Long-term registration has improved the quality of hip replacement

A review of the Swedish THR Register comparing 160,000 cases

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ABSTRACT – The Swedish Hip Register has defined the epidemiology of total hip replacement in Sweden. Most hip implants are fully cemented. Serious complications and rates of revision have declined significantly despite an increasing number of patients at risk. During the past 5 years, only 8–9% of hip replacements are revisions. Aseptic loosening with or without osteolysis is the major problem and constitutes 71% of the revisions, but the incidence had decreased three times during the past 15 years to less than 3% at 10 years. The effectiveness of the surgical technique is the most important factor for reducing the risk of revision because of aseptic loosening, but choice of implant is also important. In practice, total hip replacement in Sweden has improved, as judged by information from this Register about individualized patient risks, implant safety, and the greater efficacy of surgical and cementing techniques.

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In the middle of the 1970s, the first two registers for assessing quality of the medical profession were started in Sweden; both were in the field of orthopedics. Their goals were to provide information regarding the prevention of serious complications after replacement surgery in the hip and to describe the outcome of primary knee replacements.

The total hip replacement register began with a pilot project in 1977. The first report (Ahnfelt et al. 1980) noted the importance of continuous registration of serious complications in order to improve quality over the long-term by means of improved surgical techniques. To attain this goal, serious problems had to be defined and shown. Support was obtained from the Medical Research Council, and a prospective study, which included all the orthopedic clinics in Sweden, was started on 1 January 1979 (Ahnfelt et al. 1990).

The aim of the register is twofold: to describe the epidemiology of hip replacement surgery in Sweden, and to identify, by study of revisions, risk factors for poor outcome which are related to the patient, to the implant, and to the surgical technique. The primary goal of the register is to widen knowledge of the surgical techniques and the various types of implants, so as to improve continually the quality of hip replacement surgery.

A prerequisite for such improvement is that the clinics receive feedback about the results on a yearly basis. This in turn will give each clinic the opportunity to compare their own results with the national average, and decide whether or not their technique and/or choice of implant is adequate.

The register initially received support from the Swedish Orthopedic Society and then from the National Board of Health and Welfare. The relation with the orthopedic profession is very important for dissemination of feedback to the health caregivers who can make practical changes. The register is based on the voluntary input of individual clinics and their representatives, as well as the participation by all the clinics in the country. To ensure such input, yearly meetings with the representatives and their secretaries are held, where the results and reports are analyzed and discussed.

In this article, we summarize the quality improvements reported in hip replacement surgery in Sweden during the past two decades. The ability to influence the profession and health caregivers has increased since the register was started, in other words with greater experience and long-term results.

Definitions and methods

During the past decade, the register has received financial support from the National Board of Health and Welfare in Sweden. Register Board members have been selected by the Swedish Orthopedic Society, and a committee leads the work. The central organization is located in Göteborg, where a staff of two full-time secretaries and a data consultant carry out practical parts of the work. Data is collected prospectively and consist of all primary total hip replacement operations and revision replacements in the entire country. All clinics participate and are guaranteed confidentiality as regards the individual surgeons. The clinics have recently agreed that some information on the outcomes, in individual units will be made available to the public, starting in 1999.

The definition of failure is revision (exchange or removal of the implant). This strict criterion is validated annually. The register consists of three different databases, which reflect the project's development over the years (Herberts et al. 1989).

The primary hip replacement database, collected from 1979 to 1991, includes information on the number of interventions per year and clinic—i.e., the operations and type of implant. Since 1992, all primary surgical procedures are registered in detail, with help of the personal identification number. Age, sex, diagnosis, side and complete information on the implant have been noted. 70% of the clinics have reported this information via an Internet site (http://www.jru.orthop.gu.se/) since 1999, the rest on a paper form.

The second database, for revisions, is derived from analyses of the hospital records, where 116 parameters from each record are registered. Survival curves are calculated as regards to patient-related factors, e.g., age, sex, and primary diagnosis, implant-related factors, and surgical techniques.

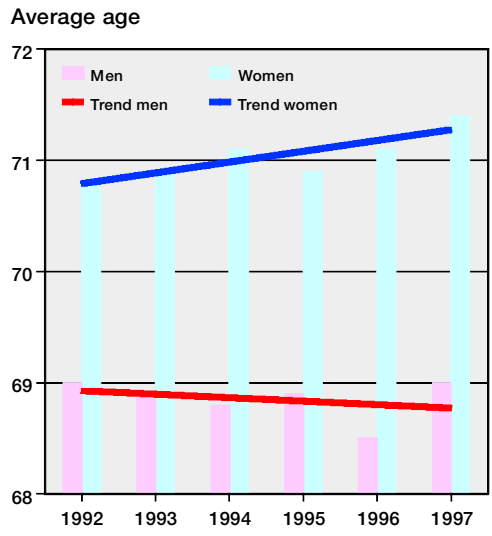

Figure 1. Average age at the primary operation for men and women operated on between 1992 and 1997. Blue and red lines, respectively, shows the trend with increased age for women and decreased age for men.

The third database is a technical one and includes information on the surgical and cementing techniques used annually at each clinic. Data on the preventive measures against infection ae also available.

Statistical methods are based on survival analyses, according to Kaplan and Meier. Survival rates, with revision as the definition of failure, are given for various implants and patient variables. The effects of surgical and cementing techniques are assessed in a Poisson model and with multivariate analysis. An essential part of the study is that the data for each clinic concerning primary and revision replacements are checked yearly (Herberts and Malchau 1997).

Primary total hip replacement

The average age of a patient who undergoes a primary total hip replacement is 70 years. The general trend has been an increase in the average age of women, but a decline in that of men (Figure 1). Primary arthrosis and arthrosis secondary to trauma are the main indications for an operation (Table 1).

The number of primary operations has continuously increased with time. During the period

Table 1. Diagnosis at index operation in 52,637 patients operated on between 1992 and 1997

Diagnosis	Percent	Number
Primary osteoarthrosis	75.7	39,842
Fracture	10.9	5,742
Inflammatory disease	6.2	3,276
Secondary osteoarthrosis	2.5	1,295
Aseptic necrosis femoral head	3.0	1,579
Childhood diseases	1.1	569
Posttraumatic osteoarthrosis	0.4	200
Tumor	0.2	134
Total	100	52,637

1979–1997, 158,172 operations were performed. The yearly number varies due to special circumstances during certain years, such as the 'treatment guarantee' for a patient introduced by the government in 1992. The cemented standard prosthesis is the main type of replacement, accounting for 93% of the cases. The number of uncemented prostheses, some of which are experimental, is low and has decreased further over the past year (Figures 2 and 3). The rate of revisions in the cemented group is low and has dropped to 7.1%, but it is considerably higher in the uncemented group, around 13%.

A significant reason for the low revision rate of cemented replacements has been the yearly feedback of outcome data, which has impelled most clinics to use safer and well-documented implants. 78% of the cemented prosthesis operations are performed using 1 of 5 types of prostheses, all of which have had good long-term function. This contrasts with the situation in most other western European countries, where pressure from the market often results in less serious experiments with new prosthesis models (Murray et al. 1995, Linder 1996).

We now perform approximately 10,000 primary hip replacement operations per year ($100/10^5$ inhabitants) in Sweden, which is too few. The frequency of this procedure should be about 130 per 10^5 inhabitants to meet the needs and eliminate the queues. There is a relatively large variation between the regions in the country. The needs have best been fulfilled in the northern (Figure 4), central (Figure 5), and southern parts of Sweden (Figure 6), and have least been fulfilled during the last decade in the eastern (Figure 7) and the western parts (Figure 8).

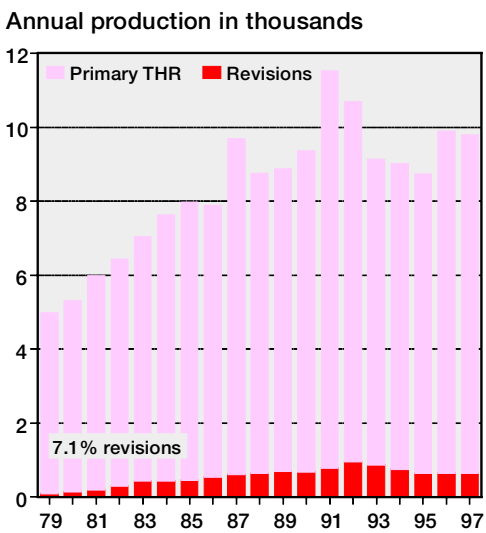

Figure 2. Cemented THR in Sweden between 1979 and 1997 (n 147,955). The diagram shows (in thousands) the annual production. The dark red bars shows the proportion of revision annually and the crude revision rate for cemented implants is 7.1%.

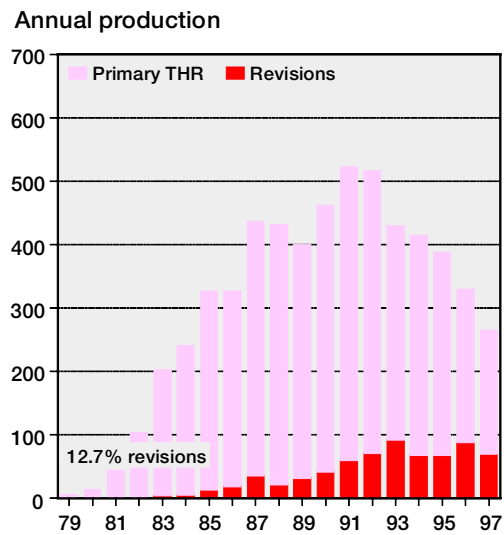

Figure 3. Uncemented THR in Sweden between 1979 and 1997 (n 5,159). The diagram shows (in thousands) the annual production. The dark red bars indicate the proportion of revisions annually and the crude revision rate for uncemented implants is 13%.

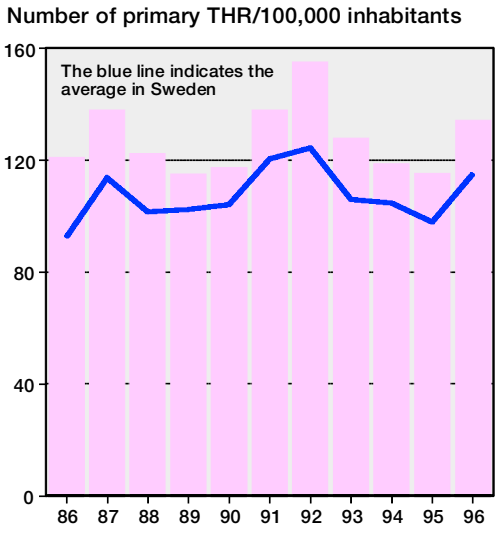

Figure 4. Northern region. The number of primary total hip replacements per 100,000 inhabitants between 1986 and 1996 are shown. The blue line indicates the average procedure frequency of operations per 100,000 inhabitants in Sweden.

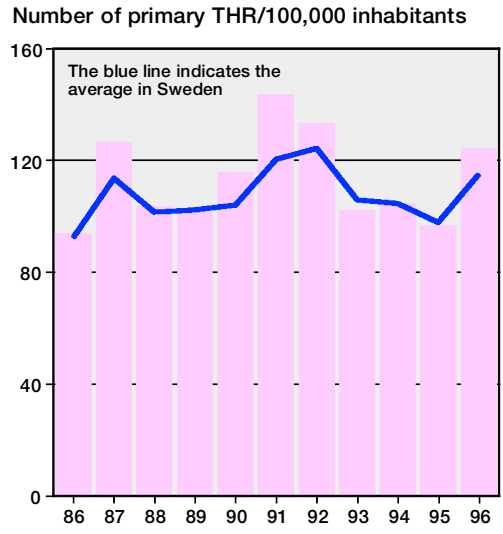

Figure 5. Central region (Örebro-Uppsala). The number of primary total hip replacements per 100,000 inhabitants between 1986 and 1996 are shown. The blue line indicates the average procedure frequency of operations per 100,000 inhabitants in Sweden.

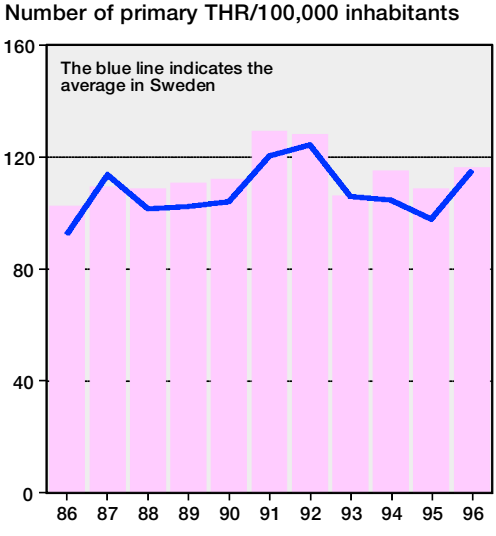

Figure 6. Southern region (Skåne). The number of primary total hip replacements per 100,000 inhabitants between 1986 and 1996 are shown. The blue line indicates the average frequency of operations per 100,000 inhabitants in Sweden.

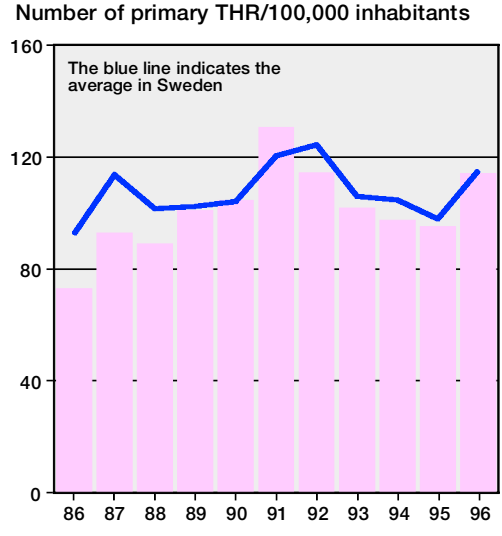

Figure 7. Eastern region (Stockholm-Gotland). The number of primary total hip replacements per 100,000 inhabitants between 1986 and 1996 are shown. The blue line indicates the average frequency of operations per 100,000 inhabitants in Sweden.

Revised total hip replacement

All reoperations on the hip in patients had a total hip replacement are registered. Revisions are the commonest interventions, accounting for 61% of all reoperations. During the period 1979–1997, approximately 12,100 revisions were performed (Figure 9). The second largest group of reoperations is for luxations, followed by various minor operations.

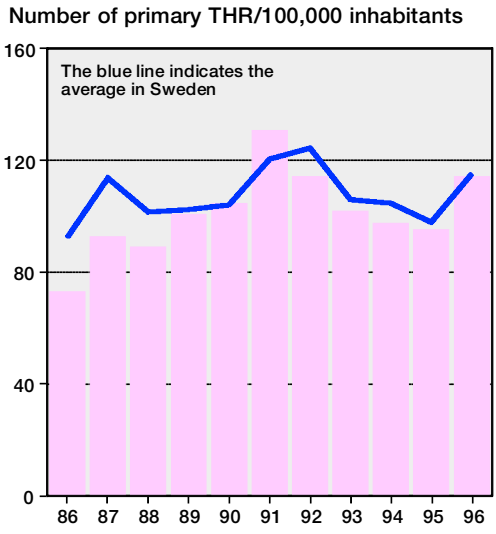

Figure 8. Western region (Göteborg). The number of primary total hip replacements per 100,000 inhabitants between 1986 and 1996 are shown. The blue line indicates the average frequency of operations per 100,000 inhabitants in Sweden.

Revision is defined as the exchange of one or both of the components, or removal of the prosthesis. Aseptic loosening, with or without osteolysis, is still the chief reason why such a dramatic procedure is done. This biological/mechanical complication, which increases with time, accounts for 71% of the revisions, but primary deep infections have decreased and now account for only 7.5% of the revisions (Table 2). The cumulative rate of deep infections after a primary THR in Sweden is now only 0.2% after 5 years.

Table 2. The reasons for revision in 12,514 patients revised between 1979 and 1997

Reason	Percent	Number
Aseptic loosening	71.1	8,799
Primary deep infection	7.5	939
Bony fracture	5.6	707
Two stage procedures	4.5	560
Dislocation	4.8	601
Technical reason	3.7	467
Implant fracture	1.6	198
Metastatic infection	0.9	111
Only pain	0.4	43
Miscellaneous	0.3	47
Polyethylene wear	0.3	42
Total	100	12,514

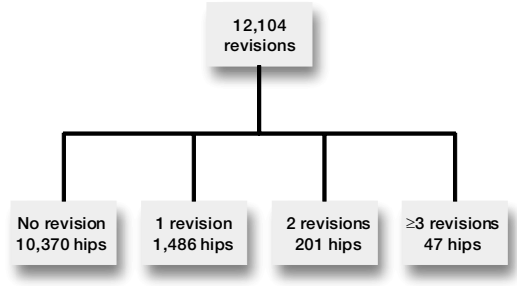

Figure 9. The total number of revisions has been subdivided into hips with no previous revision and 1, 2 o more than 3 previous revisions 1979–1997. The number in each category is shown.

The main consistent findings in our analyses have been the successive decline in the cumulative revision frequency of aseptic loosening (and deep infections) in the whole country. This continuous quality improvement is well illustrated in Figure 10. Patients operated in 1987 have been revised for loosening in 3% of the cases after 10 years, versus 9% of those operated on in 1979.

The latest yearly report from 1998 (http://www.jru.orthop.gu.se/), contains the survival rates of cemented and uncemented implants, as

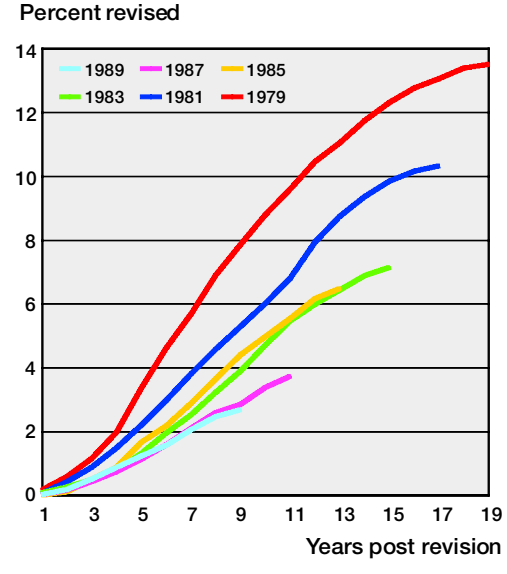

Figure 10. Cumulative revision frequency in patients with the index diagnosis osteoarthrosis and revision because of aseptic loosening for cemented implants. The figure shows patients operated on in 1979, 1981, 1983, 1985, 1987 and 1989 with a maximum of 19 years' follow-up.

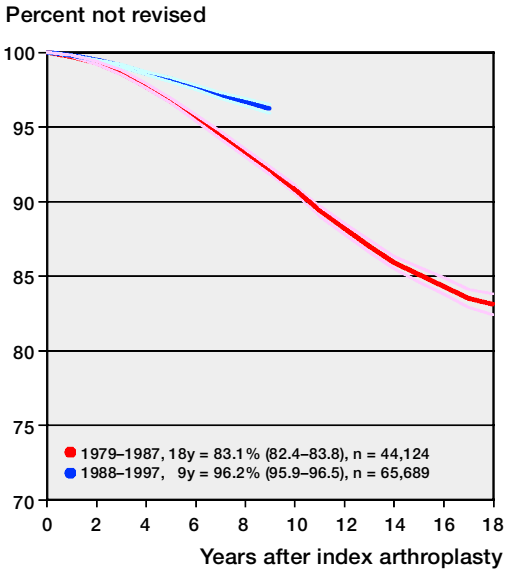

Figure 11. Modified Kaplan-Meier's curve showing survival of cemented implants. 2 cohorts are depicted: 1979 –1987 44,124 patients with 18 years' survival of 83% (95% confidence limit 82–84), and 1988–1997 65,689 patients with 9 years' survival of 96% (95% confidence limit 96–97). Index diagnosis is osteoarthrosis and reason for revision aseptic loosening.

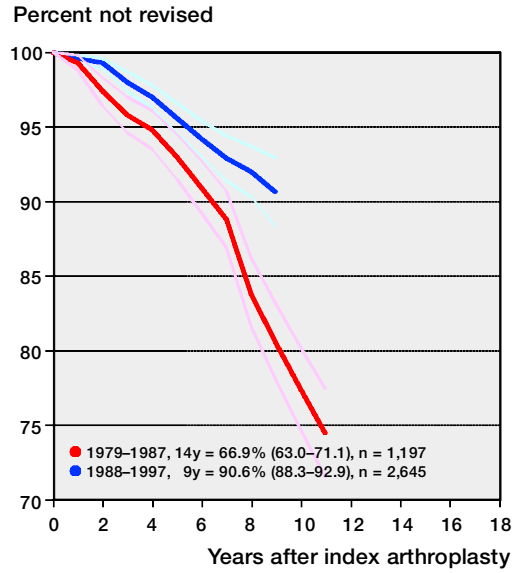

Figure 12. Modified Kaplan-Meier's curve showing survival of uncemented implants. 2 cohorts are depicted: 1979–1987 1,197 patients with 14 years' survival of 67% (95% confidence limit 63–71), and 1988–1997 2,645 patients with 9 years' survival of 91% (95% confidence limit 88–93). Index diagnosis is osteoarthrosis and reason for revision aseptic loosening.

well as a large number of other implants. Regional variations are present and the survival rates of cemented and uncemented implants during two periods are shown in Figures 11 and 12, respectively. The first period covers 1979–1986 and the second 1987–1997. These periods were chosen because they occurred when we switched to a more modern surgical technique during the late 1980s, which caused a dramatic improvement in outcome. This technique involves careful cleaning of the bone bed, compression of the cement, and vacuum-mixing of the cement to improve its strength. It is therefore correct to speak of early versus modern surgical cementing techniques during these two periods.

The cemented implant has thus improved substantially over time. This fixation technique worked better than the uncemented, more experimental ones. During the later period, most cemented implants have shown a 10-year survival of 94–97%. We can report a 95% 10-year survival of hip replacements in Sweden as a whole using the modern technique, if we limit the analysis to the commonest complication, i.e., aseptic loosening. Inclusion of all other causes for revision would increase the number of of by 1–2%.

The uncemented implant, which also changed during the 1980s, showed no significant improvement; indeed, certain implants showed a worsening. However, during the 1990s, the uncemented technique improved and showed the same stability as cement fixation in radiostereometric evaluations (Thanner 1999). The long-term results of modern uncemented implants, however, are not yet known.

The main point is that improved technique and proper choice of implant have reduced serious complications and improved the long-term results. The adequacy of the surgical technique is of fundamental importance; the initial fixation of the implant depends to a large extent on good surgical technique.

Multivariate analysis of the surgical technique

During the 1990s, most clinics changed to an optimal surgical technique for cemented hip replacement. Previously, the differences between the

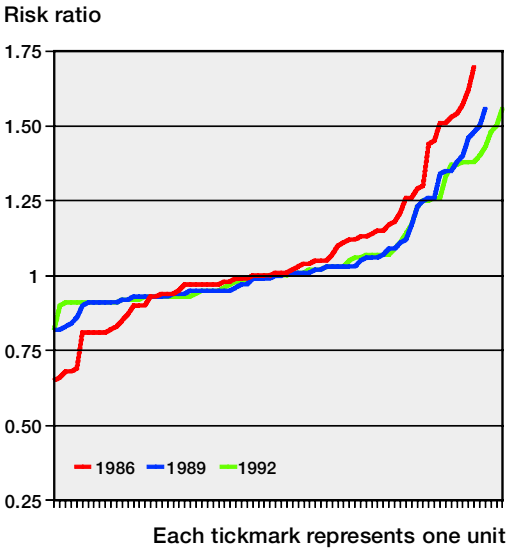

Figure 13. Risk ratio per orthopedic unit for 1986, 1989 and 1992. The calculation of this ratio is based on the choice of surgical technique. Each mark on the axis represents one orthopedic unit.

clinics were striking. Figure 13, using a risk ratio, illustrates the risk of revision for 1986, 1989, and 1992. In 1986, the risk ratio varied between 0.60 and 1.72, and improved—i.e., ranging between 0.82 and 1.56 in 1989. Continued improvement occurred during the 1990s and the quality became the same throughout the country. There are now only a few clinics which differ significantly from the large majority with similar outcomes. Likewise there are now only a few clinics which have a significantly better outcome than the majority. We believe that this change, by choice of an optimal surgical technique, is a good example of quality improvement, which can be ascribed to many years of information provided by the register.

Cementing techniques are therefore of fundamental importance for preventing revision due to loosening, which causes 80% of the failures. Cleaning of the trabecular bone with pulsatile lavage, and the distal plug and the proximal seal for increasing the cementing pressure are each associated with about 20% reduction in the risk of revision for aseptic loosening (Table 3).

We have in both the Swedish and the 10-year Norwegian national registers (Havelin et al. 1995) also found that the choice of bone cement is clearly associated with a risk of revision. The lowest risk of revision is found with Palacos/Gentamycin cement (Table 4). On the basis of this finding, it is not surprising that such cement has dominated the market in Sweden during recent years.

Regional comparisons

The latest yearly report showed regional variations over the years regarding the use of cemented versus uncemented implants, and that certain regions had totally avoided some very bad implants with a known high failure frequency, such as the Christiansen prosthesis. We later showed that safe and well-designed implants had been initially chosen throughout certain regions, as in the eastern region with the Charnley prosthesis and in the northern region with the Lubinus prosthesis. Furthermore, when comparing the various regions over time, there exists a case-mix problem, i.e., variations within the incoming patient material, which must also be considered when interpreting the results.

The frequency of operations varied considerably and the metropolitan regions, i.e., Stockholm

Table 3. Risk ratios for cementing technique. A Poisson model for univariate variables is used. Only patients operated on for osteoarthrosis and revised for aseptic loosening are included

Variable	Risk	95% CI [a]
Pulsatile lavage	0.72	0.66–0.79
Proximal femoral seal	0.79	0.72–0.87
Distal femoral plug	0.87	0.80-0.94

[a] confidence interval

Table 4. Risk ratios for type of cement. A multivariate Poisson model is used for estimating risk ratios. All patients and all reasons for revision are included. The risk ratios are related to the Sulfix-cement (risk ratio 1)

Variable	Risk	95% CI [a]
Palacos Gentamycin	0.46	0.41–0.51
Palacos	0.54	0.49–0.61
Simplex	0.57	0.50–0.65
CMW	0.62	0.56–0.68

[a] confidence interval

(eastern) and Göteborg (western), had a lower frequency than the remaining regions at least in Göteborg. This cannot be due to an outflow of patients to other areas; relatively few patients are operated on outside our region. Sufficient resources and/or higher frequency of arthrosis can explain the high procedure frequencies in both northern and southern regions. A case-mix problem also exists here and must be considered when interpreting the results.

With modern cementing techniques, most regions report excellent results and the national average is approximately 95% survival at 10 years, with a slight variation. There are many possible explanations for these slight variations and it is up to the individual clinics and regions to discuss this information to improve the quality further.

The uncemented (biologically fixated) implant initially sparked great interest, both in the profession and in general. Poor results were reported during the first period because of loosening and excessive plastic wear with osteolysis.

Unfortunately, several regions reported unsatisfactory results also during the second period, when it was thought that the uncemented technique had improved, but it had worsened slightly. Most of these mainly young patients have been carefully followed prospectively, and have had early revision, even without symptoms, which perhaps has raised the high revision frequency. During the last 7 years, uncemented implants have been used with good results so far in several regions. We hope that the third-generation uncemented prosthesis concept will produce good and reproducible long-term results. This technique could then become an alternative for younger patient groups and for revisions where cement fixation functions less well or cannot be used.

Evidence-based treatment

During recent years, there has been an increased awareness that we must validate our orthopedic techniques to be able to offer evidence-based treatment (Malchau 1995). Joint replacement surgery is an appropriate technique for a national observation study (Havelin 1995, Sochart et al. 1996).

In documenting of total hip replacements and feedback from the register, we have acquired important information about an expensive procedure. This type of register study is time-consuming and expensive, but it has proved to have a great impact on our clinical practices and attitudes (Herberts et al. 1989, Herberts and Malchau 1997). Hip replacement surgery has evolved since the orthopedic profession has collectively taken responsibility for the proper selection of patients and prostheses, and for the steady improvement in surgical techniques, which was advocated by John Charnley more than 30 years ago. The key to this success in Sweden has been the yearly feedback of important information to the clinics and by conferences with the representatives.

From a methodological standpoint, a problem has been insufficient participation by a few clinics, especially the large regional hospitals. This has resulted in late reporting of between 1 and 2 years, and even only every other year.

Another methodological limitation is our definition of failure. It cannot be denied that exchange or removal of a hip prosthesis is an immense failure, which is a tragedy for the patient, but it can be quantified and validated. In a an ongoing validation study, the survival rates of THR given in the Swedish THR register, n 93,852, were compared to the results in the Discharge register (the Swedish National Board of Health and Welfare), n 87,129 (Söderman et al. 1999a). From the Discharge register, a randomly selected cohort of 2,604 patients operated on with THR had answered a questionnaire about whether they had been revised. There were no significant differences in survival between the THR register and the Discharge register or between the THR register and the patients' answers. However, all prostheses that are not revised cannot be said to have a good outcome, from the patient's and surgeon's points of view. There are patients with pain or unsatisfactory function who are not revised. The validation study has suggested that the cohort of unrevised patients with problems is probably as large as the revised cohort. In summary, modern surgical technique and well-documented implants give an excellent 10-year result in 85–90% of the patients; approximately 5% have clinical or radiographic problems, and a further 5–7% are revised (Söderman et al. 1999b).

Scepticism vis à vis experiments—an effect of the register

Although our methods have limitations, these are minor compared to the great advantages that a large-scale database can offer. A large database is the only practical means of obtaining vital information regarding patient variations, individual surgical techniques, and the negative results of even slight differences in implant design.

An obvious effect of the register has been awareness in the Swedish orthopedic profession of the risks of large-scale experimentation with new implant technologies. Such conservatism has not been a decision taken by the manufacturers of the implants or others, but rather an agreement within the profession. Murray and co-workers (1995) reported that 62 types of prostheses are used in the U.K. Half of these were introduced during the past 5 years, without any documentation on mid-term status. Long-term results were known for only one third of the prostheses, which were used routinely. The revision frequency in the U.K. is three times greater than in Sweden.

An important consequence of our conservative attitude, aiming to improve surgical techniques instead of experimenting with new implants, is illustrated in Table 5. The use of new implants without satisfactory clinical outcomes, especially uncemented implants, has had an obvious negative effect on the ratio between primary operations and revisions in 4 countries (Sweden, Norway, Finland and USA). The Swedish healthcare system has saved about one billion Swedish crowns per year.

To improve clinical practice, by external validation or extrapolation of the results of randomized studies is usually very difficult. The results from specific validation centers are often not representative of the results from routine health care. Furthermore, patients who participate in randomized studies are frequently atypical, and specific exclusion criteria may be so restrictive that only some patients treated in regular clinical practice are represented. Therefore, the effectiveness of a widely used routine surgical technique, such as hip replacement surgery, can be evaluated better in an observational study rather than in a randomized one. We have compared various interesting factors, and tried to obtain an over all view of the effectiveness of total hip replacement in this country.

Table 5. Relation between percentage of primary uncemented THR and ratio revision/primary in various countries. The results from Sweden, Norway and Finland are based on register studies

Variable	Percentage uncemented THR	Ratio revision/primary THR
Sweden (1979–1994)	4	1:10
Norway (1987–1994)	14	1:8
Finland (1980–1994)	45	1:5
USA (1990–1994)	50	1:5

A willingness to accept quickly improved surgical techniques is evident in Sweden. This can be contrasted with the attitude in Great Britain, for example, where it was recently shown that only 25% of surgeons used modern third generation techniques (Hashemi-Nejad et al. 1994). They also reported that the outcome was much poorer in patients whose surgeons used old-fashioned surgical techniques.

The hip replacement register is financed by the National Board of Health and Welfare, but is directed by a professional committee, which alone has control over the decisions regarding activities, analyses, and reporting. We have found that the main part of reporting is being as precise and comprehensive as possible. Orthopedic surgeons recently agreed that the results the past 10 years, when relatively good implants and modern techniques had been used, should be made available for comparison. In addition, we shall analyze data for regional or national comparisons, before distribution to the media or to other authorities.

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Participating units in the Swedish THR Registrer

Unit	Doctor	Secretary
Alingsås	Rolf Appelquist/ Pär Dahlqvist	Birgitta Lindberg
Arvika	Lasse Enskog	Britt-Inger Karlsson
Boden	Lars Lundmark	Carin Isaksson
Bollnäs	Lars Gollvik	Carin Händel
Borås	Michael Eriksson	Birgitta Gunnerisson
Carlanderska	Catharina Wretbäck	
Danderyd	Henrik Bodén	Lena Eriksson/Göran Bennbom
Eksjö	Stellan Wijkström	Heléne Andersson
Enköping	Sten Karlström	Titti Zweigberg
Eskilstuna	Lars Gunnar Brobäck	Monica Lindberg
Falköping	Lars Nistor	Ulla-Britt Mörk
Falun	Gunnar Hallin	Agneta Åslund/Ann-Marie Krug
Gällivare	Jan Minde	Barbro Smedberg-Rabb
Gävle	Lars Linder	Birgitta Hansson
Halmstad	Stefan Elmerson	Lena Alpedal
Helsingborg	Peter Ljung	May-Christine Friberg
Huddinge	Håkan Hedlund	Ann-Christin Eriksson
Hudiksvall	Sven-Erik Keisu	Laila Pettersson
Hässleholm-Kristianstad	Martin Sundberg	Helena Ridderstedt
Jönköping	Nils Oretorp	Heléne Schelin
Kalix	Ulf Cannerfelt	Ulla-Britt Lundbäck
Kalmar	Carl-Henrik Hybbinette	Catharina Lindgren
Karlshamn	Christer Olsson	Linda Rothsten/Lillemor Cehlin
Karlskrona	Ronny Lövdahl	Elisabeth Malmberg
Karlskoga	Anders Lindbäck	Ulla Laursen
Karlstad	Urban Hedlundh	Carina Bååth
Karolinska	Lucas Anissian	Kerstin Saegebrecht
Katrineholm	Thomas Hultén	Maria Herlitz
Kristinehamn	Rolf Andersson	Birgitta Häggroth
Kungälv	Lennart Gustafsson	Anita Bengtsson
Köping	Ulla Lind	Wania Karlsson
Lidköping	Per-Åke Eriksson	Ann-Britt Berling/Lena Andersson
Landskrona	Reiner Brümmer	Anita Sörensson
Lindesberg	Sune Hallberg	Birgitta Bergström
Linköping	Ingemar Ivarsson	Annelie Blomberg/Lena Berglund
Ljungby	Mats Wilhelmsson	

Lund	Otto Robertsson	Marie-Louise Nilsson
Lycksele	Hans Fröbergh	Carina Brännlund
Malmö	Lennart Sanzén	Margit Friberg
Mora	Håkan Bjerneld	Margareta Larsson/Nelly Jonsson
Motala	Bengt Horn	Lotta Liljegren
Norrköping	Sven S Olsson	Birgitta Hagelberg
Norrtälje	Kjell Persson	Inger Grandin
NU/Uddevalla	Lennart Ahnfelt/Christer Strömberg	Lise-Lotte Olofsson
Nyköping	Leif Pettersson	Mari Rangensjö
Oskarshamn	Anneli Lindberg	Helene Toots
Piteå	Stig H Eriksson	Lena Forsman
Sabbatsberg Närsjukhus	Erik Mathiesen	Annika Stalebrant
Skellefteå	Torbjörn Hedlund	Irene Marklund
Skene	Josh Monastyrski	Annalisa Karlsson
Skövde	Lars Nistor	Maria Lilja/Lena Åberg
Sollefteå	Rigmor Juliusson	Birgit Ramén
Sophiahemmet	Ulf Lindén	Marlene Näslund
St Göran	Hans-Christian Hyldal	Riitta Djordjevic
Sundsvall	Eskild Pedersen	Birgitta Hellrup/Margareta Öhman
SU/Sahlgrenska	Peter Söderman	Jannica Ronnblad
SU/Mölndal	Hans-Olof Svensson	Kerstin Karlsson/Marie Mattsson
SU/Östra	Bengt Eriksson/Björn E Albrektsson	Evelina Ekros/Anneli Gustavsson
Säffle	Hans Lyrholm	Eivor Karlsson
Södersjukhuset	Björn Weijkner	Ulla-Britt Froidevaux
Södertälje	Stig Lindequist	Wailet Ljunggren
Torsby	Odd Kleppenes	Ann Persson
Trelleborg	Lennart Sanzén	
Umeå	Tore Dalén/Bo Nivbrant	Margareta Hagström/B-M Carlsson
Uppsala	Jan Milbrink	Zerny Paulsen
Varberg	Jonas Sjögren	Karin Gerdemark
Visby	Åke Karlbom	Solveig Nygren
Värnamo	Åke Deiver	Ann-Margret Norrman
Västervik	Johan Alkstedt	Lotta Törngren
Västerås	Ulla Lind	Wania Karlsson
Växjö	Torben Neergard-Richard	Kerstin Böhn/Margareta Åberg
Ystad	Krister Wulff	Agneta Wahlman
Ängelholm	Herbert Franzén	Britt-Marie Tilling
Örebro	Johan Weckström	Maria Swartling
Örnsköldsvik	Bernt Jonsson	Astrid Kallin
Östersund	Per Ramberg	Heléne Ledin Sundstad