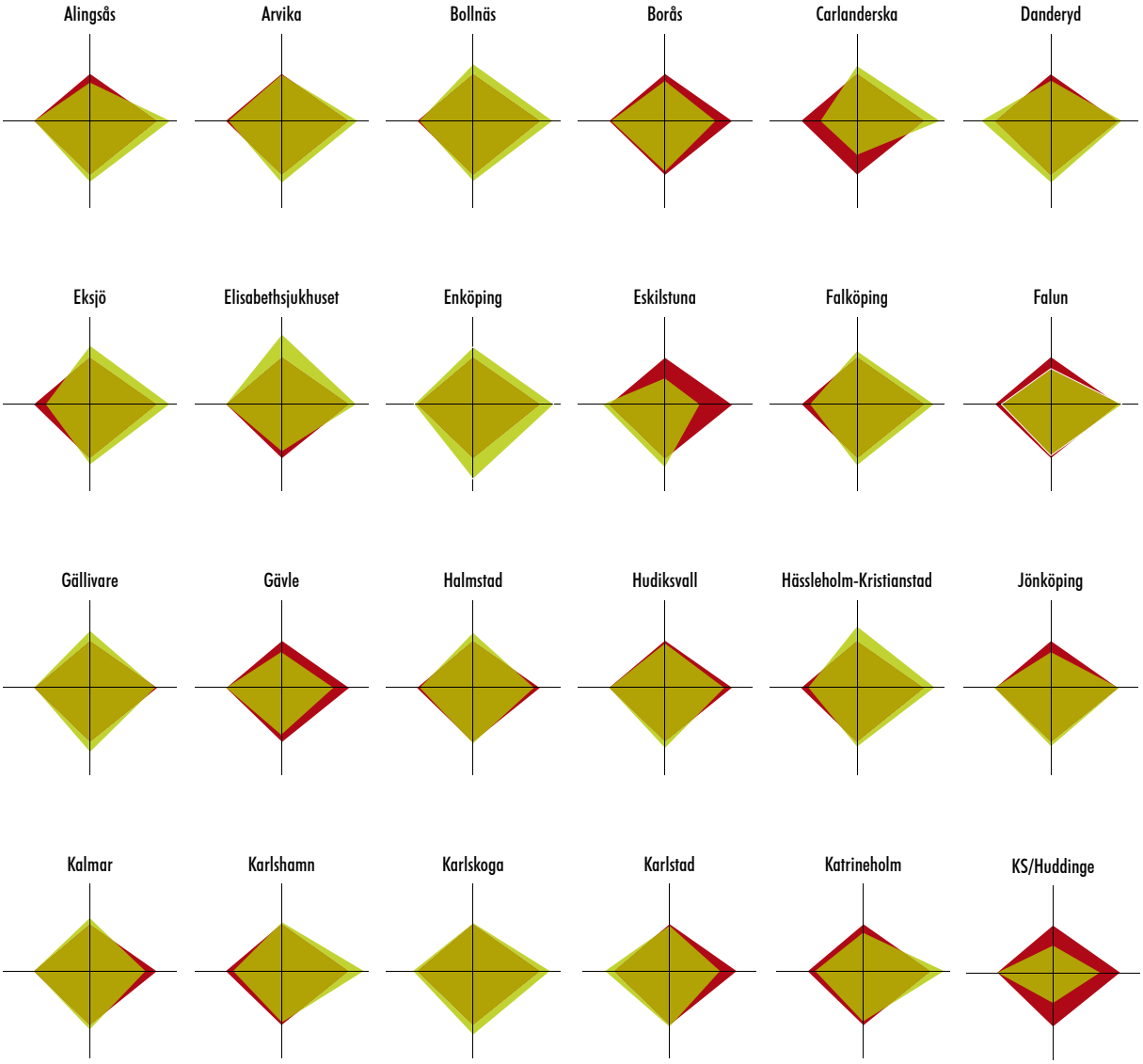


The value compasses show national results regarding the eight variables included, in red. Each department's corresponding values are shown in green. Limit values are set to that variable's largest and smallest value ±1 SD. The poorest value for the variables is assigned origo and the best value is at the periphery. The departments showing red fields have a poorer value than the national average for that particular variable. The outcome can be studied in detail in the relevant table.

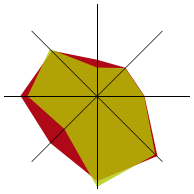




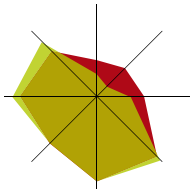
The graphic presentation of patient demography ('case-mix') shows the national result for the four variables included, in red. The corresponding values for each department are shown in green. Limit values are set to the largest and the smallest value of the variable in question ±1 SD. The poorest value for the variables is assigned origo and the best value is in the periphery. When interpreting the value compass of that department, and above all when making comparisons, the 'case-mix' profile must always be noted.



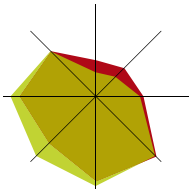
KS/Solna



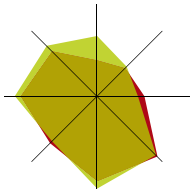
Kungälv



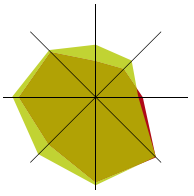
Lidköping



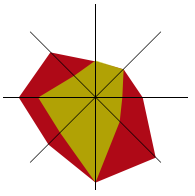
Lindesberg



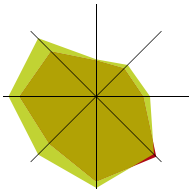
Ljungby



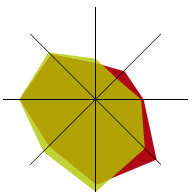
Lund



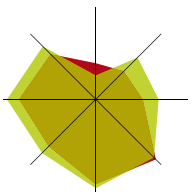
Lycksele



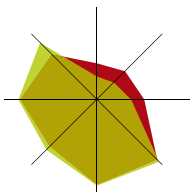
Malmö



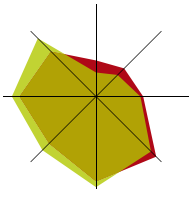
Mora



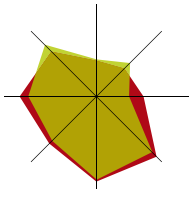
Motala



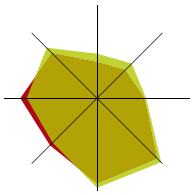
Norrköping



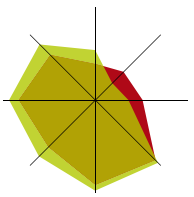
Norrtälje



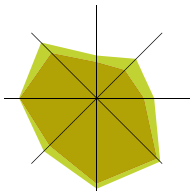
Ortopediska Huset



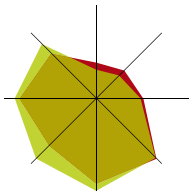
Oskarshamn



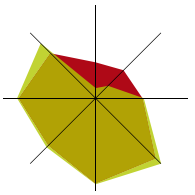
Piteå



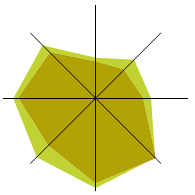
Skellefteå



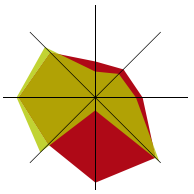
Skene



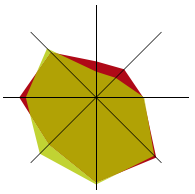
Skövde



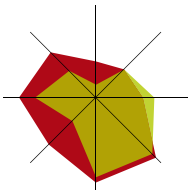
Sollefteå



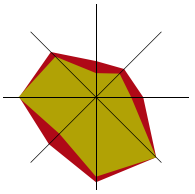
S:t Göran



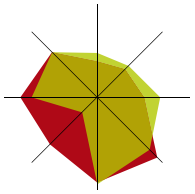
SU/Mölndal



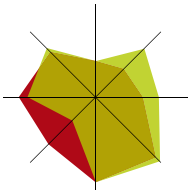
SU/Östra



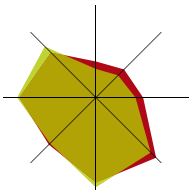
Sunderby (Boden included)



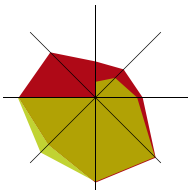
Sundsvall



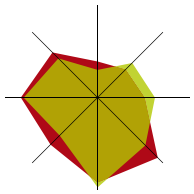
Södersjukhuset



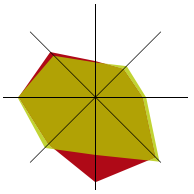
Södertälje



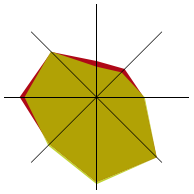
Torsby



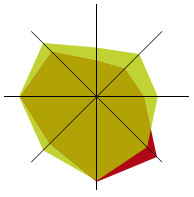
Trelleborg



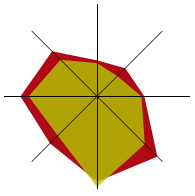
Uddevalla



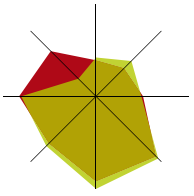
Umeå



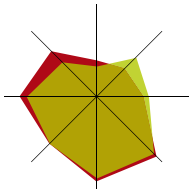
Uppsala



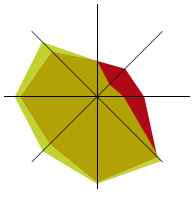
Varberg



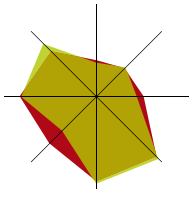
Visby



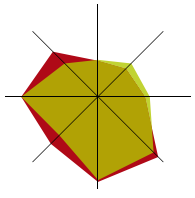
Värnamo



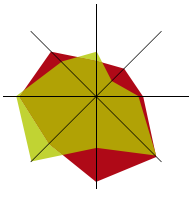
Västervik



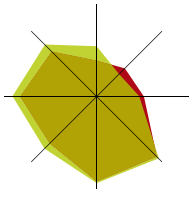
Västerås



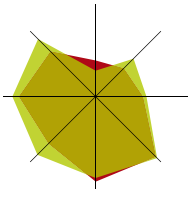
Växjö



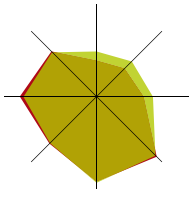
Örebro



Örnsköldsvik

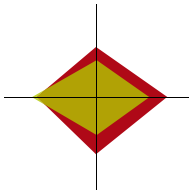


Östersund

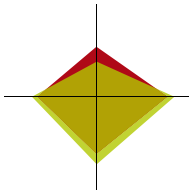


(continuation of clinical value compass)

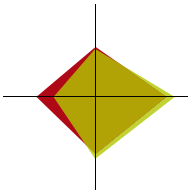
KS/Solna



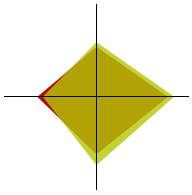
Kungälv



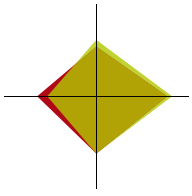
Lidköping



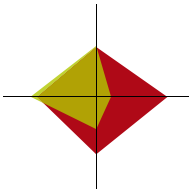
Lindesberg



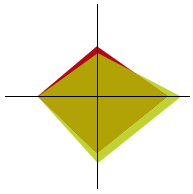
Ljungby



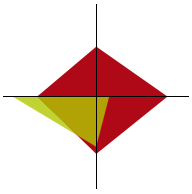
Lund



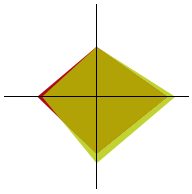
Lycksele



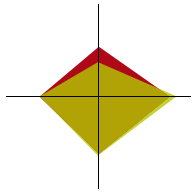
Malmö



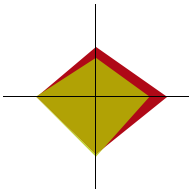
Mora



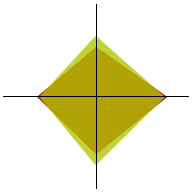
Motala



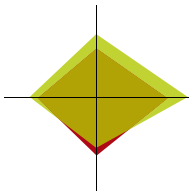
Norrköping



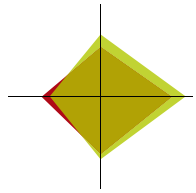
Norrtälje



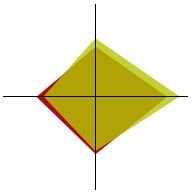
Ortopediska Huset



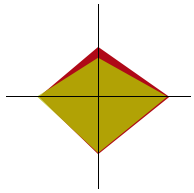
Oskarshamn



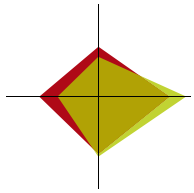
Piteå



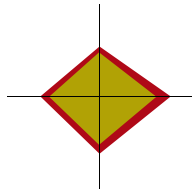
Skellefteå



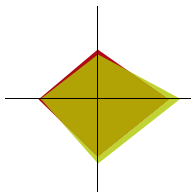
Skene



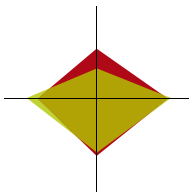
Skövde



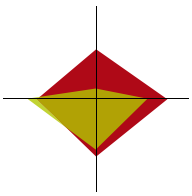
Sollefteå



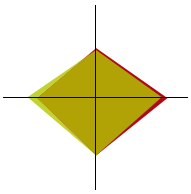
S:t Göran



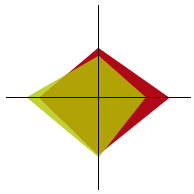
SU/Mölndal



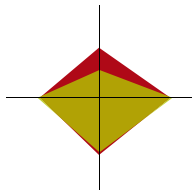
SU/Östra



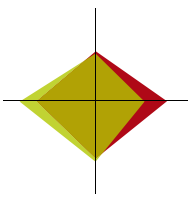
Sunderby (Boden included)



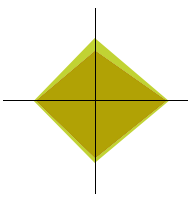
Sundsvall



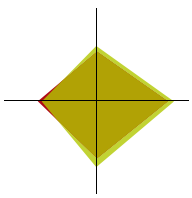
Södersjukhuset



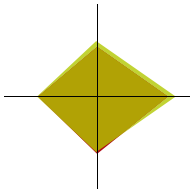
Södertälje



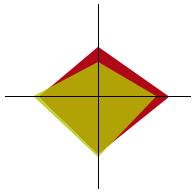
Torsby



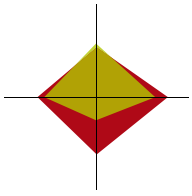
Trelleborg



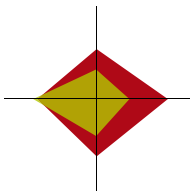
Uddevalla



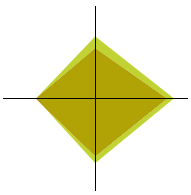
Umeå



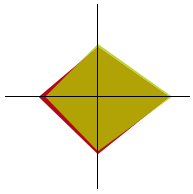
Uppsala



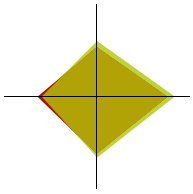
Varberg



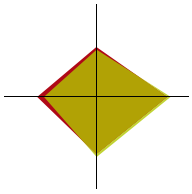
Visby



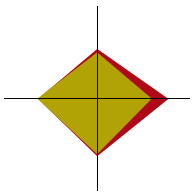
Värnamo



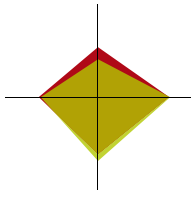
Västervik



Västerås



Växjö



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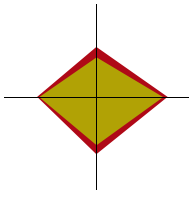

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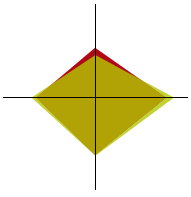

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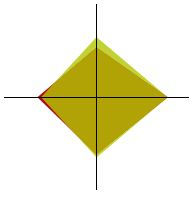


(continuation of 'case-mix' factors)

Operational analysis and work for improvement

The chief task of the Registry is, using analyses and open reporting, to generate enthusiasm among the various units to perform local in-depth analyses and to work continually for improvement.

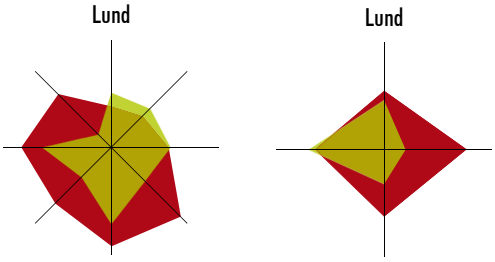
The Registry has refrained from ranking hospital results. There has been criticism that the present method of reporting results is not scientifically correct. However the Registry's Annual Report should not be considered as a scientific publication but as a combined signal system with the aim of continually improving the multidimensional quality of Swedish hip arthroplasty surgery. Had we chosen to publish everything in scientific journals with 'review' systems, our feedback to the profession would be seriously delayed and the opportunity of rapidly implementing 'best practice' would be lost.

To have each department analyse its results as a step in operational analysis, development work and improvement, we propose the following:

- focus on one's own result and its time trend.
- do not focus on the national mean value – many departments are satisfied as long as they have better values than the reported mean value, and 'lose the pace' of their own development. Moreover, mean values in one result variable at national level may be a poor result with a need for national improvement.
- Discuss 'on-line' results and the Annual Report – first of all the department's complications – continuously at internal meetings. Only then can one identify problem areas and discover systematic shortcomings in the whole process of hip arthroplastic surgery – from reporting logistics, defining indications, admission, operation-to-discharge and rehabilitation of the patient.

For several years we have published examples of local analyses and work for improvement from several departments, but this year we report only Lund's in-depth analysis of the outcome of their value compass from 2008. The Registry management considers that the Lund clinic's survey and written report are exemplary, and we hope that all departments regardless of whether 'poor or good' outcome follow this good example of optimal interplay between a national register an individual department. Such reviews are important not only for that clinic's improvement; they are also a validation of and check on the data quality of the Register. Remember, the Registry can report that something has happened but not why!

In last year's Report, Lund's value compass had the following appearance:



After discussion with colleagues in Lund, a careful review was carried out and the following report made, which is given word-for-word below:

Self-scrutiny of Lund Orthopaedic Clinic's data from the Swedish Hip Arthroplasty Annual Report for operation year 2008

The orthopaedic clinic in Lund had in the SHPR annual report for 2008 remarkably poor results in several respects, concerning both reporting and results. For this reason we carried out during spring 2010 an internal review of data to see if we could find systematic deviations regarding our total arthroplasties.

For many years Lund has had a computerised system for operation reports (?) from which data can be obtained. This data was compared with data we ourselves downloaded from the SHPR home page. The data were matched with the anaesthesia and patient registers. The medical histories were reviewed by Martin Sundberg and Uldis Kesteris (contact physicians).*

The orthopaedic clinic in Lund conducted 400 total arthroplasties in 2008, of which 304 were conducted in Trelleborg by the clinic's surgeons and 96 in Lund.

Degree of completeness

According to the register we had reported 95 patients. In our system we found 96 operations and all these were reported according to the data we obtained from SHPR. The last patient probably came after the Annual Report. The Report states that only 88.5% of these were reported to the Patient Register but 91 of these 95 were there with the correct operation code. One patient was in the Register but with an incorrect operation code. Two patients in care at our clinic lacked operation codes and two at another department (the Oncological Clinic) lacked operation codes. This gives the correct reporting frequency of 95.8%. We find it hard to explain the discrepancy. It has been impossible to find out which patients in the match of the SHPR and the SoS Patient Register are missing. In 2008 our clinic started a special drive with DRG secretaries, which it is hoped will improve our results. In addition we have pointed out to other clinics the importance of also registering correct operation codes.

New variables

The clinic reported > 20% of ASA, height and weight for 2008. This is naturally not an acceptable level. What we found was that for the major part of the year an old form had been used as the basis for reporting. This had no boxes for filling in this data. This has now been corrected and it has been stressed in the surgical department that it is everyone's responsibility that reporting is done. We hope that the figures will be considerably improved for the 2009 Report.

Re-operation within 2 years

Of 357 patients reported, 14 were re-operated (3.8%) within 2 years following their primary operation: 45% of these 357 patients were acute cases. We received from SHPR a list of these 14 patients which was analysed.

Infection

Of the five infected cases (1.4%) three underwent revision with replacement of ball and synovectomy, while two had total revision. Four of these patients were acute cases and 1 was elective (sequelae following acetabular fracture). The clinic has an aggressive attitude to prosthesis infections involving early synovectomy. Prostheses with modular heads make it possible to change these, which is done routinely even when there is nothing wrong with the

prosthesis. The infection frequency of 1.12% is judged not to be abnormally high, given the patient material.

Dislocation

Five re-operations owing to dislocation were registered but of the 14 patients 7 had been re-operated owing to dislocation. One patient was given as other complications and had 'only' infection registered, but was revised owing to both dislocation and deep infection. Five of the seven patients were acute cases. One underwent surgery for tumour and one for osteoarthrisis. The dislocation frequency is too high. In a more detailed review a clear over-representation of dislocations for inexperienced operators emerges (fewer than 20 operations between 2005 and 2008). In addition the clinic has routinely used posterior incision in the operation of hip fractures with joint prostheses.

We have now decided to use anterior incision in joint prosthesis operations for hip fractures. In 2008 anterior incisions were used in 88 of 194 (45%) of these operations; in 2009 87 of 174 (50%) and up to June 2010 the corresponding figure is 51 of 77 (66%). In addition, operators not doing more than 20 total arthroplasties per year will not do these operations alone, for which reason operators from the arthroplasty section take part in these cases.

Other points

Of the other eight complications four were verified. All these concerned resurfacing prostheses with re-operation owing to cervical fracture (three rheumatics, one arthrosis patient). One patient with only other complications underwent re-operation for dislocation (see above). Two patients had both other and infection as complications, but all the operations at our clinic were ascribed to infection. It is possible that 'prosthesis out' in the two-step change was reported as other. One patient with both infection and dislocation was also reported as other, for which we could find no explanation.

In summary, we consider that infection frequency is very reasonable in view of our case-mix, but the frequency of re-operation for dislocation should sink following our measures taken. We have also greatly reduced the use of resurfacing prostheses and today only younger men with arthrosis are the target group.

Implant survival 5 and 10 years

In our own analysis we found for the period 1999-2008 1,064 patients (992 in SHPR) who had undergone primary arthroplasty. Of these we could identify via our own data and files from SHPR 38 revised within five years. We lack access to data on those patients who were revised at other hospitals outside Skåne. The reasons for revision at 5 years and 10 years were the following:

We saw a clear over-representation among the revisions for loosening and other reasons for Scan Hip classic II with Optima cup and Durom. This variant of Scan Hip has proved a clearly poorer prosthesis than expected and has not been used at the clinic since 2005 on the stem side, and only sporadically on the cup side since then (old stocks have been used up in selected cases). Durom has also been used in patient groups whom we today know are not suitable for this type of prosthesis (RA, caput necrosis, older women). After 2005 the predominant prostheses were Lubinus SP II, MS-30 and Exeter, which all have excellent results regarding revision for loosening. Regarding dislocation, see above. Infection is judged to be reasonable in view of our case-mix.

After 5 years	After 10 years
12 aseptic loosening	29 aseptic loosening
11 dislocation	11 dislocation
7 infection	7 infection
8 others (smärta. mekanisk komplikation etc.)	12 others (smärta. mekanisk komplikation etc.)

90-day mortality

Our 90-day mortality is higher than all other clinics', and 17 of our patients during the period died within 90 days. Ten of these were operated on for metastasising cancer (total 43 in this group) and seven for cervical hip fracture (total 100 in this group). We consider this what one can expect. Since we have a smaller proportion of elective patients in Lund and in principle all arthrosis patients undergo surgery in Trelleborg by our clinic, this factor is misleading in relation to other hospitals. If Lund, Malmö and Trelleborg are pooled and compared as one unit regarding 90-day mortality, Lund/Malmö/Trelleborg come 58th nationally and with a mortality not particularly different the national average. Only 11 hospitals in the country have established lower 90-day mortality; none of these a university hospital dealing with all types of patient. Note also that we as opposed to other university hospitals also report metastasis patients to SHPR.

Health-related quality of life

Since our case-mix involves more than 50% acute patients, EQ-5D data are scarcely representative for reporting in the value compass. There are only a few electively admitted patients who can answer pre and post operatively. Tumour patients should not be evaluated, since EQ-5D among these reflects their tumour disease rather than the effect of the intervention. Our degree of completeness will remain low in Lund since our elective patients undergo surgery in Trelleborg.

Conclusion

The review has given us valuable knowledge. We have improved internal routines but also found data errors which cannot be explained by poor internal routines. Regarding re-operation within 2 years we find our infection frequency reasonable in view of our case-mix, and the frequency of re-operation should sink through the measures taken (anterior incision in operation for hip fracture, experienced arthroplasty operators present at all total arthroplasties and greatly reduced use of resurfacing prostheses). The poor implant survival at 5 and 10 years is explained by the use of implants which are no longer used at all, or by more stringent indications. Our high 90-day mortality is explained only by the case-mix, and the fact that we both carry out and report operations for skeletal metastasising.

Lund 28 July 2010

Martin Sundberg
Head of section, joint prostheses

Pelle Gustafson
Director

The Registry's comments

If every orthopaedics unit producing prosthesis surgery carried out a similar analysis of operations based on result measures and not, as is most common today, based on budget, structure and process measures, then the Registry management is convinced that the quality of Swedish prosthesis surgery could be further improved. A common reason given for not conducting such analyses is lack time and resources. However such reasons are scarcely acceptable when it has been calculated that approximately 30% of the total cost of Swedish health and medical care arises from shortcomings in quality.

Analyse the unit's results and cases of complications in detail and discuss at internal meetings with all personel involved - a sure path to improvement!

Environmental and technical profile

One of the most important factors in success for a National Quality Register is to have a low number of registered variables. Many registers have 'bitten the dust' or achieved low degrees of coverage owing to their endeavour to capture all too many individual-based variables. The environmental and technical profile embraces structural and process measures regarding infection prophylaxis, surgical technique and the technical status of operating theatres. The optimal would be if we were able to individually-base this data. We do not at present wish to load the departments with a greater burden of registration, for which reason this database is based on year-aggregated data from each participating unit. When and if data capture to the quality registers is supplied automatically via local patient records and/or digital operative systems, then we can transfer to individual-based variables. Such a development process is going on following decisions on the national IT strategy – however the time perspective is 5-7 years before this can be implemented.

Thus departments report to the environmental and technical profile annually. It is therefore of great importance that the units update their current environmental profile via the website. If no alteration is made it is assumed that structures and processes remain unchanged from the previous year. The aggregated variables bring an uncertainty to statistical analyses of the database. Two variables historically present in the environmental profile are type of cement and type of incision. These variables have been individual-based for 7-8 years and are now reported in the section Primary total arthroplasty.

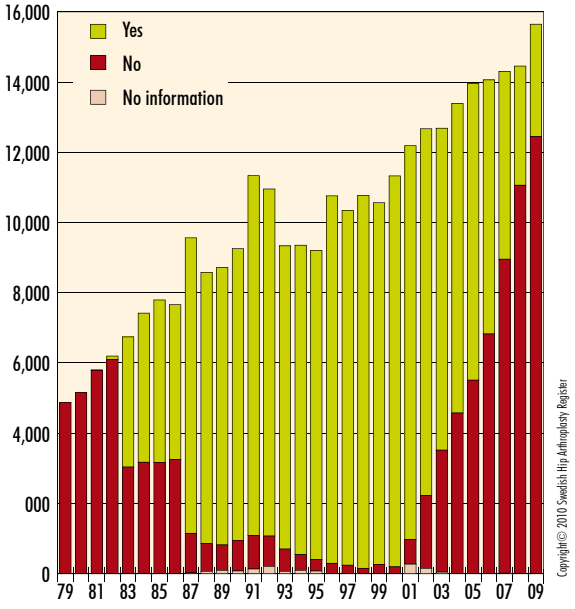
In recent years we have noted that departments very seldom alter their profile. This may depend on two things: 1 that technique, prophylaxis and operational environment have not been changed, 2 that people have "forgotten" to register the changes. The Registry management naturally hope that the first alternative is the dominating reason. We urge all contact physicians to up-date their profiles at least once a year.

This year's results

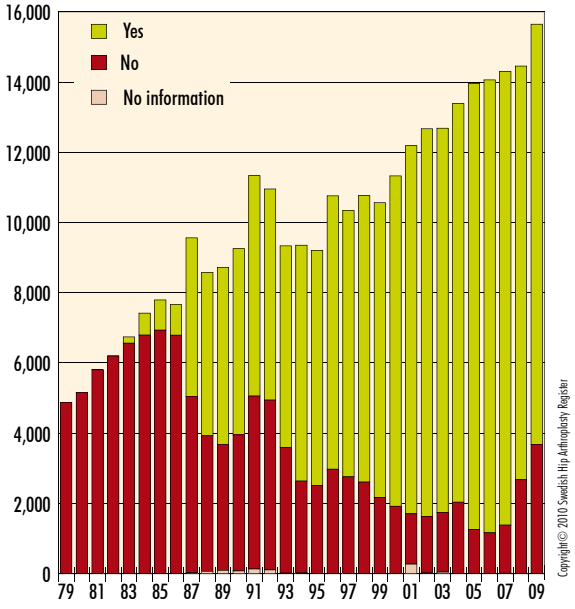
The change from the previous year's result is small. The Registry management consider one trend that has further increased this year is disquieting. The use of proximal sealing plugs for femur cementing should, on strong evidence, be used to almost 100%. This year, with rising frequency, almost 25% state that they do not use this type of equipment. If proximal is not used, the opportunities of good cement penetration are not exploited, which is an important constituent of a good modern cementing technique.

Almost one-quarter of the hospitals state that they do not use proximal sealing (plugs). This means that one quarter of the hospitals do not follow evidence-based, modern cementing technique.

Cleansing by brush
1979–2009

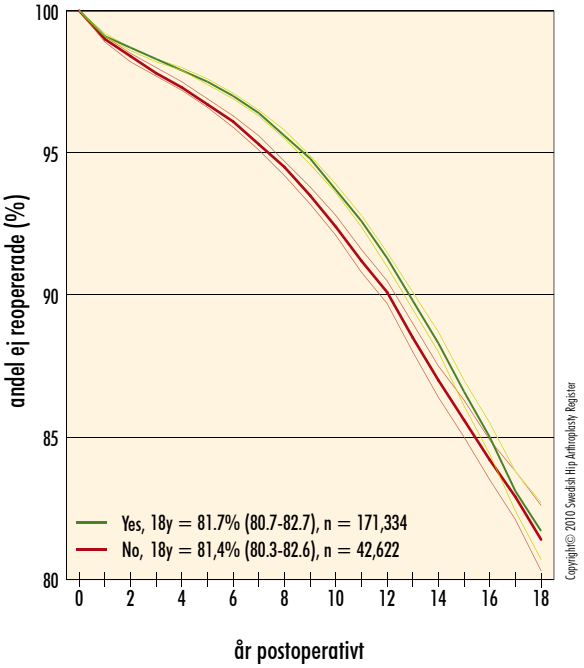


Proximal Femoral Sealing
1979–2009



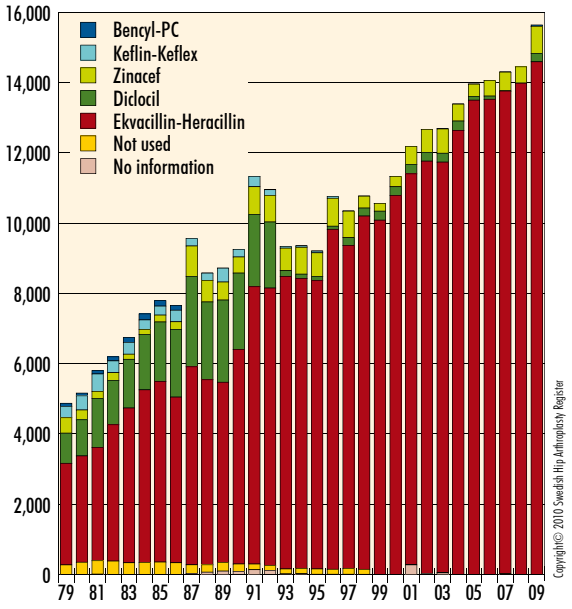
Proximal femoral sealing

all diagnoses and all reasons



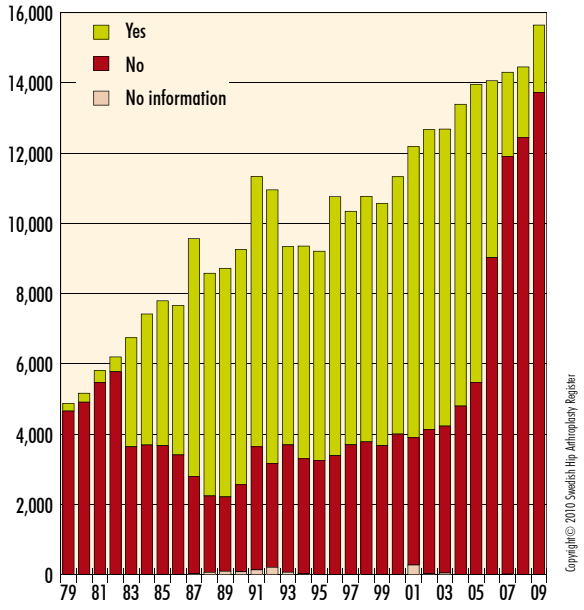
Parenteral brand of antibiotics

1979–2009



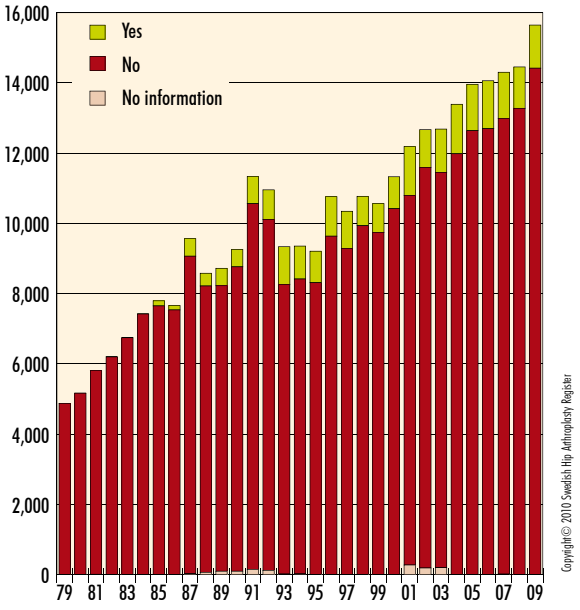
Cleansing by hydrogen peroxide

1979–2009



Cleansing by adrenaline

1979–2009



Notes

Mortality after total hip arthroplasty

Background

90-day mortality was introduced four years ago as an open variable at unit level. The variable is also included as one of eight parameters in the value compass. Even if hip arthroplasty today may be viewed as routine surgery, it is in fact a major surgical intervention which is not entirely risk-free for the patient. Modern anaesthesiology, careful pre-operative medical investigation and infection- and thrombosis-prophylactic measures have brought about low complication and mortality frequencies. The indications for prosthesis surgery have been expanded during the past few years, however – both nationally and internationally. More younger and older patients alike undergo operation than during the seventies and eighties. Today, predominantly at larger units, more risk patients are receiving surgery than formerly.

The Hip Arthroplasty Register updates its database many times a year (via the Inland Revenue).regarding possible dates of death of individuals included

Short-term mortality (90-day mortality)

Ninety-day mortality is an indicator used frequently in the literature and applied in several different medical areas. The reasons for a patient to die in connection with or within 90 days of a hip arthroplasty operation, and related to the intervention, may be many; but the predominant causes are probably cardiovascular or thromboembolic diseases.

This variable would be even more adequate had we been able to state cause of death. To arrive at this, a matching with the Causes-of-Death Register is needed. The new Patient Data Protection Act (1/7 2009) has now facilitated individual-based matching with the Causes-of-Death Register. The problem is, however, that the National Board of Health and Welfare, despite increased resources for this, has a 1-2 year lag in registration.

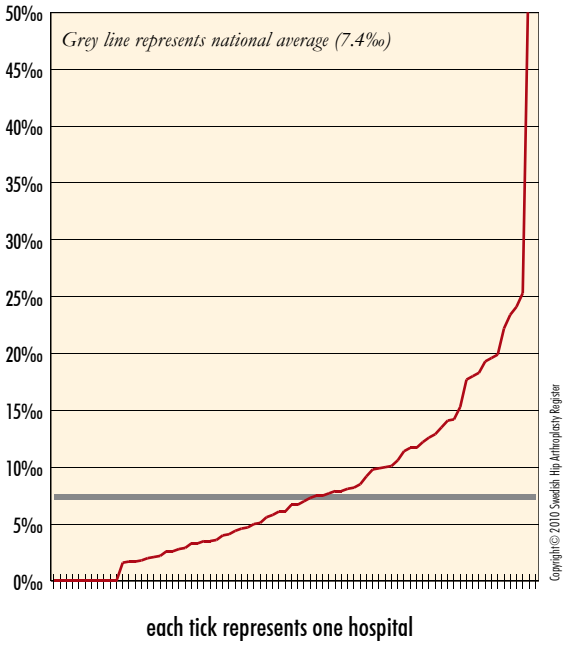
Ninety-day mortality varies relatively greatly among Swedish hospitals during the years of observation: from 0‰-89.1‰ and with a national mean value of 7.4‰. This means at national level that one patient in about 130 undergoing surgery died within three months of a hip arthroplasty operation during the years 2006-2009. As expected, 90-day mortality is higher after an operation at a university/regional hospital and a county hospital than at a county-district hospital and above all in comparison with private care units. This reflects the patient material at the different hospitals.

Ninety-day mortality following hemi-prosthesis is more than 20-fold higher – 14.7‰ – than following THR surgery. These are two entirely different groups operated on chiefly with different methods. Hemi-prostheses patients are older, generally more morbid and often undergo an acute operation. For details and tables see section on hemi-prostheses.

We recommend the units to analyse their death rates as a step in patient security work. Patients have a life expectation at the relevant age, but all units must strive for a high-quality pre-operative medical risk assessment. When doing this it is important to know how many have died. It is not self-evident that an orthopaedic clinic has fed back that a patient died from, for example, a massive cardiac infarction three weeks after the operation at a different unit or even at a different hospital.

Mortality rates are generally low and should be assessed with the same caution as the variable 're-operation within 2 years', i.e. should be assessed as a possible trend over time.

90-day mortality
primary THR performed during the past four years



Genus perspective

Operations involving hip prosthesis are more common among women. The total number of women increased between 1992 and 2009 from 6,263 to 9,141 operations/year; but the relative proportion decreased from 59.4% to 58.4% (see Primary total hip arthroplasty).

During the 3-year period 1992-1994, 83.6% men and 69% women underwent surgery for primary arthrosis. The female overrepresentation was noted for the diagnoses fracture (14.2 and 6.1%, respectively), inflammatory joint disease (8.6 against 5.2%), idiopathic caput necrosis (3.6 against 2.1%) and sequelae after childhood disease (1.9 against 1.1%). During the most recent 3-year period (2007-2009) the proportion of primary arthroses increased for both men and women to 87.0% and 80.8%, respectively. Women still dominate regarding the diagnoses fracture (11.5 against 6.8%) and inflammatory joint disease (2.4 against 1.2%), while the diagnosis idiopathic necrosis (2.7 against 2.3%) and sequelae to childhood disease (2.1 against 1.9%) were distributed more equally between the sexes. The cause of this shift in diagnoses between the sexes is unclear. The large increase in the total number of hip arthroplasties has involved an addition of chiefly patients with primary arthroses while the relative proportion of the various sub groups of secondary arthrosis have shown a more complex pattern. The proportion of patients undergoing surgery for inflammatory joint disease more than halved during the period for both sexes. The proportion of women undergoing surgery for fracture increased until the period 1998-2000 but has then declined somewhat, while in men we see a continual increase and almost a doubling up to the period 2007-2009 (Figure 1).

We have in earlier reports noted that the choice of fixation differs between men and women. All-cemented fixation is more common in women while wholly uncemented and resurfacing prostheses are more common in men. This difference can doubtless be explained partly by the fact that women are more often afflicted by osteoporosis and that the risk of complications in the use of resurfacing prostheses is higher among women. The trend towards leaving wholly-cemented fixation, however, is about equally clear for both genders (Figure 2).

Anterior incision in the lateral or supine position is used more often in operations on female patients. One reason can be worry that some female patients run an increased risk of dislocation. In 2010, however, we note a break in this trend so that the proportion of posterior incisions is showing an assumed increase, from 52.0 to52.8%. This trend appears to be fairly gender-neutral with an increase for men of 0.7% and for women 1.0%.

During 2009 relatively more women received their operations at county hospitals (39.0% compared to 38.1% for men) than at university and county-district hospitals. The private hospitals' proportions of women and men were about the same (11.3 and 11.4%, respectively).

Outcome

In general men are more often afflicted by revision than women, irrespective of cause, following primary hip arthroplasties (RR; 1, CI: 1.38-1.50; analysis of all hip arthroplasties 1992-2009 adjusted for age, side, bilaterality, diagnosis, incision, choice of fixation and type of operating department). Men dominate the cause groups revision for infection where the risk is more than doubled (RR: 2.09, CI: 1.86-2.36), revision owing to fracture (RR: 1.77, CI: 1.48-2.00) and revision owing to loosening (RR: 1.44, CI: 1.37-1.52). Regarding risk of revision for dislocation, we found no difference (RR: 1.09, CI: 0.98-1.20).

Before primary arthroplasty women reported lower health-related quality of life and a somewhat higher degree of pain on the VAS scale (Table). One year after operation women reported a better effect of the intervention measured as improvement both in health-related quality of life and in pain reduction. Despite this, women still reported somewhat lower health-related quality of life, more pain and less satisfaction 1 year after the intervention ($p<0.0005$; Mann-Whitney test, and logistic regression with correction for side, bilaterality, diagnosis, incision, choice of fixation and department group).

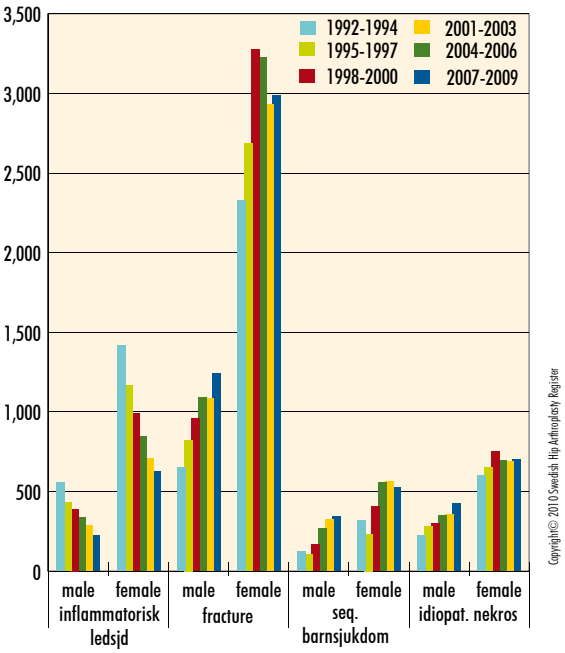


Figure 1. Distributionof sex 1992-2009 in three-year intervals for the 4 most common groups of secondary arthritis (number of performed operations).

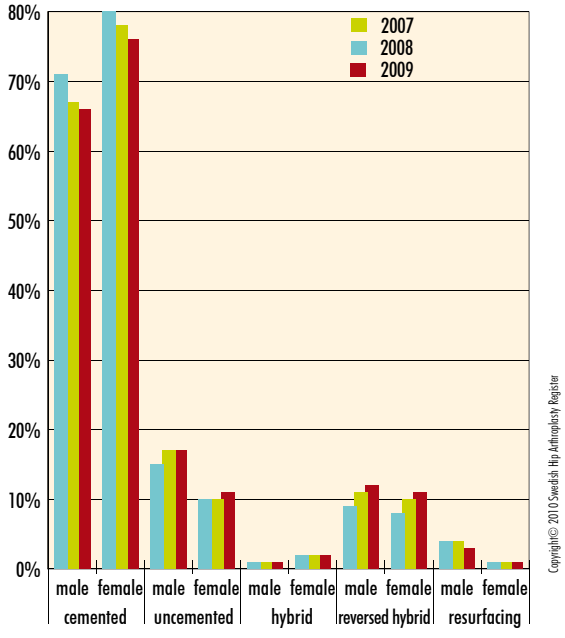


Figure 2. Choice of fixation 2007-2009 for men and women.

Hemi-arthroplasties

The most important indication for operation with hemi-arthroplasties was acute fracture, and this represented 93.4% of cases during the years 2005-2009 (n=19,931). In this year's Report we have limited the analysis of the gender perspective to this group. The majority of patients receiving hemi-arthroplasties for acute fracture were women (2005-2009: 72.1%). In 2006, 74.3% were women. This relative proportion subsequently decreased to 70.1% during 2009.

As opposed to the situation in total arthroplasty, the choice of fixation remained fairly similarly distributed between men and women for acute fracture treated with hemi-arthroplasty (all types: 94.1 and 94.0%, respectively, cemented fixation). Modern uncemented implants were used about equally in women and men (2.8 and 3.0%, respectively). During the period women were more frequently operated on with monoblock prostheses, with a poorer result. This prosthesis type was used in 10.8% of cases in women and in 9.1% in men. During 2009 the use of monoblock prostheses almost ceased. As opposed to the situation in total arthroplasty, posterior incision was used somewhat more frequently in women (50.2%) than in men (49.4%).

Men are afflicted more frequently by re-operation irrespective of cause than women are (RR: 1.44, KI: 1.39-1.50) following adjustment for age, side, bilaterality, choice of incision and type of stem used (modern cemented, modern uncemented, monoblock). Among the three commonest causes of re-operation, dislocation (RR: 1.10, KI: 0.86-1.41), infection (RR: 1.08, KI: 0.78-1.48) and fracture close to prosthesis (RR: 2.44, KI: 1.68-3.55) there was a statistically significant increased only for the latter.

Men receiving hemi-arthroplasties for hip fracture had a poorer health states than women. Sixty-four percent of the men had a serious or potentially life-threatening disease state (ASA 3 or 4) compared with 53% of women. Men's mortality was also higher; 51% died during the follow-up period up to 2009, compared to 37% of women. Gender differences may be explained by the fact that osteoporosis is the single most common contributory cause of hip fracture in women, while for men there is most probably a more mixed picture with general morbidity and abuse. Among the patients where mental status was recorded, dementia was fairly equally distributed between the sexes.

EQ-5D before operation	No.	mean	(median)	SD
Male	14,476	0.45	(0.62)	0.31
Female	20,034	0.37	(0.29)	0.32
1 year				
Male	14,476	0.80	(0.80)	0.23
Female	20,034	0.75	(0.76)	0.25
6 years				
Male	977	0.77	(0.80)	0.26
Female	1,329	0.70	(0.73)	0.28
Change				
Before op. - 1 year				
Male	14,476	0.35	(0.27)	0.34
Female	20,034	0.38	(0.34)	0.35
Before op. - 6 years				
Male	977	0.33	(0.28)	0.36
Female	1,329	0.33	(0.31)	0.36

Pain VAS before operation	No.	medel	(median)	SD
Male	14,482	59	(60)	17
Female	20,034	63	(69)	16
1 year				
Male	14,482	13	(7)	17
Female	20,034	15	(10)	19
6 years				
Male	977	14	(8)	18
Female	1,329	17	(10)	21
Change				
Före op. - 1 year				
Male	14,482	4,549		23
Female	20,034	4,850		24
Före op. - 6 years				
Male	977	4,447		23
Female	1,329	4549		25

Satisfaction	No.	mean	(median)	SD
1 year				
Male	17,672	16	(10)	20
Female	25,846	19	(10)	22
6 years				
Male	1,113	16	(10)	20
Female	1,626	19	(10)	22
Change				
1-6 years				
Male	1,113	0.35	(10)	18
Female	1,626	0.38	(10)	21

In the study period there were differences between the sexes.

In total hip arthroplasty regarding:

- **age at operation**
- **side operated on**
- **prosthesis operations on both sides**
- **diagnoses**
- **choice of incision**
- **method of fixing stem**
- **risk of revision**

In hemi-arthroplasty regarding:

- **age at operation**
- **side operated on**
- **diagnosis**

Hip fracture and prosthesis surgery

Method and material

The material was obtained from the Patient Register and is one of the national quality indicators regarding diseases of the locomotive organs included in Open Comparisons.

The selection criterion was cervical hip fracture (S72.00) in patients over 64 years of age, observation period: 2008 and 2009. The indicator (blue bar in bar diagram) shows the proportion of patients treated primarily with hemi-arthroplasty (NFB09 and 19) or total hip arthroplasty (NFB29,39, 49, 62 and 99). Hemi-arthroplasties dominated with about 85% of the material. The analysis this year was run at both county-council and unit levels.

Result

Please refer to the figures and tables below. The result of the analysis shows a large spread between the various county councils, of 42%-68%, and a national mean value of 58.4%. At unit level, as expected, the variation is greater, from 25.9% to 76.4%.

Discussion

Cervical hip fracture can either be treated with osteosynthesis or with hip prostheses. Current research shows that hip prostheses in a dislocated fracture (Garden III and IV) give a considerably better result, with fewer than 10% failed cases compared with 40-50% following osteosynthesis. This information has led to a change in the treatment model in Sweden during the past ten years. The proportion of prosthesis operations increased appreciably during the past ten-year period, from 11% to 58% in the country as a whole.

A proportion of 60-70% should undergo hip arthroplasty primarily, in an evidence-based treatment algorithm. Approximately 30-35% of the cervical fractures should, however, still undergo osteosynthesis where they are not wrongly aligned or occur in younger individuals. Further, acute, life-threatening disease may cause a more limited osteosynthesis operation to be selected.

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

per hospital, 2008–2009

Hospital	Antal insatta proteser under 2008-2009	Primär protes-operation vid cervikal höftfraktur	K.I
Akademiska sjukhuset	232	67.6%	±4.5%
Alingsås lasarett	63	55.1%	±10.9%
Arvika sjukhus	40	55.8%	±10.6%
Blekingesjukhuset	190	58.1%	±6.0%
Danderyds sjukhus	228	50.6%	±4.3%
Falu lasarett	237	54.5%	±5.3%
Gällivare lasarett	12	25.9%	±7.8%
Gävle sjukhus	240	62.0%	±5.0%
Halmstads sjukhus	148	66.7%	±5.8%
Helsingborgs lasarett	299	64.8%	±4.8%
Huddinge sjukhus	174	50.8%	±5.6%
Hudiksvalls sjukhus	101	50.7%	±6.4%
Hässleholms sjukhus	250	66.2%	±4.9%
Höglandssjukhuset	97	42.5%	±7.0%
Karlskoga lasarett	54	32.4%	±8.5%
Karlstads sjukhus	105	58.7%	±5.6%
Karolinska sjukhuset	134	52.5%	±7.7%
Kungälvs sjukhus	127	68.6%	±6.6%
Lindesbergs lasarett	41	65.1%	±10.8%
Ljungby lasarett	58	69.1%	±9.3%
Länssjukhuset Kalmar	211	76.4%	±5.6%
Mora lasarett	91	65.5%	±7.5%
Motala lasarett	61	60.0%	±9.0%
Mälarsjukhuset	136	42.5%	±5.8%
Norrlands Universitetssjukhus	139	53.6%	±6.4%
Norrtälje sjukhus	60	49.5%	±8.4%
NU-sjukvården	453	71.0%	±3.8%
Nyköpings sjukhus	68	47.7%	±8.0%
Ryhov. Central Hospital	120	61.5%	±6.3%
S:t Görans sjukhus	354	63.4%	±4.4%
Sahlgrenska universitetssjukhus	655	60.6%	±3.2%
Skaraborgs sjukhus	232	47.1%	±6.7%
Skellefteå lasarett	90	44.3%	±7.4%
Sollefteå sjukhus	86	63.2%	±11.0%
Sunderbyns sjukhus	279	66.2%	±4.6%
Sundsvalls sjukhus	130	44.3%	±5.8%
SÄ-sjukvården	180	60.5%	±5.4%
Södersjukhuset	471	59.7%	±3.5%
Södertälje sjukhus	59	43.6%	±8.8%
Torsby sjukhus	60	58.5%	±10.3%
Universitetssjukhuset i Linköping	136	62.3%	±6.1%
Universitetssjukhuset i Lund	345	71.0%	±4.5%
Universitetssjukhuset MAS	455	69.6%	±3.7%
Universitetssjukhuset Örebro	214	56.3%	±5.6%
Varbergs sjukhus	144	59.5%	±6.3%
Visby lasarett	55	57.3%	±11.0%
Vrinnevisjukhuset	127	56.9%	±5.8%
Värnamo sjukhus	60	47.4%	±8.5%
Västerviks sjukhus	59	31.4%	±7.6%
Västerås lasarett	213	59.9%	±4.8%
Växjö lasarett	94	59.4%	±7.0%
Ystads lasarett	95	53.4%	±11.1%
Örnsköldsviks sjukhus	81	64.5%	±8.2%
Östersunds sjukhus	144	49.4%	±5.9%
Nation	8,992	58.4%	±0.8%

Table data taken from PAR at The National Board of Health and Welfare , hence the different grouping of hospitals.

In view of current research results, the large variability found between the county councils and above all at hospital level is surprising, and this year's analysis shows only a marginal change compared with last year.

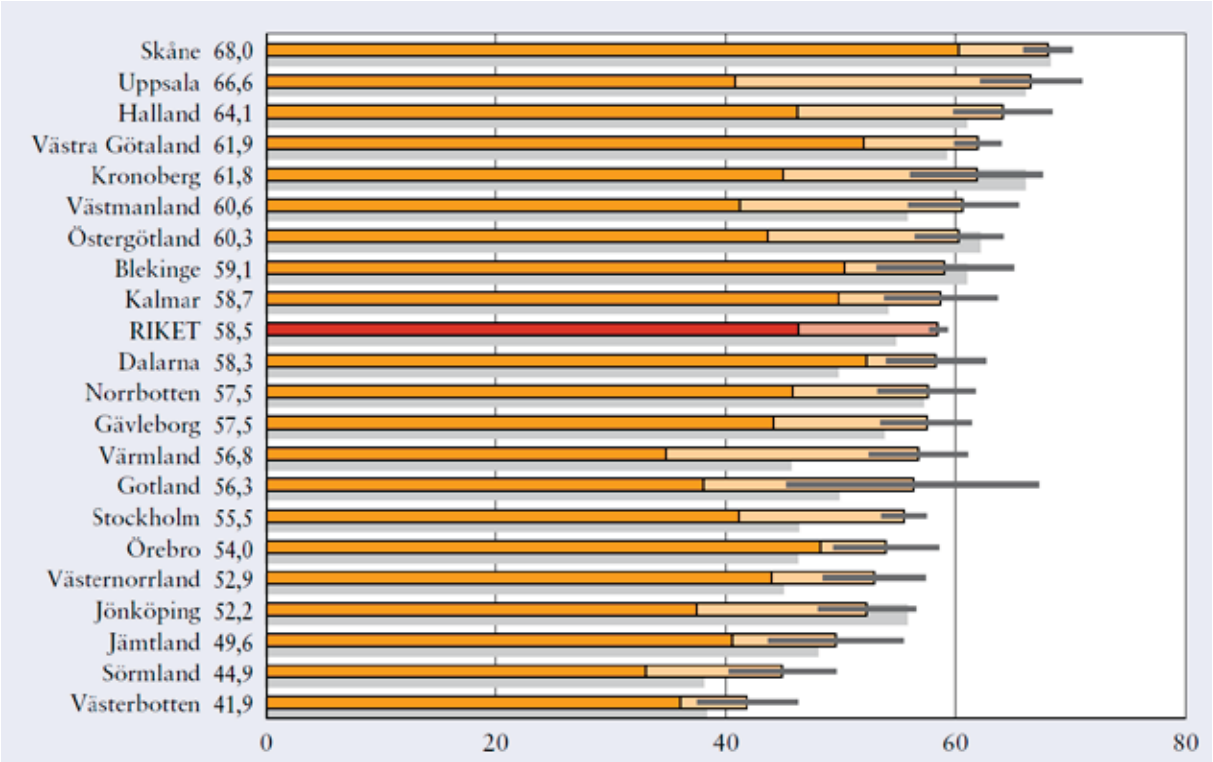
Operating 60-70% of all cervical fractures with prostheses, however, places great demands on the departments with reorganisation of on-call work and requirements for increased surgical competence. One reason for hesitation at some departments/county councils regarding implementing the new model in its entirety is the discussion as to whether lengthened operation times and raised prosthesis costs make the care of hip fractures more expensive. The treatment model raises the cost of the first care occasion, but since it results in a five-fold reduced frequency of re-operation, it is, instead, very cost effective. Primary hip arthroplasty also leads to less pain, simpler rehabilitation, and better health-related quality of life for the patient.

What characterises county councils/regions and hospitals with a large proportion of hip arthroplasties is their earlier participation in large clinical multi-centre studies, which form the basis of the now-modified treatment model.

International discussion is going on as to whether the use of hemi- or total arthroplasties constitutes optimal surgery. Since the Swedish Hip Arthroplasty Register now follows up both prosthesis types, we have good future opportunities for studying and possibly answering this question. The choice of prosthesis type at present probably depends on the individual surgeon's choice and surgical competence. RA patients with hip fracture should, however, always receive total arthroplasty.

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

per landsting, 2008–2009



Share of prosthetic operations due to hip fracture, 2008–2009. Denotes patients 65 years of age or older. Age standardised values. Dark yellow part of the bar denotes hemi prosthesis, light yellow total prosthesis. Grey bar denotes observational years 2006–2007.
Source: PAR, The National Board of Health and Welfare. Is included as a quality indicator in "Open comparisons".

Hemi-arthroplasties

Hemi-arthroplasty registration

During 2009, 4,482 hemi-arthroplasties were reported to the Registry. The number has thus stabilised with 4,487, 4,266 and 4,244 during the preceding years. The proportion of men increased from 27% in 2005 to 30% in 2009. The mean age increased from 83 to 84 years and the proportion over 85 years increased from 40 to 47% during the five-year period. Since high age and male gender are known risk factors for complications following hip fracture, it is an increasingly fragile group that receives hemi-arthroplasty. The alternative in unstable health states has been for a cervical fracture to be operated on with osteosynthesis (nailing/screwing), a less extensive operation which, however, has clearly poorer final results than hip arthroplasty. According to an established grading of health states, the ASA classification, 6% of hemi-arthroplasty patients have a potentially life-threatening disease state (ASA 4) compared with approximately 9% of all individuals with cervical fracture (Rikshöft ((National Hip)) 2008). Thus one group continues to receive osteosynthesis as a precautionary measure in serious disease. The scientific basis for this is limited and further focus on the oldest, most ill patients is important.

Changes in choice of implant and operation technique

As earlier, a limited number of implants is in use in Sweden (Table). Appreciable changes took place however in 2009 when the bipolar head declined in favour of the unipolar (Figure 1). This applies especially to VarioCup in relation to Megacaput. This is in response to the Registry's identifying bipolar heads with an increased risk of re-operation for dislocation (see below). Swedish orthopaedic surgeons have practically ceased to use the monoblock prostheses Moore, Thompson and ETS. There, too, the Registry, together with current research, has demonstrated unsatisfactory clinical results and presented clinical recommendations which have been well followed. A third example is incision, where both the Registry and scientific studies have shown that anterior incision reduces the risk of dislocation in fracture patients. From 2005 to 2009 anterior incision also increased its proportion from 46% to 56%. Lastly, the Registry's reporting that even the modern uncemented stems entail an increased risk of fracture close to the prosthesis has led to a restricted use of

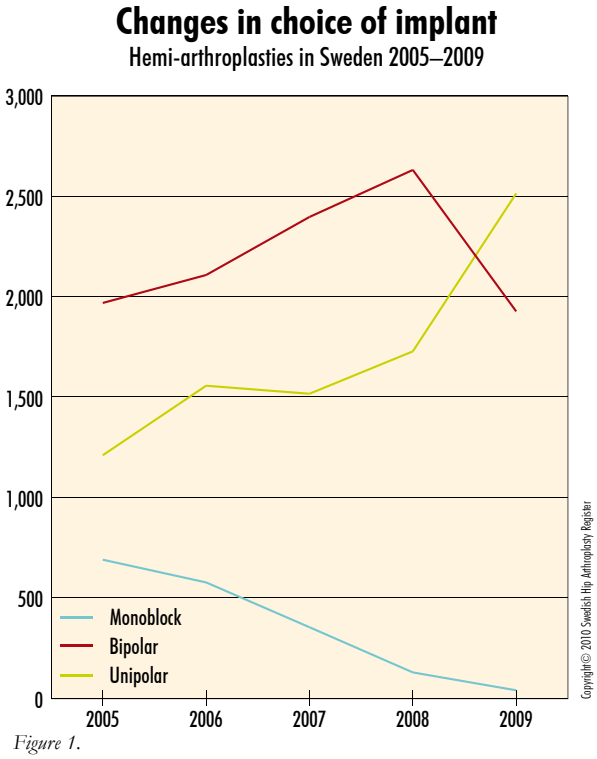
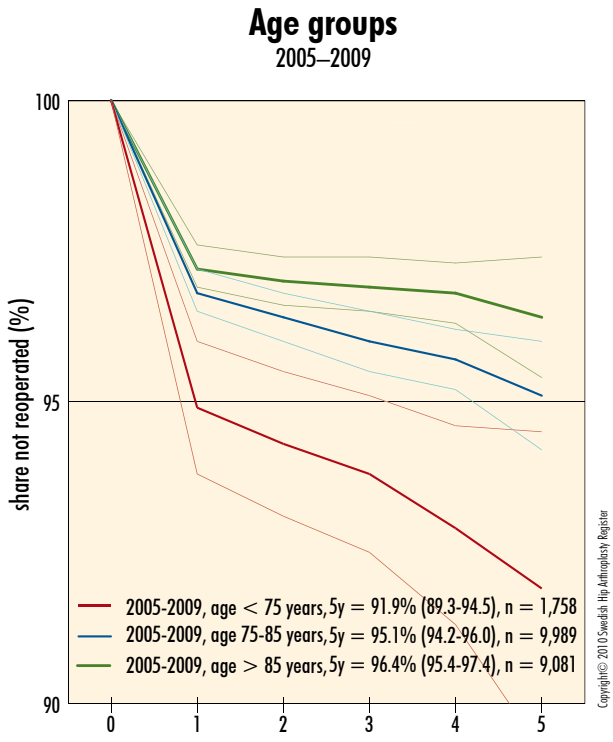
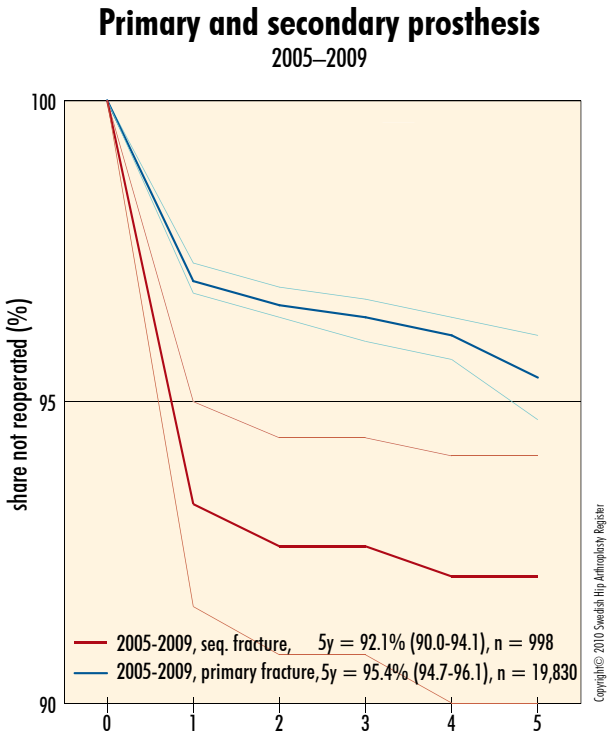


Figure 1.





these implants. In Sweden they are used in fewer than 3% of operations, compared for example to Norway's 19%

Mortality

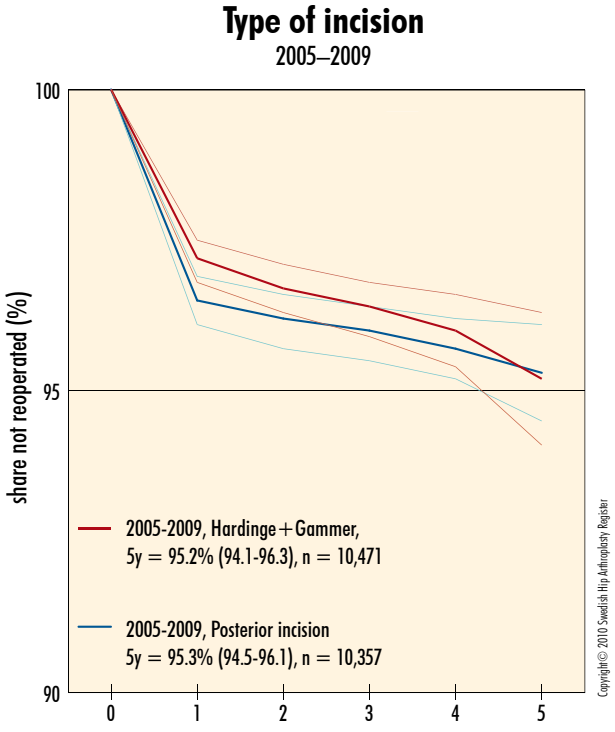
Mortality within 90 days is 15% nationally, i.e. higher than in former years. The increase may be caused by rising age in the patient group and an increasing proportion of men as above. As previously, large variations are seen between hospitals: between 3 and 25%.

Early re-operation

Most re-operations occur early, 2.9% within six months, and the re-operation frequency varies greatly among hospitals (Table). Hospitals with many re-operations may be characterised by a different case-mix (for example Karolinska/Solna with 15% non-fracture-related arthroplasties), but these hospitals are most frequently normal departments. The proportion of re-operations also reflects the department's view of how to treat complications: for some reason, a defensive approach where one refrains from re-operations gives 'better figures' but probably does not benefit the patient. Lastly the figures are affected by the degree of completeness in reporting of re-operations. Clinics with high re-operation and mortality figures are encouraged to analyse the reasons for this.

Re-operation and its risk factors

All analyses were carried out on the group of patients undergoing surgery for hip fracture, either acute or in consequence of complications following osteosynthesis, with conventional posterior or anterior incision. Patients with malignity and other rare diagnoses were excluded. The material for the analyses was 20,828 patients. Of these, 743 underwent at least one re-operation, of whom 598 a revision operation (3.6 and 2.9%, respectively). The commonest reasons for re-operation were dislocation (1.7% of the patients were re-operated for this reason), infection (1.0%) and fractures close to the prosthesis (0.6%). Erosion of acetabular cartilage is a continued unusual cause of re-operation (0.2%) as is aseptic loosening (0.03%). The latter two are late complications which may possibly increase with longer follow-up times. The frequently brief survival time in the aged hip fracture patients, however, limits the appearance of these late complications, and a cautious conclusion is already that erosion and loosening are probably not clinical problems. This may depend on the use of well-documented implants and operational techniques, but hopefully also good patient selection. The most active patients should receive total arthroplasties to reduce the risk of cartilage erosion. According to total arthroplasty registration, the number of acute cervical fractures receiving total arthroplasties increased from 355 in 1999 to 1,032 in 2009.



Men and individuals under 75 years or with hemi-arthroplasties following failed osteosynthesis run an increased risk of both re-operation and revision, as do those with bipolar heads and uncemented stems (Cox regression analysis). The increasing risk is greatest for secondary prostheses (RR: 2.1, CI: 1.7-2.7) and uncemented stems (RR: 2.0, CI: 1.5-2.6).

Incision

Anterior incision reduces the risk of re-operation for dislocation (RR: 0.6, CI: 0.5-0.8). There is, however, no difference in general risk of re-operation. The posterior incision may have advantages in the long term as is known for total arthroplasties. In a survival analysis regarding revision, no difference was seen after five years. The appreciable increased risk in posterior incision during the first months, however, is most relevant for hip-fracture patients, in view of their short survival. Recurrent dislocations appreciably worsen health-related quality of life and this complication can be reduced with anterior incision.

Results for the commonest implant combinations

The risk of re-operation or other undesired result is affected by many factors. For a start, fracture patients as a group run a higher risk of complications than those who received hip arthroplasty for arthrosis. The fracture group must receive immediate surgery while arthrosis patients can undergo other treatment for optimised health state before hip surgery in a planned manner. Fracture patients often become confused following injury/operation, they are older, more ill and more often have cognitive impairments. Confusion and dementia lead to increased risk of dislocation but also new cases and fractures close to the prosthesis. There is a further increased risk of complications and death following hip fracture – see chapter on genus. Patient-related risk factors are very hard to affect other than with improved acute care aiming to reduce confusion, infections etc.

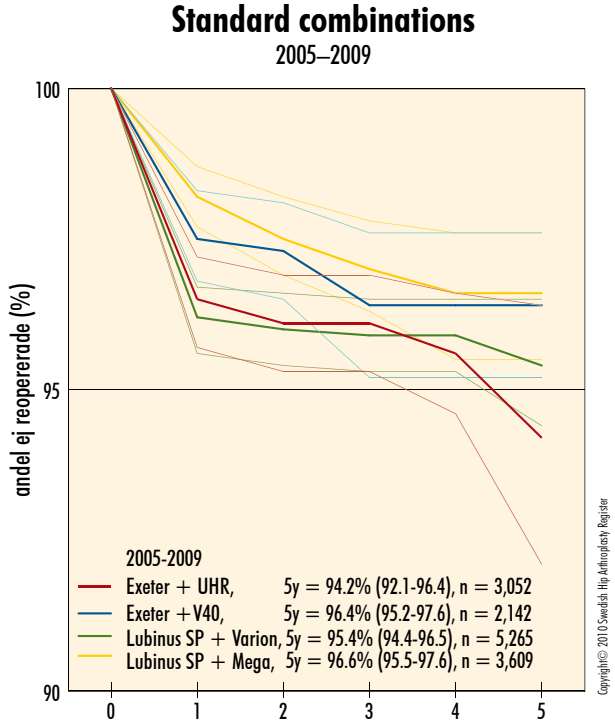
In the next step the outcome is affected by choice of operation technique such as incision, the anchoring of the prosthesis,

the theatre environment and other factors. At this level there are also influences from factors harder to define such as the operator's and the operating team's competence, supervision of inexperienced colleagues, while postoperative care and rehabilitation also play a part. Lastly, the choice of stem and head type can affect the final result in different directions. Only some of these factors can be captured in a quality register, and our analyses can only illustrate part of the causal connection. That participating clinics report re-operations, ASA and degree of dementia with good precision gives increased chances for even fairer comparisons.

As an illustration of the complexity of causal connections the Variocup is found to 'protect' against fractures close to the prosthesis. The risk of fracture can hardly be related to head type, but the effect is explained by the fact that the Variocup is used almost exclusively with the Lubinus stem, which also has a low risk of fracture. The effect also disappears when stem type is introduced into the regression analysis.

In an attempt at a more complete clinical picture we compared the most common stems with their bi- and unipolar heads which represent 14,068 operations. There was a raised re-operation risk for both the Exeter stem with its bipolar head (UHR) and the Lubinus stem with its Variocup (RR: 1.8, KI: 1.3-2.4 and RR: 1.6, KI: 1.2-2.1, respectively) compared with the Exeter with unipolar V40 head and Lubinus and Megacaput. In a survival analysis, no significant differences were seen, and it is worth stressing that all combinations had a good implant survival of 94% or more after five years.

Thus well-functioning implants are used for the most part in hemi-arthroplasty in Sweden. Using the cheaper unipolar heads with their somewhat lower re-operation risk is a logical recommendation. Yet account must also be taken of how choice of implant affects the patient's experience. The bipolar head possibly gives better function, which the Register is unable to show. A current study is gathering information on heath-related quality of life in a year-cohort of fracture patients. Interpreting and applying the Register result will of course take place parallel with the results from parallel clinical research.



15 most common stem types

most used 2005–2009

Stem	2005	2006	2007	2008	2009	Total	Share[1)]
Lubinus SP II	1,466	1,665	1,966	2,095	1,957	9,149	42.9%
Exeter Polished	870	936	1,040	1,204	1,377	5,427	25.4%
CPT (CoCr)	187	211	240	275	336	1,249	5.9%
Spectron EF Primary	351	408	182	107	163	1,211	5.7%
Thompson	354	360	244	168	44	1,170	5.5%
Moore	329	220	78	23	26	676	3.2%
MS30 Polished	0	1	111	177	163	452	2.1%
Corail stem	26	96	92	109	94	417	2.0%
Covision straight	0	0	24	152	233	409	1.9%
ETS Endo	98	104	129	48	0	379	1.8%
Müller straight	101	84	60	25	0	270	1.3%
Basis	0	41	50	54	62	207	1.0%
Bi-Metric Fracture Stem	42	53	19	13	2	129	0.6%
Charnley	26	31	3	0	0	60	0.3%
Spectron Revision	6	10	2	8	7	33	0.2%
Others (20)	14	22	25	28	17	106	0.0%
Missing	0	0	1	1	1	3	0.0%
Total	3,870	4,242	4,266	4,487	4,482	21,347	100%

The most common hemi-prosthesis stem types 2005-2009. 1) Share of the total number of operations performed 2005-2009.

15 most common head types

most used 2005–2009

Head	2005	2006	2007	2008	2009	Total	Andel[1)]
Vario Cup	1,012	1,053	1,320	1,381	795	5,561	26.1%
Mega caput	463	655	681	705	1,174	3,678	17.2%
UHR Universal Head	604	583	638	709	674	3,208	15.0%
V40 Uni polar	277	333	377	497	710	2,194	10.3%
Ultima Monk	316	435	388	429	325	1,893	8.9%
Unipolar head	337	449	228	152	180	1,346	6.3%
Unipolar head	95	57	119	106	89	466	2.2%
Versys endo	5	5	61	105	123	299	1.4%
Covision unipolar head	0	0	19	125	87	231	1.1%
Covision unipolar head for sleeves	0	0	7	33	146	186	0.9%
Multipolar cup	0	1	37	73	69	180	0.8%
Moore modular hemi-head (Anatomica)	33	51	13	4	0	101	0.5%
Tandem bipolar	0	0	0	14	57	71	0.3%
Hastings	26	31	3	0	0	60	0.3%
Scan bipolar head	10	3	6	9	2	30	0.1%
Others (8)	1	8	15	15	8	47	0.2%
Missing	1	1	0	0	2	4	0.0%
Monoblock	690	577	354	130	41	1,792	8.4%
Total	3,870	4,242	4,266	4,487	4,482	21,347	100%

The most common types of femoral head 2005-2009. 1) Share of the total number of operations performed 2005-2009.

90-day mortality after hemi-arthroplasties

proportion deceased within three months after primary THR, 2008–2009

Hospital	No. [1]	>80 years [2]	Male [3]	ASA = 3	ASA = 4	Primary prosthetics [4]	Surgery within 48 h [5]	Mortality [6]
University/Regional Hospitals								
Karolinska/Huddinge	174	74%	33%	62%	13%	94%	92%	11.5%
Karolinska/Solna	134	63%	36%	68%	15%	95%	96%	20.9%
Linköping	136	75%	28%	36%	5%	99%	93%	25.0%
Lund	338	74%	33%	57%	4%	95%	91%	14.5%
Malmö	455	77%	33%	66%	6%	96%	85%	17.4%
SU/Mölndal	639	75%	28%	56%	5%	96%		15.8%
Umeå	139	55%	34%	100%	0%	96%	100%	14.4%
Uppsala	232	80%	32%	67%	4%	95%		15.5%
Örebro	214	71%	31%	38%	6%	94%	91%	12.1%
Central Hospitals								
Borås	179	83%	30%	56%	6%	95%	90%	16.8%
Danderyd	228	76%	29%	64%	7%	97%		13.6%
Eksjö	97	79%	26%	45%	2%	92%	95%	11.3%
Eskilstuna	136	74%	24%	52%	4%	95%	91%	15.4%
Falun	236	64%	26%	38%	3%	95%	95%	6.8%
Gävle	240	79%	28%	51%	9%	97%		15.0%
Halmstad	146	82%	26%	46%	5%	96%	86%	23.3%
Helsingborg	299	72%	32%	44%	6%	93%	93%	18.1%
Hässleholm-Kristianstad	250	71%	25%	46%	5%	97%		14.4%
Jönköping	120	80%	28%	51%	1%	90%	92%	6.7%
Kalmar	211	74%	35%	38%	1%	95%	98%	14.7%
Karlskrona	186	75%	30%	38%	11%	93%		16.1%
Karlstad	102	84%	35%	58%	4%	98%	94%	14.7%
Norrköping	127	88%	25%	41%	2%	94%	98%	11.8%
S:t Göran	353	82%	25%	48%	2%	96%	94%	15.6%
Skövde	152	69%	29%	34%	3%	96%	94%	13.8%
Sunderby (incl. Boden)	279	62%	28%	67%	7%	95%		17.2%
Sundsvall	130	70%	38%	51%	0%	96%	100%	13.8%
Södersjukhuset	471	73%	36%	58%	10%	97%	92%	13.6%
Uddevalla	453	76%	34%	47%	7%	95%	93%	14.1%
Varberg	143	73%	36%	32%	1%	97%	87%	10.5%
Västerås	213	69%	26%	42%	3%	92%		16.0%
Växjö	94	79%	26%	47%	23%	97%	95%	8.5%
Ystad	95	71%	25%			96%	92%	14.7%
Östersund	144	74%	24%	44%	3%	96%	93%	13.2%
Rural Hospitals								
Alingsås	63	67%	24%	49%	3%	89%	93%	14.3%
Hudiksvall	101	71%	30%	47%	5%	98%	97%	20.8%
Karlskoga	54	78%	20%	33%	2%	96%	92%	16.7%
Kungälv	127	80%	36%	62%	9%	97%	89%	13.4%
Lidköping	79	72%	27%	42%	3%	95%	93%	11.4%
Ljungby	58	85%	33%	40%	0%	98%	95%	20.7%
Mora	91	80%	29%	28%	0%	93%	99%	11.0%
Motala	61	69%	23%	28%	0%	95%	95%	8.2%

(table continued on next page)

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

proportion deceased within three months after primary THR, 2008–2009

Hospital	No. [1]	>80 years [2]	Male [3]	ASA = 3	ASA = 4	Primary prosthetics [4]	Surgery within 48 h [5]	Mortality [6]
Norrtälje	60	78%	23%	60%	10%	98%	93%	11.7%
Nyköping	68	79%	19%	44%	11%	99%	95%	13.2%
Skellefteå	90	69%	29%	45%	1%	93%	99%	7.8%
Sollefteå	85	72%	33%	54%	0%	93%		17.6%
Södertälje	59	68%	25%	56%	6%	97%	92%	11.9%
Torsby	60	73%	35%	49%	5%	95%	90%	25.0%
Visby	55	69%	33%	50%	7%	93%	89%	9.1%
Värnamo	60	80%	30%	40%	2%	90%	94%	8.3%
Västervik	59	64%	22%	25%	4%	100%	96%	3.4%
Örnsköldsvik	82	66%	38%	56%	8%	92%		22.0%
Nation	8,969	74%	30%	51%	6%	95%	93%	14.7%

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 2009).

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 50 hemi-arthroplasties 2008-2009 excluded.

Reason for reoperations

number of individuals, 2005 - 2009

Reason	Number	% of reop.	% of primary THR
Dislocation	351	1.6%	46.1%
Infection	221	1.0%	29.0%
Fracture	119	0.6%	15.6%
Erosion	36	0.2%	4.7%
Loosening (early/late)	6	0.03%	1.7%
Others	28	0.1%	3.7%
Total	761	3.5%	100.8%

1) share of the total number of re-operated individuals performed 2005-2007.

Reoperation within 6 months per hospital

2008–2009

Hospital	Prim. Op number	Reop. within 6 m. number	%
University/Regional Hospitals			
Karolinska/Huddinge	174	7	4.0%
Karolinska/Solna	134	12	**9.0%**
Linköping	136	0	0.0%
Lund	338	11	3.3%
Malmö	455	10	2.2%
SU/Mölndal	639	13	2.0%
Umeå	139	2	1.4%
Uppsala	232	3	1.3%
Örebro	214	3	1.4%
Central Hospitals			
Borås	179	8	4.5%
Danderyd	228	8	3.5%
Eksjö	97	4	4.1%
Eskilstuna	136	4	2.9%
Falun	236	15	**6.4%**
Gävle	240	10	4.2%
Halmstad	146	6	4.1%
Helsingborg	299	7	2.3%
Hässleholm-Kristianstad	250	2	0.8%
Jönköping	120	4	3.3%
Kalmar	211	10	4.7%
Karlskrona	186	2	1.1%
Karlstad	102	5	4.9%
Norrköping	127	1	0.8%
S:t Göran	353	2	0.6%
Skövde	152	0	0.0%
Sunderby (Boden included)	279	13	4.7%
Sundsvall	130	8	**6.2%**
Södersjukhuset	471	7	1.5%
Uddevalla	453	8	1.8%
Varberg	143	4	2.8%
Västerås	213	16	**7.5%**
Växjö	94	3	3.2%
Ystad	95	2	2.1%
Östersund	144	6	4.2%
Rural Hospitals			
Alingsås	63	4	**6.3%**
Hudiksvall	101	5	5.0%
Karlskoga	54	1	1.9%
Kungälv	127	0	0.0%
Lidköping	79	2	2.5%
Ljungby	58	2	3.4%
Mora	91	3	3.3%
Motala	61	3	4.9%

(continued on next page)

Reoperation within 6 months per hospital (cont.)

2008–2009

Hospital	Prim. Op number	Reop. within 6 m. number	%
Norrtälje	60	1	1.7%
Nyköping	68	3	4.4%
Skellefteå	90	3	3.3%
Sollefteå	85	1	1.2%
Södertälje	59	1	1.7%
Torsby	60	2	3.3%
Visby	55	2	3.6%
Värnamo	60	4	**6.7%**
Västervik	59	3	**5.1%**
Örnsköldsvik	82	0	0.0%
Nation	8,969	258	2.9%

Red mark denotes values one standard deviation above national average. Units with less than 50 hemi-arthroplasties 2008-2009 are excluded.

NARA – Nordic registry co-operation

In earlier annual reports we have described in detail our collaboration with the established Nordic implant registers that resulted in the formation of NARA (Nordic Arthroplasty Register Association). The co-operation has been further consolidated during the past year and one result is NARA's first two scientific publications in ACTA Orthopaedica (August 2009 and January 2010). The articles show, among other things, that we in the Nordic countries, although close neighbours, have widely differing user profiles regarding implants and fixation methods.

A matter that has been debated in Sweden over the years is that, while the Swedish Hip Arthroplasty Register continues to be of great significance for national results, it may at the same time inhibit further development of new techniques and prosthesis solutions. We possess an instrument which with great statistical power can broaden our opportunities for analysis. Three further articles have been accepted for publication and four studies are in hand.

NARA's objective

- To work for pan-Nordic clinic improvement.
- To foster Nordic register and implant research and in the future to train research students in Nordic co operation.
- To create common databases for the Nordic registers so as to broaden the base for register research.
- To create a Nordic platform for continued co-operation with the international register associations (ISAR = International Society of Arthroplasty Registries and EAR = European Arthroplasty Register).

Further information is available on NARA's home page.

www.nordicarthroplasty.org

The BOA project

In the 2007 Annual Report we described the BOA register in detail. This project seeks to become a national diagnosis register for patients with hip and knee osteoarthritis. At present approximately 40 units are associated to the register. The register will apply for a starting grant as a National Quality Register in this year's grant application procedure. In May 2011, the National Board of Health and Welfare will publish National Guidelines for Diseases of the Locomotive Organs. Non-surgical treatment of knee and hip arthrosis will be recommended as first treatment of these patients.

The Swedish Hip Arthroplasty Register has therefore broadened its area of interest during the past few years to include the whole course of disease, predominantly among patients with arthrosis. Operation with a selection of good operational technique and well-documented prosthesis types has long been analysed in detail by the Registry. There remain however a series of factors not dependent on the operation that affect the subjective, patient-reported result 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 on the condition and correct expectations following surgery.
- Correct postoperative information.
- Standardised rehabilitation measures.
- Adequate follow-up with early intervention after both short-term and long-term complications.

The BOA organisation with arthrosis schools has as its goal and vision to affect these very factors.

www.boaregistret.se

Notes

Summary

The objective of the Swedish Hip Arthroplasty Register's annual report is to give an all-round picture of hip arthroplasty in Sweden. Remember, a Registry report can describe that something happens but not always why.

The open reporting of a number of variables will lead to increased pressure for change among the clinics. Although Sweden has the world's lowest reported revision frequency there are clearly defined problem areas which it is possible to affect via systematic local analyses and subsequent work for improvement. The increasing focus during the past few years on the National Quality Registers has been further accentuated and has led among other things to the current national review of the Swedish registers. A brief summary of this review is given under the title The State Review of National Quality Registers in Sweden.

This Annual Report is, like last year's, seriously delayed owing to a number of interacting factors. The work on the Register and the Annual Report requires increasing resources every year. In addition the Register has for the past five years also included hemi-arthroplasties presented separately therein. The Registry management plans to modify the annual report process. The printed report will in future focus on the year's analyses, and large parts of the descriptive tables will successively be published on our home page where they may possibly be updated several times a year.

In Sweden in 2009, 15,646 primary total hip arthroplasties were carried out, a dramatic increase over the previous year. The procedure frequency during 2009 was then 167 total hip arthroplasties per 100,000 inhabitants. The frequency varies between 135 and 260 per 100,000 among county councils/regions. Any fairly small demographic differences cannot explain this uneven production and we plan to analyse this finding further. In 1999, 10,563 operations were registered. This means that just over ten years later we have increased production by 48%. During the year, 2,284 re-operations were reported which unfortunately is an increase compared to 2008. Revision for infection is increasing (+38, +1.3%) which is a long-term trend also noted in the Nordic countries. This disquieting development will be analysed during the year in a joint Nordic (NARA) database. During the year 4,482 hemi- arthroplasties and 279 re-operations were registered. In total, then, during 2009, 22,691 operations were reported to the Swedish Hip Arthroplasty Register.

Development areas

The Nordic co-operation (Nordic Arthroplasty Register Association – NARA) was further deepened during the year. The objective of this association is to promote Nordic implant research and possibly to produce standardised Nordic quality indicators for hip arthroplasty. The organisation has been noted at EU level and is viewed as a 'role model' for quality control and dissemination of knowledge in a normal medical-care area.

In Sweden it has been debated whether the great success of the Swedish Hip Arthroplasty Register regarding quality work has also implied an obstacle to continued development of new techniques and prosthesis designs. We now possess an instrument that with great statistical power can broaden our opportunities for analysis not least as an effect of the differing user profiles among the three participating countries.

During the year the Registry continued its co-operation with the National Board of Health and Welfare. Data matching with the Patient Register at individual level was used, as last year, for a detailed analysis of degree of coverage at hospital level. This type of analysis with matching with health computer registers at the National Board and with Statistics Sweden has so far been under-exploited and can be of great significance for continued quality development for Swedish THR surgery. In the health-data registers and in population statistics we can capture important background variables not registered in our normal register routines. This type of database opens new fields for improvement and research in the area.

This year's in-depth analyses

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

Degree of coverage/completeness. Degree of coverage is an entirely essential part of a register's data quality and credibility. Unless coverage is high all analyses are burdened with great statistical uncertainty. This year's analysis shows a good degree of coverage of about 97% regarding registration of primary total hip arthroplasties and hemi-arthroplasties. However, a few hospitals have poorer registration frequency and the Registry management urges the clinics in question to review their routines to achieve better registration.

Total hip arthroplasty

Primary total arthroplasties. In summary, increasing numbers of patients are receiving primary total hip arthroplasties. The increase is somewhat skewed between the sexes in favour of younger men. The proportion of primary arthrosis is increasing and the proportion of patients with inflammatory joint disease is smaller, both relatively and in absolute numbers. The proportion of patients receiving total prostheses for fracture has not changed appreciably during the past six years.

Operating departments. Increasing numbers of patients are undergoing surgery at private clinics, primarily at the expense of the proportion at university/regional hospitals. In general patients operated on at private hospitals more often have primary

osteoarthritis and are healthier than those operated on at other types of hospital. Compared with county-council and county-district hospitals, they are also younger and have lower BMI.

Fixation and choice of implant. The relative decline in all-cemented hip arthroplasties continued during 2009 even though it appears to be slowing down. Reverse hybrids and all-uncemented fixation continue to increase. The majority of the implants used have good clinical documentation.

Cross-linked high-molecular plastic. The Registry cannot demonstrate either advantages or disadvantages of the new plastic. Nor was this expected, since the primary problem the new plastic is intended to address was not expected to lead to lower revision incidence until after 7-10 years at the earliest. Nor can we demonstrate any unexpected problems giving rise to an increased incidence of revision.

Resurfacing prostheses. Several unclear points remain regarding resurfacing prostheses. The early risk of revision in Sweden is still high. The long-term effects of metal-metal articulations are unclear and serious soft-tissue complications have been observed primarily among women. On the basis of observations from the Register, the NARA database and other studies we consider that if resurfacing is used this should be under controlled forms. The operation should be performed at centres with sufficiently large volumes to maintain good surgical competence, and the patients should be followed up continuously. Operations on women should be avoided.

Revisions. Patients undergoing revision are more frequently overweight and more often have serious associated diseases than those receiving primary arthroplasty. The Registry finds a clear trend towards increased use of uncemented revision prostheses. The reason for this is multifactorial. Uncemented implants and particularly modular implants facilitate reconstruction of the anatomical circumstances, while the absence of cement may make healing of bone tissue easier, particularly when revising fractures near to the implant. Several studies have shown good results of cementing specially if bone destruction is not excessive. Exceptionally good results have also been shown from some centres when cementing is combined with bone-packing technique. Revision operations are often very complex, for which reason the surgeon's experience of different types of technique is often decisive and in many cases as important as choice of fixation type.

Hemi-arthroplasties

Risk of re-operation. Men and individuals below 75 or with hemi-arthroplasties following failed osteosynthesis run an increased risk of both re-operation and revision, as do bipolar heads and uncemented stems. The increase in risk is greatest for secondary and uncemented stems.

Patient-reported outcome

The PROM database. Routine collection of patient-reported outcome is now nationally covered except for one private hospital in Stockholm. The Registry have run a special analysis of the response rate regarding the PROM protocol. All hip arthroplasties during 2008 performed at the clinics associated to the PROM database on 1 January 2008 were included in the analysis, which comprises 12,300 operations. The preoperative questionnaire was answered by 86% and the questionnaire for the 1-year follow-up was answered by 90%. Seventy-nine percent answered both questionnaires. That the preoperative answer frequency was lower probably reflects various local logistical problems in capturing all patients preoperatively. In addition the whole distribution process of 1-year follow-ups including reminders is organised so that the questionnaire probably reaches more patients.

Work for clinical improvement

Nationally

Sweden has the world's lowest reported revision frequency. One of the explanations is that we in Sweden use few and well-documented implant types and consistent technique. We have moreover, been careful in the introduction of new prosthesis technology and new operation techniques. This continuous national improvement can in all probability be explained by the fact that the Registry has been in operation for many years and that Swedish orthopaedic surgeons receive recurrent feedback which the Registry supplies via its home page, annual reports and orthopaedic meetings. Since we during the past 10 years have approached 95% 10-year prosthesis survival, we must expect a slowing-down of result improvements regarding revision frequency at national level. The variation between departments and for certain patient groups, however, is more appreciable, for which reason there is naturally a residual realistic potential for improvement.

Re-operation for infection is increasing somewhat at the same time as re-operation for loosening is declining. The former increase can partly be explained by a somewhat modified treatment strategy in early suspicion of deep infection; more departments than previously are performing extensive debridement on patients with extensive soft-tissue earlier on in an attempt to avoid prosthesis extirpation.

Locally

This year the Registry presents the very comprehensive local analysis that the Orthopaedic Clinic in Lund conducted following last year's open reporting. The Registry management con-

siders that the analysis, of which the final report is published word-for-word in this Annual Report is exemplary and should stand as a model to be followed by all participating departments. If such an analysis is followed with improvement projects, we have opportunities of further improving Swedish THR surgery.

Inclusion of patient-reported outcome enables the clinics to analyse their outcomes from the starting point of their patients' needs. Here we now have an instrument that can be used for improvement regarding care programmes for patients with hip disease, i.e. measures that can improve patients' satisfaction and health gains and that need not be directly linked to the surgical intervention.

Realisation of objectives

The objective of hip arthroplasty 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 registration of patient-reported outcome is now implemented throughout practically all the country. Only one of 79 hospitals has refrained from participation in the follow-up routine. This means that the Swedish Hip Arthroplasty Register is the only national register presently measuring PROM prospectively on almost all patients.

Hemi-arthroplasty registration achieved national coverage right from the start on 1 January 2005 and the registration has a good individual-based degree of coverage of 96%. Via the Patient Register analysis of the frequency of primary arthroplasty patients with cervical hip fracture, we know that the new treatment algorithm for these fractures has not been fully implemented throughout the country.

Problem areas

The problem of reduced 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 arthroplasty will sink owing poorer opportunities for training and clinical research.

Hip arthroplasties has for many years been one of the medical interventions that has been burdened with long waiting time. During the past few years there has been a strong focus in Swedish medical care on issues of accessibility. Unfortunately this work has been wholly directed to accessibility as a time variable: time to operative treatment. The Registry management maintains, however, that accessibility for the patient with hip problems should include rapid and adequate care throughout the whole course of the disease and that any surgery must be followed-up with an outcome analysis before shortened waiting times can be invoked as improved quality.

The number of re-operations unfortunately increased somewhat during the operational year. This refers primarily to early and serious complications such as dislocation, deep infection and fracture close to the implant. The statistical certainty of these data is low at department level but the aggregated statistics for the whole country indicate that there is reason to continually review routines and care programmes to minimise the risk of early complications.

Current trends

The greatest change regarding choice of implants is a continued trend towards the increased use of wholly uncemented prostheses. What are termed reverse hybrids with uncemented stem and cemented cup also continue to increase.

Final word

The Registry management wish to thank all departments for good co-operation during the past year. The common task is becoming increasingly interactive, thus stimulating the feedback of results in a more active and instructive manner. Together we can, both professionals and decision makers, further improve the quality of Swedish THR surgery and gain increasing numbers of satisfied patients.

Photo: Göran Garellick

Current research objects

The main task of a National Quality Register is computer capture analysis and feedback, which is to lead to analysis of operations and work for improvement. The very comprehensive databases, however, also have a great research potential. Nine theses and some hundred scientific articles have been published entirely or partly based on analyses from the Swedish Hip Arthroplasty Register. Clinical research and above all register-based research had for many years had low status in Sweden. However, in the past few years there has been a clear and heartening break in trend which will be further accentuated when the state review of National Quality Registers now in hand presents its final report.

In research and evidence-based medicine, the randomised and prospective study (RCT) is considered the gold standard of research. However, we lack opportunities of conducting this type of study in all areas – perhaps above all in the surgical disciplines. A national prospective observation study (register study) has characteristics that cannot be achieved with an RCT. Extensive material affords primarily possibilities to analyse unusual complications with great statistical power. A further great advantage is that generalisable results can be obtained – a result achieved within the whole profession. In an RCT what is termed 'performance bias' can easily arise, i.e. these types of study often reflect an intervention at special units and/or by the innovator of a method. Prospective observation studies must in the first instance be viewed as hypothesis-generating studies that can give ideas for relevant randomised studies.

Since most National Quality Registers are based on the personal ID number, their data bases can be matched, following application to ethics committees, with various registers and with the health data registers at the National Board of Health and Welfare and also with Statistics Sweden's various data bases. Matching with the national KPP database (cost per patient) has also the possibility of increasing the Registry's own possibilities of conducting adequate health-economic studies. These types of combined database can potentially become world-unique instruments for studying the significance of a series of background variables for medical results. This in turn means that fewer variables can be included in the continual data capture of the quality registers.

The Registry management wishes to stress that the Registry's databases are not only a matter for registry colleagues in Göteborg. All researchers both in this country and elsewhere can, given adequate questions, use the register for research.

Research projects within the Registry

The Registry's management and its steering group include post-graduate researchers who act as supervisors and joint supervisors for a number of doctoral students. In this group research regarding implant fixation, health economics, hip fractures and prosthesis surgery, fractures close to the prostheses, revision surgery and patient-reported outcome following Arthroplasty are being conducted. This group includes:

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

Doctoral students with all or part of their dissertation material from the Register:

Ola Rolfson, Göteborg
Health-economic aspects of hip arthroplasty.

Buster Sandgren, Stockholm
Computed tomography of patients who have received an uncemented acetabular component in connection with hip arthroplasty.

Ferid Krupic, Göteborg
The significance of socioeconomic variables for outcome following hip arthroplasty.

Olof Leonardsson, Malmö
Hip fracture treatment with hip arthroplasty.

Oskar Ström, Stockholm
Health-economic aspects of hip arthroplasty.

Viktor Lindgren, Stockholm
Complications and outcome following hip arthroplasty with special reference to infections and the importance of surgical incision.

Max Gordon, Stockholm
Co-morbidity and the significance of socioeconomic variables for outcome following hip arthroplasty.

Per-Eric Johanson, Göteborg
Hip arthroplasty for the younger patient. Evaluation of different prosthesis concepts.

Stergious Lazarinis, Uppsala
Hydroxyaptite coverage of hip prostheses in primary and secondary revision surgery, respectively – clinical effects based on data from national registers.

In addition, a Canadian orthopaedic surgeon, Anthony Marchie, is interested to become a doctoral student at the Registry and two more Swedish orthopaedic surgeons have announced their interest. Meredith Greene from the Harris Orthopaedic Laboratory at Massachusetts General Hospital, Boston, Harvard Medical School, is to follow a masters' programme in public health in Göteborg with research linked with the Swedish Arthroplasty Register.

Ola Rolfson defended his dissertation on 10 December 2010 with a thesis entirely based on the Registry's database regarding patient-reported outcome: Patient-reported Outcome Measures and Health-economic Aspects of Total Hip Arthroplasty. A study from the Swedish Hip Arthroplasty Register.

The registry is now conducting intensive research co-operation within NARA. The group's first three scientific articles have now been published and a further five manuscripts are in production.

The Swedish Hip Arthroplasty Register's databases are still underexploited in research.

The Registry management invite collaboration from all interested researchers with adequate question areas.

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Scientific articles

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2.1 Operative Steps: Acetabulum, pages 16-27.
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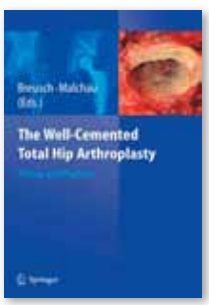
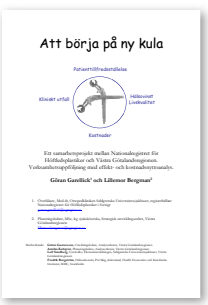
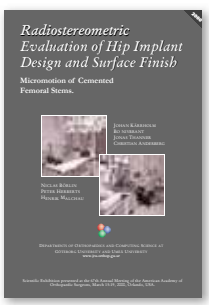
2.2 Operative Steps: Femur, pages 28-36
Steffen J. Breusch, Henrik Malchau

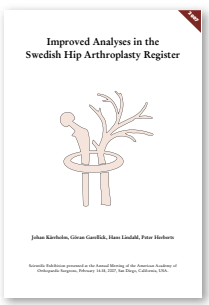
6.1 Optimal Cementing Technique – The Evidence: What Is Modern Cementing Technique?, pages 146-149
Henrik Malchau, Steffen J. Breusch

7.3 Migration Pattern and Outcome of Cemented Stems in Sweden, pages 190-195
Jeffrey Geller, Henrik Malchau, Johan Kärrholm









11 The Evidence from the Swedish Hip Register, pages 291-299
Henrik Malchau, Göran Garellick, Peter Herberts

19 Economic Evaluation of THA, pages 360-366
Marieke Ostendorf, Henrik Malchau

20 The Future Role of Cemented Total Hip Arthroplasty, pages 367-369
Henrik Malchau, Steffen J. Breusch

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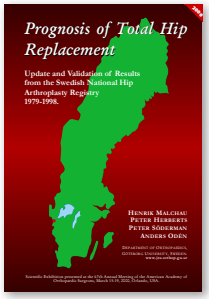

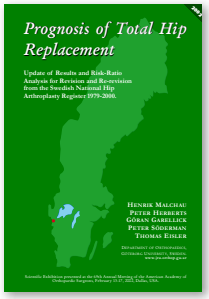

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Appendix

National quality indicators regarding hip replacement surgery in Open Comparisons

In November 2010 the fifth Open Comparisons report was published. The report is a project of co-operation between the National Board of Health and Welfare and the Swedish Association of Local Authorities and Regions (SALAR). This year, too, the number of national quality indicators has increased, to about 155, of which more than one-third come from just over 20 National Quality Registers. Open Comparisons should be considered as a paradigm shift regarding control of health- and medical care in Sweden. The county councils and regions have long controlled medical care on the basis of cost analyses and productivity calculations: the shift consists of an increased focus on medical results. The Quality Registers have for many years published medical result measures but it is only now that they are collected in a joint national report that medical quality has achieved a clear breakthrough in the strategic management of health and medical care.

The Uppsala researchers Blomgren and Waks show in their report 'New thinking – open comparisons in the management, control and quality work of health- and medical care' that there is broad agreement among leaders in health- and medical care on the value of open comparisons for quality assurance. Despite the challenges and problems in this connection, the overall impression from the survey is that the open comparisons have contributed greatly and positively to broadening the control of care; from having chiefly concerned economy to include and focus upon medical results. Blomgren and Waks interviewed 37 officials at different management levels in four county councils: Jönköping, Kalmar, Norrbotten and the Western Götaland Region. The overall conclusion of the analysis is that Open Comparisons has had a clear breakthrough in the county councils' control and management.

The immediate effect of the publication of Open Comparisons is that county council managements have been compelled to take responsibility vis-à-vis politicians and the public for the results achieved in the care that they manage. This has meant improved and deepened dialogue between management and the profession: an increased interest from management in quality issues and a greater need for management to explain how their activity functions.

The report is no scientific report but should be seen as a signal system and should result in local analyses at county-council and local levels, i.e. about the same task as the individual registers have. All who work on the report agree that it is a development product which in future years will certainly be developed further.

The Swedish Hip Arthroplasty Register is one of 24 National Quality Registers supplying data to Open Comparisons. The Registry is responsible for three indicators as below. The indicators are also shown at unit level, which is becoming increasingly common for indicators supplied from quality registers. Two further indicators illustrate hip replacement surgery with data from the Patient Register (National Board of Health and Welfare): hip replacement surgery following cervical hip fracture and readmission within 30 days. These indicators are shown in the present Report on pages 90 and 42.

Short-term complications, i.e. re-operation (of all types) within 2 years of the primary operation. These are reported for the four most recent years. This variable is in this connection to be considered as a 'rapid' quality indicator. Note that the report concerns complications that have been dealt with surgically (see section 'Short-term complications – re-operation within 2 years').

Ten-year survival of prostheses according to traditional Kaplan-Meier statistics. The definition of failure is exchange of one or both components or definitive removal of the implant. All primary diagnoses and all causes of revision operation are included. The result refers to operation period 2000 up to and including 2009. 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-experienced quality should be included'. Patient-reported outcome with health gain is an important variable for this patient group undergoing surgery on the indication of low health-related quality of life. This variable should also be considered as a 'rapid' quality indicator.

Result

In the interpretation of these results the confidence intervals clearly shown in the illustrations must be observed. For overlapping confidence intervals it may be said simply that there is probably no statistical difference between the results given.

The patient demography ('case-mix' – included in the tables) between the various county councils must also be taken into account. Some county councils have no university/regional hospital within their area and can then work with a less risk-burdened patient mix.

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

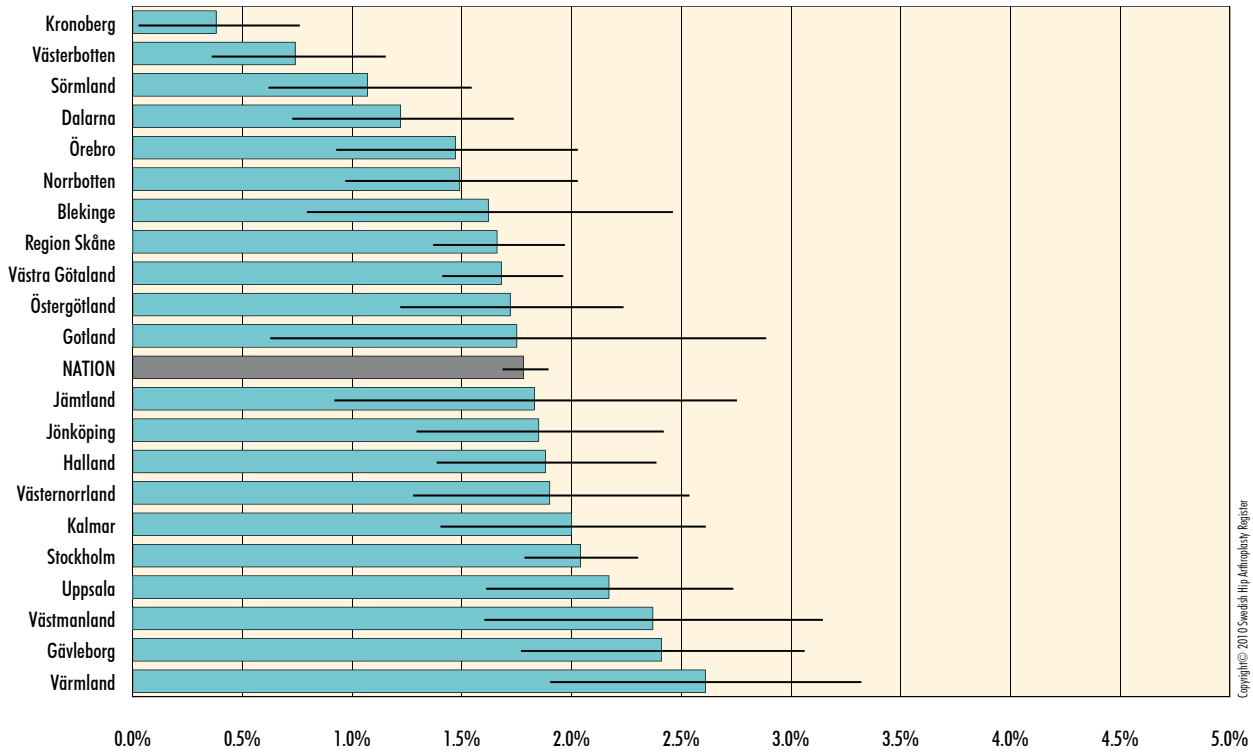
10-year survival. Sweden has he world's highest reported 10-year survival of hip prostheses in international comparisons. At county-council level there are no large and significant differences, which can be detected at unit level – see page 65.

EQ-5D index gain. The patient-reported outcome routine has now been implemented nationally (all hospitals except Sophiahemmet are participating). The variation at county-council level is fairly large and should prompt analysis regarding indications and waiting times for the intervention.

The genus perspective. All three indicators show differences between the sexes. Many earlier studies show a generally larger risk of re-operation and revision for men. The present results confirm these earlier findings. Large population studies (cross-sectional studies) in Sweden have demonstrated that women in general report poorer health-related quality of life than men of corresponding ages. The EQ-5D gain, however, was the result of a prospective longitudinal study and the women reported a marginally better mean health gain.

Reoperation within 2 years per county

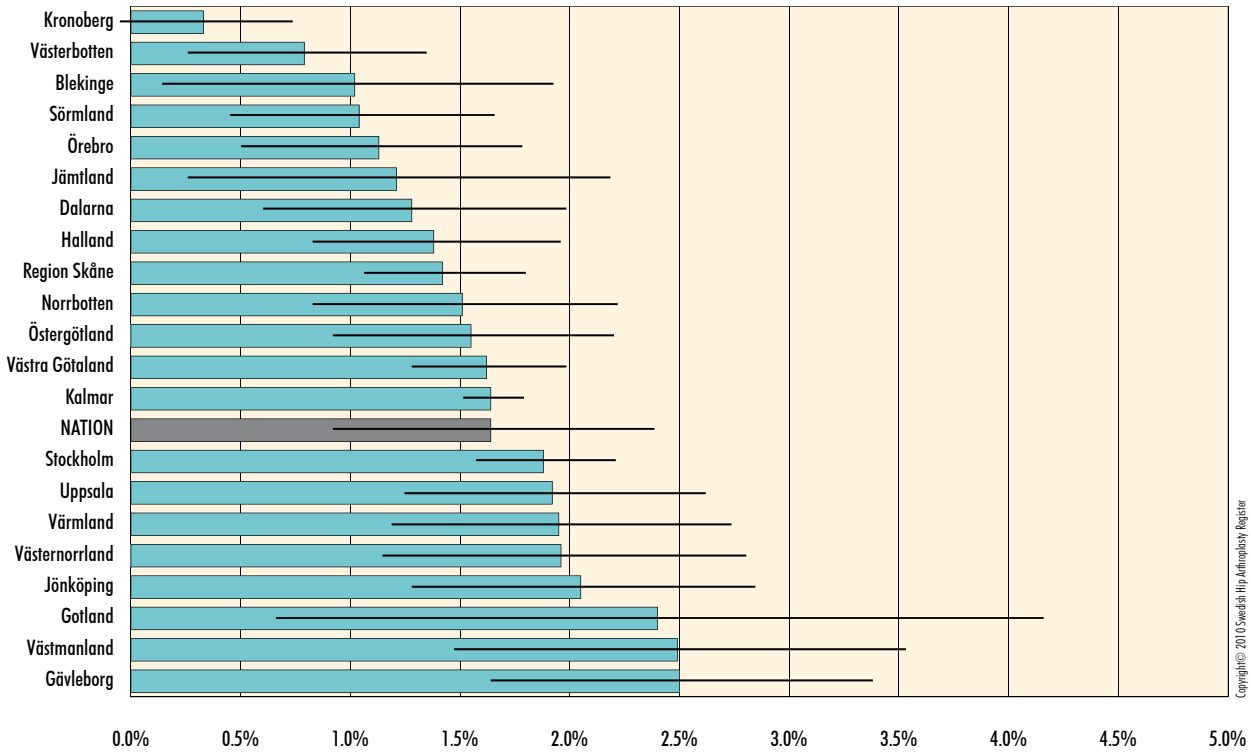
2006–2009



	Primary THRs	– Total –		– Infection –		– Dislocation –		– Loosening –		– Others –	
	Number	Number	%	Number	%	Number	%	Number	%	Number	%
Kronoberg	1,049	4	0.4%	0	0.0%	3	0.3%	0	0.0%	1	0.1%
Västerbotten	1,763	13	0.7%	8	0.5%	4	0.2%	0	0.0%	5	0.3%
Sörmland	1,874	20	1.1%	12	0.6%	5	0.3%	0	0.0%	4	0.2%
Dalarna	1,810	22	1.2%	14	0.8%	5	0.3%	0	0.0%	5	0.3%
Örebro	1,831	27	1.5%	11	0.6%	5	0.3%	0	0.0%	14	0.8%
Norrbotten	2,007	30	1.5%	13	0.7%	13	0.7%	2	0.1%	4	0.2%
Blekinge	864	14	1.6%	1	0.1%	11	1.3%	0	0.0%	3	0.4%
Region Skåne	6,751	112	1.7%	48	0.7%	18	0.3%	12	0.2%	47	0.7%
Västra Götaland	8,371	141	1.7%	64	0.8%	44	0.5%	7	0.1%	45	0.5%
Östergötland	2,447	42	1.7%	16	0.7%	15	0.6%	1	0.0%	15	0.6%
Gotland	515	9	1.8%	2	0.4%	2	0.4%	0	0.0%	5	1.0%
NATION	58,463	1,043	1.8%	456	0.8%	314	0.5%	49	0.1%	352	0.6%
Jämtland	819	15	1.8%	5	0.6%	6	0.7%	1	0.1%	5	0.6%
Jönköping	2,163	40	1.9%	23	1.1%	14	0.7%	0	0.0%	8	0.4%
Halland	2,763	52	1.9%	21	0.8%	18	0.7%	2	0.1%	16	0.6%
Västernorrland	1,786	34	1.9%	20	1.1%	11	0.6%	0	0.0%	10	0.6%
Kalmar	2,046	41	2.0%	27	1.3%	11	0.5%	0	0.0%	5	0.2%
Stockholm	11,482	234	2.0%	80	0.7%	68	0.6%	17	0.2%	100	0.9%
Uppsala	2,537	55	2.2%	19	0.8%	30	1.2%	3	0.1%	16	0.6%
Västmanland	1,477	35	2.4%	14	1.0%	14	1.0%	1	0.1%	9	0.6%
Gävleborg	2,155	52	2.4%	21	1.0%	13	0.6%	1	0.1%	19	0.9%
Värmland	1,953	51	2.6%	37	1.9%	4	0.2%	2	0.1%	16	0.8%

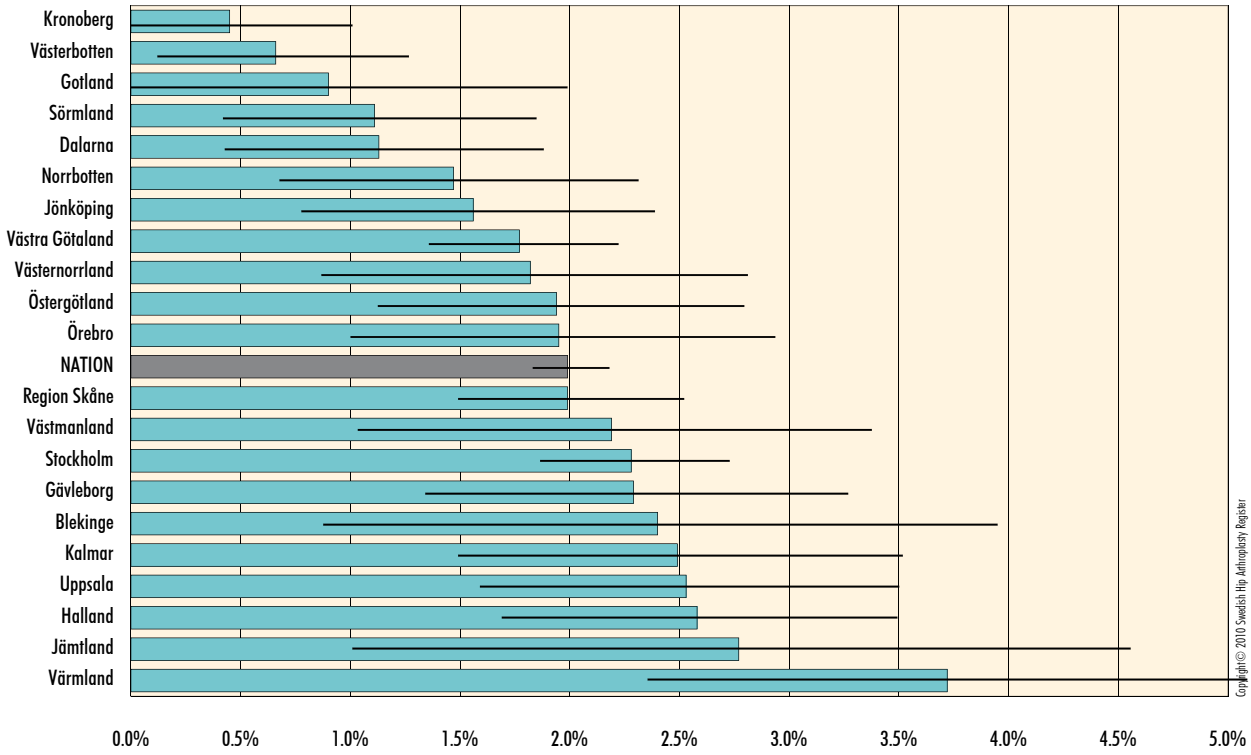
Reoperation within 2 years per county - only female

2006–2009



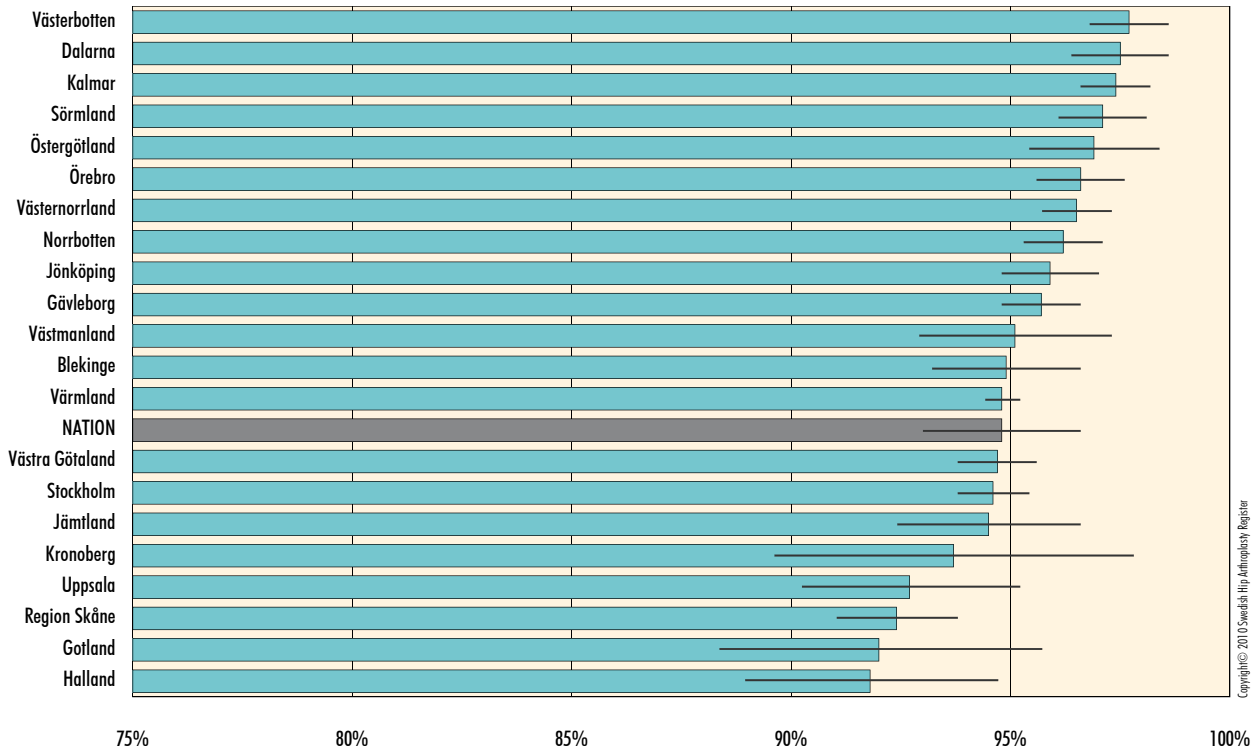
Reoperation within 2 years per county - only male

2006–2009



Implant survival after 10 years per county

2000–2009



	Number of THRs	OA [1]	≥ = 60 years [2]	Female [3]	10 years	K.I.
Halland	5,178	83.90%	17.40%	58.20%	91.80%	±2.9%
Gotland	998	84.20%	20.10%	56.40%	92.00%	±3.7%
Region Skåne	17,070	81.30%	18.50%	58.80%	92.40%	±1.4%
Uppsala	5,381	69.90%	21.00%	60.90%	92.70%	±2.5%
Kronoberg	2,349	84.30%	17.00%	56.70%	93.70%	±4.1%
Jämtland	1,744	82.00%	17.10%	57.80%	94.50%	±2.1%
Stockholm	26,590	82.40%	20.90%	62.50%	94.60%	±0.8%
Västra Götaland	19,533	79.40%	19.40%	58.70%	94.70%	±0.9%
Värmland	4,260	78.30%	15.50%	61.00%	94.80%	±1.8%
NATION	134,679	81.50%	18.70%	59.50%	94.80%	±0.4%
Blekinge	2,042	86.20%	19.00%	58.00%	94.90%	±1.7%
Västmanland	3,401	81.60%	17.50%	57.60%	95.10%	±2.2%
Gävleborg	5,249	80.10%	17.40%	59.00%	95.70%	±0.9%
Jönköping	4,970	87.20%	15.90%	57.20%	95.90%	±1.1%
Norrbotten	4,407	82.50%	17.70%	59.20%	96.20%	±0.9%
Västernorrland	4,234	87.30%	18.00%	60.40%	96.50%	±0.8%
Örebro	4,319	84.40%	17.20%	59.00%	96.60%	±1.0%
Östergötland	5,846	75.90%	19.10%	59.60%	96.90%	±1.5%
Sörmland	4,232	81.50%	17.70%	57.80%	97.10%	±1.0%
Kalmar	4,650	82.20%	16.20%	57.50%	97.40%	±0.8%
Dalarna	4,085	86.70%	17.60%	57.00%	97.50%	±1.1%
Västerbotten	4,141	85.00%	19.40%	59.50%	97.70%	±0.9%

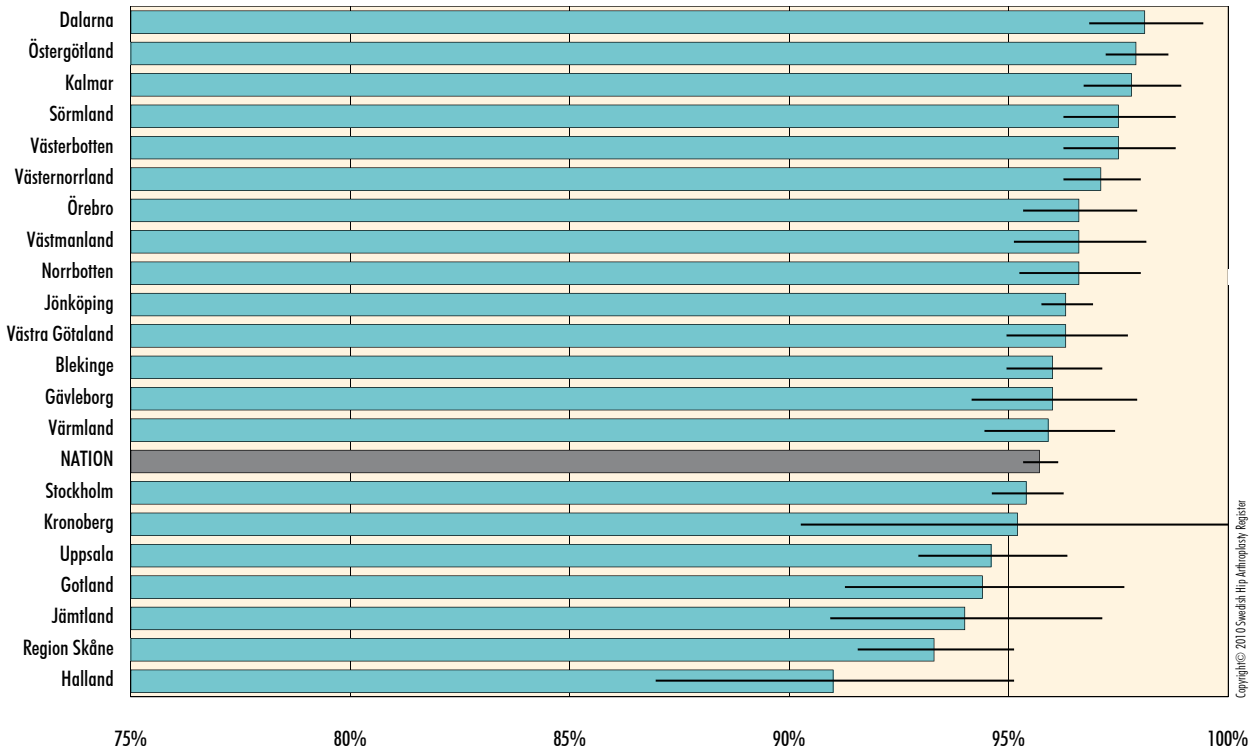
1) Refers to the share of primary THRs performed due to primary osteoarthritis.

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.

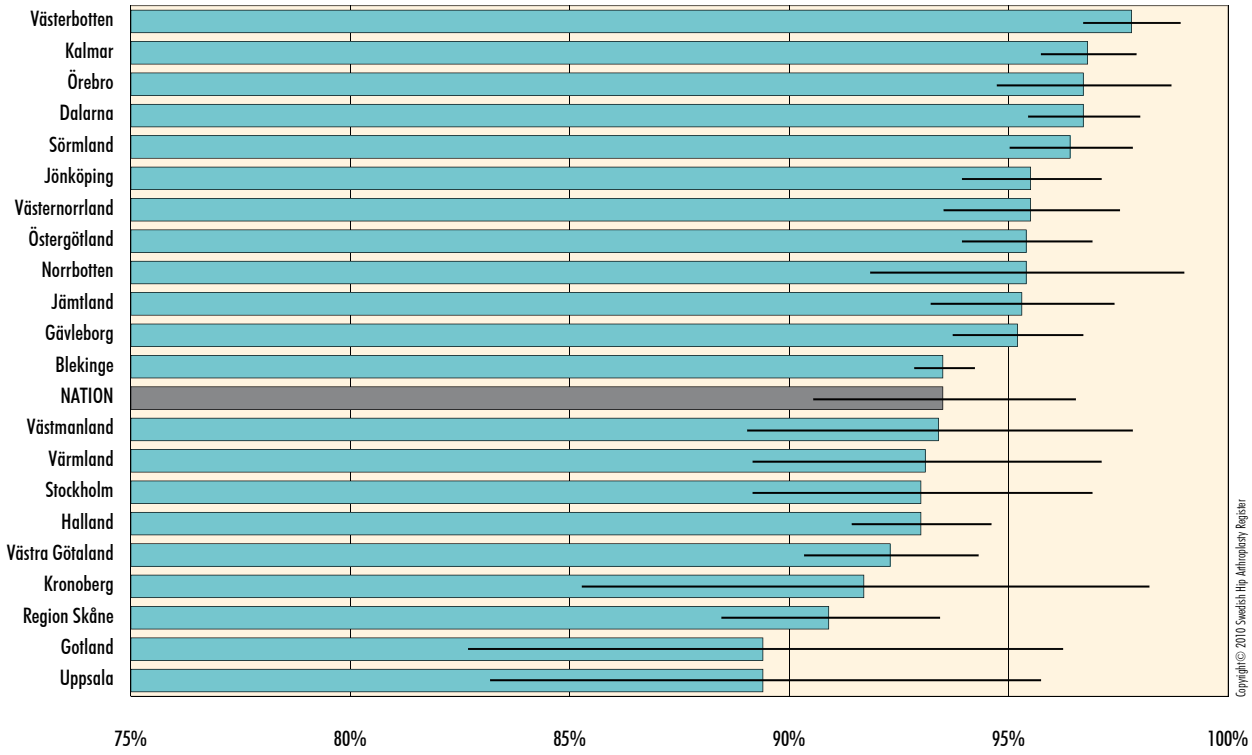
Implant survival after 10 years per county - only female

2000–2009



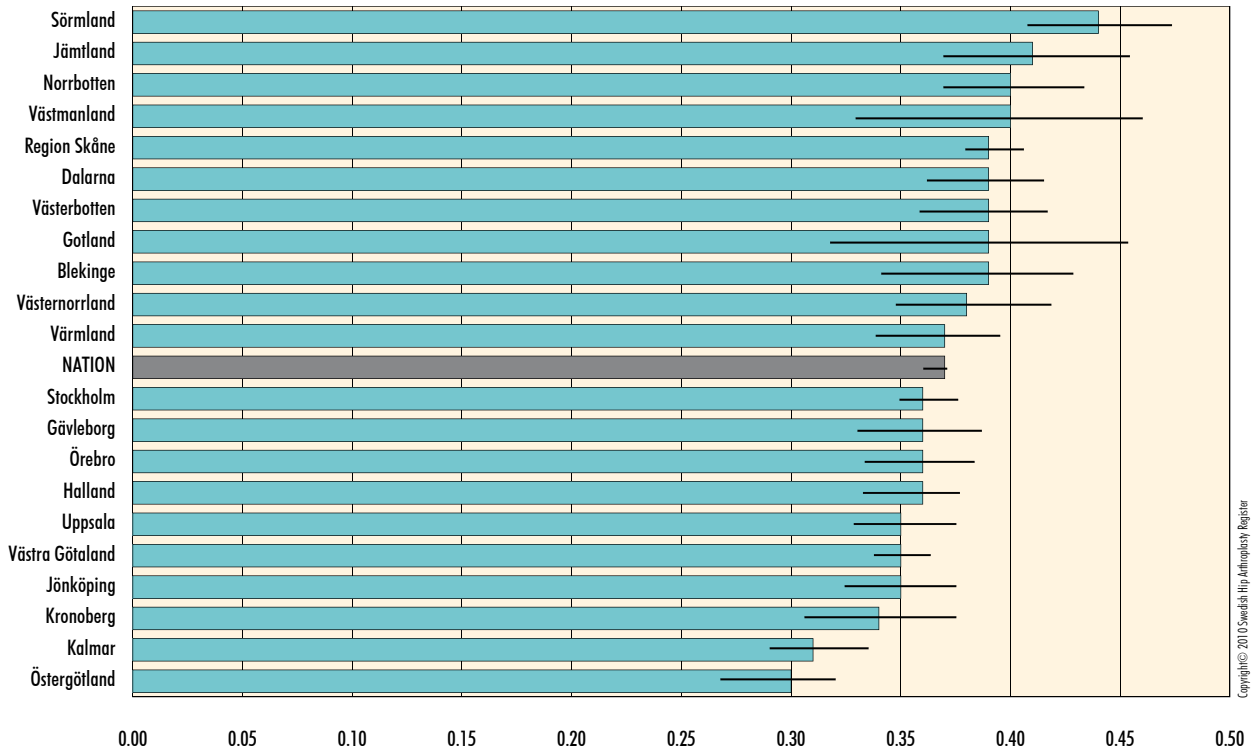
Implant survival after 10 years per county - only male

2000–2009



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

2007-2008

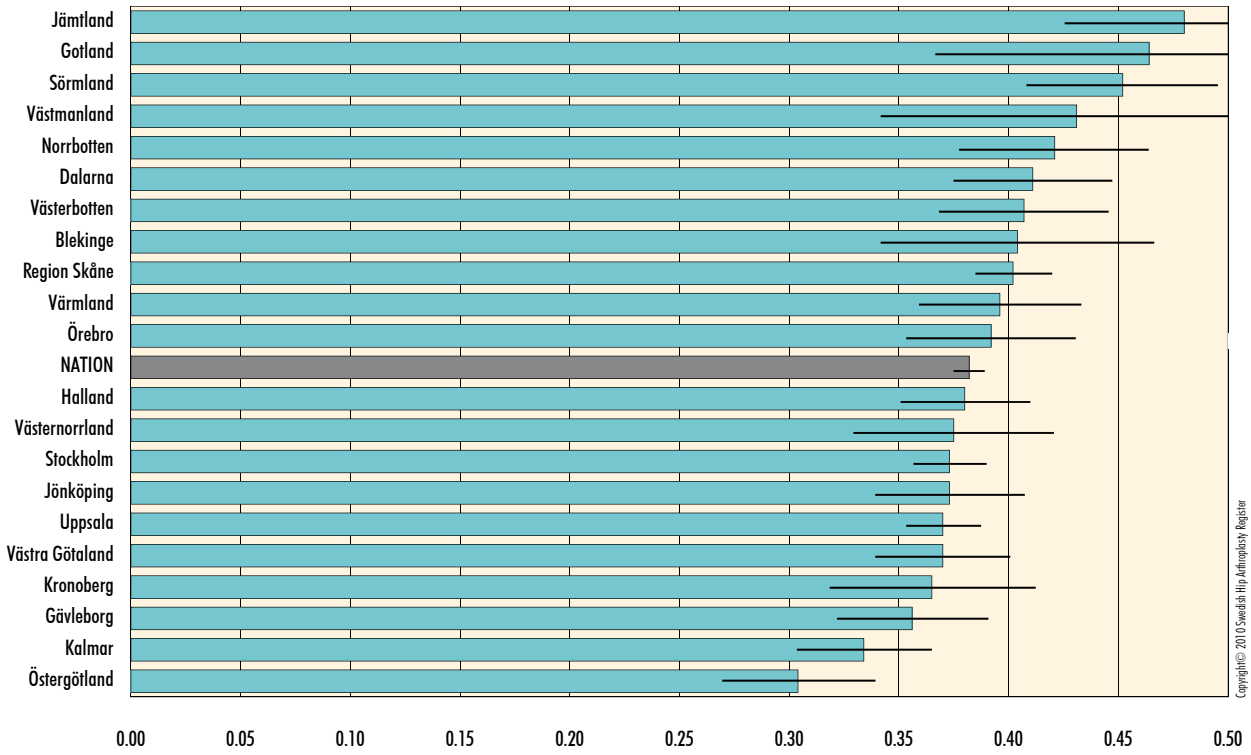


	Number [1)]	Share C-pat. preop.	EQ-5D-index preop.	EQ-5D-index 1 year	Gain in EQ-5D-index after 1 year	K.I
Östergötland	567	53.1%	0.48	0.77	0.30	0.026
Kalmar	825	37.8%	0.48	0.80	0.31	0.023
Kronoberg	308	43.8%	0.48	0.83	0.34	0.035
Jönköping	736	41.0%	0.43	0.78	0.35	0.026
Västra Götaland	2,755	47.6%	0.41	0.76	0.35	0.013
Uppsala	747	36.8%	0.44	0.79	0.35	0.024
Halland	845	32.7%	0.45	0.81	0.36	0.023
Gävleborg	757	41.2%	0.39	0.75	0.36	0.025
Örebro	559	43.7%	0.43	0.79	0.36	0.029
Stockholm	2,852	44.3%	0.40	0.76	0.36	0.013
NATION	17,332	42.3%	0.41	0.78	0.37	0.006
Värmland	583	42.7%	0.39	0.76	0.37	0.029
Västernorrland	380	48.7%	0.37	0.75	0.38	0.036
Blekinge	251	42.2%	0.40	0.79	0.39	0.044
Gotland	94	40.4%	0.41	0.79	0.39	0.068
Västerbotten	527	46.1%	0.39	0.78	0.39	0.030
Dalarna	664	47.7%	0.39	0.78	0.39	0.027
Region Skåne	2,531	35.8%	0.40	0.79	0.39	0.014
Västmanland	144	44.4%	0.37	0.77	0.40	0.066
Norrbotten	489	36.8%	0.40	0.80	0.40	0.032
Jämtland	304	35.9%	0.36	0.77	0.41	0.043
Sörmland	414	49.9%	0.34	0.78	0.44	0.033

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

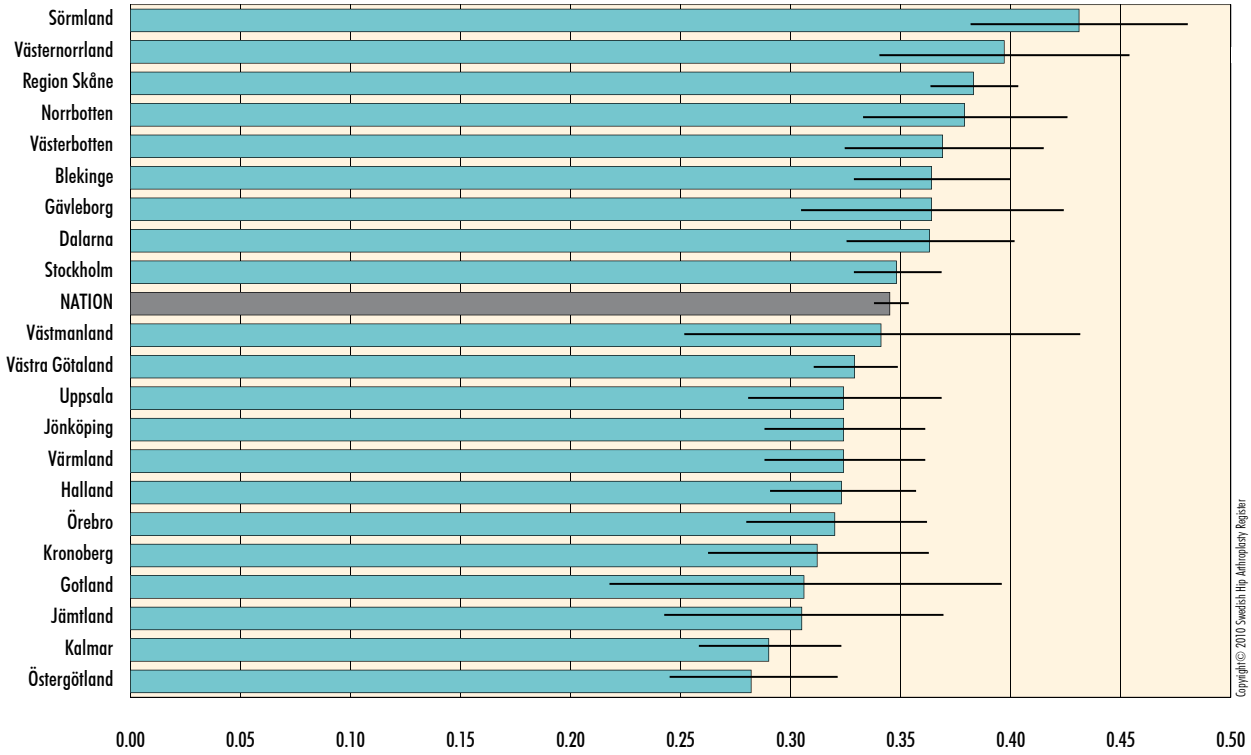
Gain in EQ-5-index after 1 year per county - only female

2007-2008



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

2007-2008



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