Akademiska sjukhuset
Alingsås
Arvika
Bollnäs - Söderhamn
Borås
Carlanderska
Danderyd
Eksjö-Nässjö
Elisabethsjukhuset
Enköping
Eskilstuna
Falköping
Falun
Frölunda Spec. Sjh.
Gällivare
Gävle
Halmstad
Helsingborg
Huddinge
Hudiksvall
Hässleholm/Kristianstad
Jönköping
Kalmar
Karlshamn
Karlskoga
Karlstad
Karolinska
Kullbergska
Kungälv
Köping
Lidköping
Lindesberg
Ljungby
Lund
Lycksele
Malmö
Mora
Motala
Movement Halmstad
Mölndal
Nacka / Proxima
Norrtälje
Nyköping
Orthocenter Göteborg
Orthocenter Stockholm
Oskarshamn
Piteå
S:t Göran
Skellefteå
Skene
Skövde
Sollefteå
Sophiahemmet
Spenshult
Sunderby
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Södertälje
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Trelleborg
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Varberg
Visby
Värnamo
Västervik
Västerås
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Annual Report 2009

The Swedish Knee Arthroplasty Register

Dept. of Orthopedics, Lund University Hospital

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To the orthopedic surgeon, locally responsible for the Swedish Knee Arthroplasty Register

On January 1st, the Swedish Knee Arthroplasty Register (SKAR) started using a new form to be filled out in the operation theatre. The information can still be accommodated on one A4 page. We have added a number of new questions such as regarding previous surgery on the affected knee, methods used (tourniquet, drainage, CAS, MIS), prophylaxis (infection, thrombosis) as well as timing. It is our hope that this new information in the short term will contribute to continuous improvement in quality as well as to scientific studies in the long term. The new form can be viewed on the last page of this report.

Regarding the question on how long before surgery the patient received antibiotic prophylaxis, we mean at what time the infusion was started and it should reflect the true time, not what is the general routine at the hospital.

As previously, the report consists of 3 parts. The first part describes the routines of the register, epidemiology and general results.

The second part contains information regarding what has been reported to the register during 2008 as well as analyses covering the 10-year period 1998-2007.

The third part is specific for each reporting unit and contains lists with information regarding all the operations reported by the unit in 2007. One list is sorted by ID and the other by the date of operation.

It is our hope that the lists will be compared to locally available information, in an attempt to find and correct any errors in the registration. Further, we consider it important that colleagues receive information about the report at hospital meetings so that the content can be discussed and analyzed.

We want to remind you that the SKAR is prospective and that any revision reported to the register is only included in the analyses if the primary operation has previously been reported to the register according to prevalent routines. Thus, if a primary operation is discovered only as it became subject of a revision at a later time, neither the primary nor the revision will be taken into account.
Late reporting of primary procedures is only allowed in cases, in which there is a reasonable explanation for why the reporting was missed in the first place and when there is no suspicion of a bias. Late reporting may also occur when the register retroactively requests information regarding all primaries performed during a certain time period.

The Knee Register in Lund would like to thank our contact physicians and secretaries for their important contribution during the years and ask you to analyze and circulate the presented information.

Lund, October 16th, 2009
On behalf of the Swedish Knee Arthroplasty Register

Lars Lidgren Otto Robertsson Annette W-Dahl

CONTENT

Introduction

The beginning – In the early seventies, endoprosthetic surgery of the knee was a relatively uncommon procedure restricted for those with severe disability. Little information was to be found in the literature and there was an abundant choice of implants which continuously were being modified. In this setting, the Swedish Orthopedic Association initiated a nationwide multicenter study in 1975, to prospectively monitor knee arthroplasty surgery. The orthopedic surgeons realized that it would be impossible for an individual surgeon to base his choice of optimal operative methods or implants on his own experience. The aim was to collect, analyze and render information that could warn against suboptimal techniques and implants.

Number of units – The vast improvement in quality of life for the majority of patients quickly made the surgery a success and the technique dispersed to more hospitals and surgeons. Since the start of the registration in 1975, participation has been voluntary. 24 units reported during the first year. In 1980 the number was 47, in 1985 51, in 1990 66 and in 1996 82 units. In the late nineties, the number of reporting units lessened somewhat due to merger of hospitals, only to increase and diminish again. In 2008, 76 orthopedic units reported to the register, i.e. all units that routinely performed knee arthroplasty surgery in Sweden.

Volumes – Since the start of the registration there has been an exponential increase in the number of operations (see page 8). In 2008, 10,936 primary arthroplasties were reported which was an increase of 5% from 2007. The number of revisions went up by 8% to 668. The sharp increase in the number of operations we have experienced in recent decades has ceased somewhat since 2005. However, what speaks against that the top has been reached is that the incidence in Sweden (see page 9) is still considerably lower that in countries such as USA and Germany. But even without further increase in age specific incidence, changes in the age distribution of the population will still increase the demand for surgery.

New reporting form – After having the same "minimal" data set form for 10 years the registry introduced a new form at the turn of the year. The same information is required as before but a number of questions have been added, mostly in relation to the operative procedure itself. This allows for monitoring process quality and facilitate systematic improvement of the health care.
The new form has resulted in extensive work introducing new routines at the hospitals, change of computer programs as well as input and control of the new variables. The new information will among other things give increased knowledge with respect to operative techniques and preventive treatment against infection and thrombosis.
In a longer perspective, this will be the basis for research on the effect of these procedures on outcome. But even in a shorter perspective, it makes it possible to evaluate if recommended routines regarding treatment have been introduced and if such routines are complied with. In turn, this facilitates continuous quality improvement.

Reporting – The registration is continuous and the knee arthroplasty register has recommended that the form (page 39) is filled in the operation theater. As on the old form, one set of the stickers found in the implants and cement packages are to be attached to the form. The form is then sent to the register office at Lund University Hospital where the final registration occurs. In case of revisions, a copy of the operation report and discharge letter is required. The register recommends that units with high volume of surgeries report at least once a month. The majority of the units observe the recommendations. The reason for that registration using the Internet has not been introduced is that we consider it is important that the registration is done in the operation theater. Further, the technology and the flow of information from the implant distributors to the register is not sufficient. In our view, the paper-based system at present has essential advantages such as less workload for the surgical units, the most reliable information and the least chance of input error. Further, during the input of data the register staff is able to check part numbers against a local database and in case of new numbers turning up, directly contact the distributors.

Annual report – Each annual report accounts for the primary arthroplasties that were reported during the previous year (in this report 2008). Analyses concerning the revision rate end one year prior to that (in this report 2007).
The reason for the survival analyses ending one year earlier is that a few errors in the registration

of revisions can have a large impact on the final result. The extra year allows for the most complete and correct information on revisions possible. Revisions are often complicated procedures in which forms, discharge letters and operation reports have to be examined thoroughly. Supplementary information is often needed before the reason for and the type of revision is reasonably clear. Unfortunately, it also happens that units send completing information after discovering, by examining the annual report and the accompanying lists, that their previous reporting had been incomplete.

10-year analyses – Some have wondered why the register most often accounts for 10-year revision rate while the registration has been going on for more than 30 years.
There are several reasons; The main reason is that the interest usually focuses on relatively modern techniques and implants. Another reason is that survival analyses allow for inclusion of patients during the entire observation period. i.e. implants have been inserted in the beginning as well as in the end of the observation period. This implies that the first part of a revision (survival) curve includes operations performed both during the first and last part of the observation period. The end of the curve (to the right), only includes operations inserted during the first part of the period. The result is that the latter part of the curve represents older techniques and implants as well as the younger part of the patients (those more likely to live to the end of the observation period). In summary, this means that without special selections it is difficult to interpret curves that stretch over long time periods. A more detailed description on how the register compares implants can be found on page 6.

Cooperation – The collaboration with NKO (National Competence Centre within the area of musculoskeletal disorders) has developed and is facilitated by the fact that the SKAR and NKO share premises at the Lund University Hospital. The Nordic countries cooperate through the framework of NARA (Nordic Arthroplasty Register Association) where joint analyses of knee arthroplasty data (Denmark, Norway, Sweden) are being performed. The SKAR and AOANJRR (Australian Orthopedic Association National Joint Replacement Register) have a common research project and the SKAR also collaborates with individual scientists in different countries.
Besides that such collaborative projects may result in interesting findings they give the participants insight into each other´s methods for registration, selection, analyses and reporting. In turn this hopefully will result in the registers approaching each other so that it will be easier to compare their results in scientific papers and reports in the future.

Reports – The register reports in several ways; verbally, in writing and using modern computer technology. At annual meetings, contact surgeons from the participating hospitals are informed. Each unit receives their own data annually so they have the opportunity to check their own results. By publication of annual reports and scientific articles, as well as through participation in national and international conferences the register disseminates information to professionals, administrators and other interested.
The register has a Web-site (www.knee.se) were annual reports can be downloaded and where a list of publications is available. There is also a secure server where participating units have their individual folder in which they are provided with their own data in a computerized form including revisions of their patients performed elsewhere.
Hitherto, the register has not seen the cost-benefit in using the Web-site to provide the units with constantly updated information. The reason for this is that the units report to the register irregularly and that there may be a delay in registration of revision information (see annual report above). It can be assumed that the individual units have access to local computer systems containing information concerning their own patients. The information that the SKAR has on revisions performed elsewhere is supplementary information of restricted use as it is not certain that it is complete. However, it may be more important for the units to have earlier information with respect to the new variables we have started to gather. Thus we are working on a system allowing for continuous reporting.

Comparison of coverage in 2007

Estimating the percentage of operations accounted for in the SKAR is not easy. The register can only compare itself with the National Patient Register (NPR), an inpatient-care register of the health authorities, based on ICD coding. However, NPR didn't have nationwide coverage the first 12 years of the SKAR. Further complicating the comparison of these registers is that they have registered different variables (operations vs admissions) and that the side treated has not been registered in NPR.

During the late eighties, the coverage of the SKAR was estimated as being 85%. However, after validation in 1997 using mail enquires to all patients and performing a search of missing operations in the PAR followed by improved routines for reporting, coverage was estimated as 95%.

Last September the statistical unit of the National Board of Health and Welfare compared the SKAR and NPR, concerning the number of primary knee arthroplasties registered in 2007.

The SKAR had registered 10,502 primary knee arthroplasties translating into 10,357 admissions (NPR can't separate same-day bilateral operations (1.5%). The NPR had 9,884 admissions for primary knee arthroplasty. There were 869 admissions in the SKAR that were not registered in NPR and 396 admissions in the NPR not found in SKAR. Assuming that the total number of admissions is the sum of admission in both registers, the SKAR had 96.3% coverage and the NPR 91.9%. However, there is the possibility that patients have had knee arthroplasty surgery without being registered in any of the registers, although they presumably are few.

Below there is a list of the units containing the combined number of operations in both registers as well as the coverage of respective register.

Those units who do not reach 96% coverage are marked in red. Units with low coverage have reason to investigate if they missed reporting surgeries and if their ICD-10 coding is satisfactory.

Hospital	Number of op.	SKAR percent	NPR percent
Akademiska sjukhuset	126	94.4	97.6
Alingsås	201	92.5	98.5
Arvika	70	98.6	98.6
Bollnäs	235	95.7	95.3
Borås+Skene	237	96.6	97.9
Carlanderska	26	100.0	3.8
Danderyd	225	96.9	96.4
Eksjö-Nässjö	118	100.0	100.0
Elisabethkliniken	106	100.0	0.0
Enköping	199	97.5	78.9
Eskilstuna	48	97.9	75.0
Falköping+Lidköping+Skövde	371	97.6	97.0
Falun	216	100.0	97.7
Frölunda Spec.	121	99.2	100.0
Gothenburg Med Center	20	100.0	0.0
Gällivare	95	97.9	98.9
Gävle	69	97.1	98.6
Halmstad	164	98.2	97.6
Helsingborg	14	100.0	100.0
Huddinge	165	93.3	98.8
Hudiksvall	88	97.7	97.7
Hässleholm + Kristianstad	519	98.7	98.3
Jönköping	104	95.2	99.0
Kalmar	106	96.2	98.1
Karlshamn	177	95.5	98.9
Karlskoga	108	97.2	98.1
Karlstad	200	97.5	98.5
Karolinska	178	90.4	97.8
Kullbergska sjukhuset	122	72.1	86.9
Kungälv	186	97.8	97.3
Köping	217	98.6	97.7
Lindesberg	95	96.8	97.9
Linköping	2	0.0	100.0
Ljungby	72	100.0	97.2
Lund	27	96.3	96.3
Lycksele	35	97.1	100.0

Unit	Number of op.	SKAR percent	NPR percent
Malmö	25	96.0	88.0
Mora	102	97.1	98.0
Motala	359	96.4	98.6
Movement Halmstad	132	100.0	97.7
Nacka-Proxima	40	92.5	87.5
Norrtälje	82	96.3	97.6
Nyköping	97	97.9	84.5
Ortho Center Stockholm	182	100.0	62.6
Ortopediska huset	430	98.1	54.7
Oskarshamn	269	98.5	98.1
Piteå	300	97.3	97.7
S:t Göran	254	86.6	94.5
Sahlgrenska+Mölndal+Östra	282	89.4	91.5
Skellefteå	52	98.1	96.2
Sollefteå	112	96.4	99.1
Sophiahemmet	103	100.0	1.0
Spenshult	55	98.2	94.5
Sunderby	22	100.0	100.0
Sundsvall	91	97.8	97.8
Södersjukhuset	334	96.7	95.5
Södertälje	128	96.9	96.1
Torsby	95	96.8	96.8
Trelleborg	541	98.2	98.7
Uddevalla	190	94.7	93.7
Umeå	142	97.2	99.3
Varberg	178	98.9	98.3
Visby	103	96.1	96.1
Värnamo	134	93.3	97.0
Västervik	93	94.6	96.8
Västerås	89	94.4	83.1
Växjö	135	92.6	96.3
Ängelholm	169	97.0	97.6
Örebro	163	95.7	98.2
Örnsköldsvik	109	96.3	94.5
Östersund	99	94.9	94.9

Definitions

Revision is defined as a new operation in a previously resurfaced knee during which one or more of the components are exchanged, removed or added (inc. arthrodesis or amputation). This implies that soft tissue operations such as arthroscopy and lateral release are not considered revisions. The reason for this stringent definition is that some minor operations are not necessarily related to the primary surgery and thus cannot be considered a complication or failure.

TKA (Total or Tricompartmental Knee Arthroplasty) is defined as a knee arthroplasty in which the femoral component has a flange and thus all three compartments of the knee are affected. Even in cases where a patellar button is absent, the flange resurfaces half of the femoropatellar compartment and the arthroplasty is still considered to be a TKA.

Bicompartmental arthroplasty (historical) uses two components, one on the femoral and one on the tibial side to resurface both the femorotibial compartments (medial and lateral) but not the femoropatellar compartment. Thus, this implant has no femoral flange and is not meant to allow for resurfacing of the patella.

UKA (Unicompartmental Knee Arthroplasty) implies an arthroplasty that separately resurfaces the medial or lateral femorotibial compartment. (med. UKA or lat. UKA). If 2 UKA implants are used to resurface both femorotibial compartments the arthroplasty, it is named bilateral UKA.

Patello-femoral arthroplasty is used to resurface only the femoropatellar compartment. Even if this arthroplasty is unicompartmental by definition, it is accounted for separately.

Hinged implants. As the name implies these implants only allow for flexion and extension through a fixed axis.

Linked implants (Linked/Rotating hinge) have a mechanical coupling between the femoral and tibial components allowing for flexion and extension as well as for a varying amount of rotation.

Stabilized implants. Even if the hinges and the linked implants are extremely stabilizing, the term stabilized implants is used for a group of prostheses that are a kind of TKA but use the form of the femoral and tibial components to restrict movement in valgus, varus and rotation. The posterior cruciate sacrificing type most often has an eminence in the middle part of the tibial polyethylene, that can be contained by a box in the femoral component that lies between the medial and lateral sliding surfaces. By a camshaft-like property, the femoral component is forced to slide back during flexion, which simulates the effect of the posterior cruciate ligament. The fit between polyethylene and metal is such that it allows for some rotation. In so-called super stabilized implants the congruency has been increased by making the eminence larger with a total fit against the box of the femoral component thus, restricting the rotation and varus/valgus movement. Intermediary forms also occur. Stabilized implants are most often used for revision but also for the more difficult primary arthroplasties.

The ordinary TKA can be made somewhat more stabilized by increasing the congruency between the sliding surfaces. In these instances, there is a slight eminence of the polyethylene that fits against the femoral component. However, the term stabilized is only used for those implants that are more stabilized than usual by use of the above mentioned camshaft construction.

TKA-revision models are TKA that mainly are used for revisions or difficult primary cases. As mentioned above, these are often stabilized implants, which additionally often are used with stems. Many have proper names that make them easy to distinguish from common TKA's. However, due to the modularity of the modern TKA, a named TKA can represent both a common TKA or a stabilized stemmed TKA depending on which components have been put together. For the primary surgeries, this implies that certain named TKA´s have only been used for standard cases while others have also been used for difficult primary cases. This can result in bias when models are being compared. To make the comparison of the revision rate after primary surgery as just as possible, the SKAR classifies certain TKA as being "revision models" and excludes them from the analyses. Accordingly, revision models with identifiable names are excluded (e.g. NexGen-LCCK, AGC-Dual Articular and F/S-Revision) but even those modular TKA's that have been inserted using extra long stems (5 cm. or more).

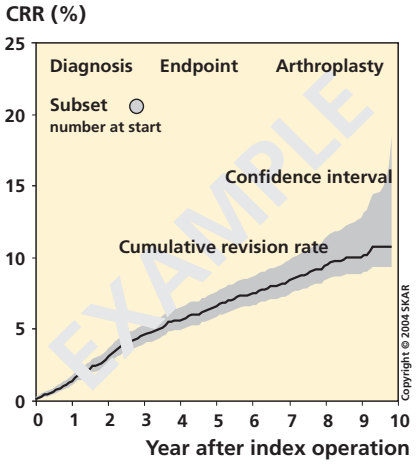
For those interested there is an excellent article on the history and the developement of the TKA; Robinson RP; The Early Innovators of Today's Resurfacing Condylar Knees. J of Arthroplasty 2005 (suppl 1); 20: 1.

How the register compares implants

Survival analyses are used for graphical presentation of data. The curves show the Cumulative Revision Rate (CRR) which describes what percentage of the operated patients was expected to become revised with time. The calculation is based on the sum of all the revisions and expresses the rate for surviving patients. Most often the time axis shows a 10-year period. However, it has to be kept in mind that patients are continuously being added during this time. Thus, all the patients have not been followed for the whole period. This implies that if 1,000 patients were operated on each year (and nobody dies), a 10-year study would include 10,000 patients of which only 1,000 had been followed for more than 9 years. The last part of the curve (at the right) therefore expresses the long-term rate of revision for patients operated more than 9 years earlier. As the number of these patients is relatively small, the 95% confidence interval becomes large. When the number of patients at risk is small (at the right of the curve), each revision has a large effect (e.g. 50% are revised when 2 patients are left at risk and one of them has a revision). For this reason, the Register cuts the curves when less than 40 patients are left at risk.

Survival statistics are used to calculate how long an implant is left unrevised. With increasing observation time, the fraction of deceased patients increases (figure below). These patients are not disregarded because they were at risk of becoming revised during their lifetime and are thus allowed to deliver data for the period they lived. The probability for each revision is related to the number of remaining unrevised patients. The sum of all the probabilities is the cumulative risk of revision which specifies the risk for a surviving patient of becoming revised at a given time.

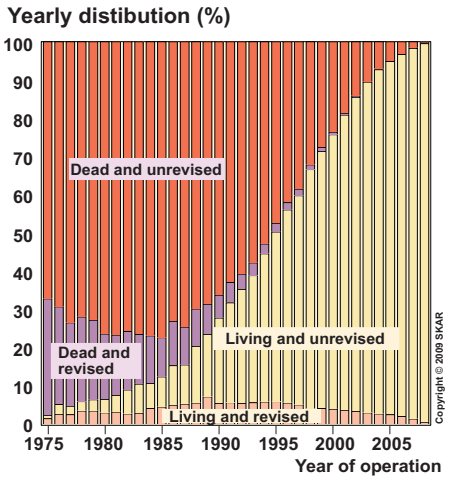
Cox regression allows for taking into account different factors that may vary within groups. The results are expressed as risk ratios (RR) between factors. If a factor is a category (e.g. implant model), one category is defined as a reference with a risk of 1 to which the other categories are compared. An implant with the risk of 1.2 thus has a 20% increased risk of becoming revised etc. For numerical variables (e.g. age) the risk ratio relates to the change in risk if the variable increases by one unit (e.g. 1 year). When comparing groups where uneven distribution of factors can be expected (e.g. age in cemented vs. uncemented implants) the Cox regression is especially important.



CRR curve example.

It is important to note that as the individual patient also is at risk of dying, the real proportion of revisions is lower than the CRR. As the figure below shows, more than 3/4 of the patients that were operated in 1980 deceased without having been revised Half of those still alive have suffered revision.

When one tries to estimate differences in risk of revision between units it is complicated by the variation in volume. The reason is that units with few observations (operations) are more likely to have overly good or bad results. Thus the register received help from NKO statisticians to calculate the risk using a "shared gamma frailty model" which takes volume into consideration. However, one has to remember that the units may have different "case-mix", i.e. patients with different grades of joint destruction or differences in general health and activity. These factors, which we at present are unable to take into account, may influence the risk of revision and thus the results of individual units.



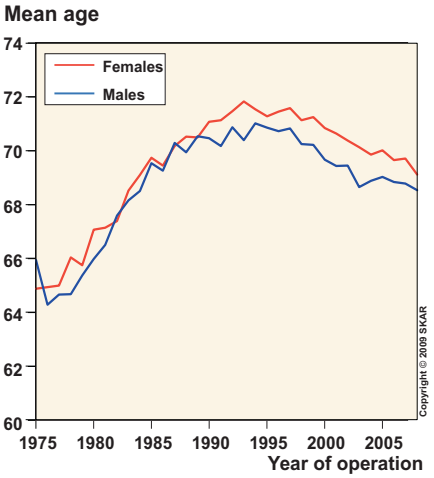
The status in 2008 for each yearly batch of patients operated since 1975.

Gender and age distribution

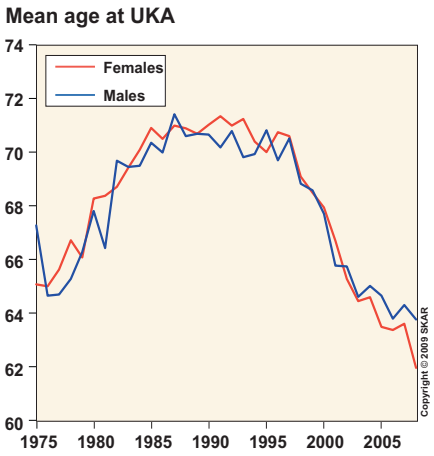
Between 1975 and 1994, the mean age at primary operation increased from 65 years to almost 72 years. The main reason was the relatively large increase in number of operations for the older age groups. Probable explanations are improvements in anesthetic techniques as well as a changed age distribution of the population. Since 1994 the proportion of patients less than 65 years of age has increased again, why the mean age again started to decrease. In 2008, it was a barely 69 years and slightly higher for females (figure on the right).

If TKA and UKA are analyzed separately, it is apparent that when TKA was introduced in the seventies it was to a larger extent used in young patients rather than the UKA, which at the time was the standard treatment (figures below and on the next page). On the other hand, in recent years the mean age at UKA surgery has fallen considerably which coincides with the introduction of mini invasive surgery. An interpretation of these observations may be that new technology to a larger extent is being tested in younger patients.

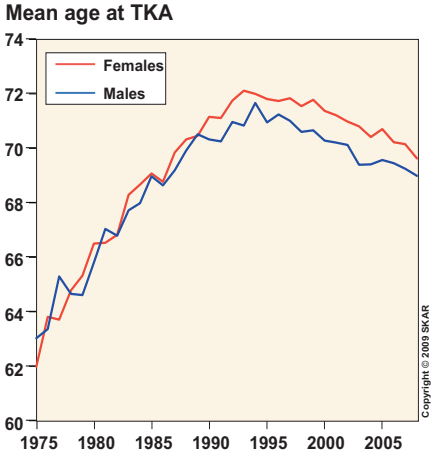
When comparing a series of patients operated during different periods, the change in the mean age make it necessary to account for age by use of regression or to analyze different age groups separately.



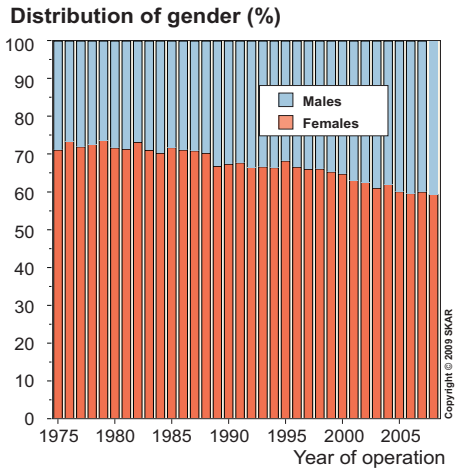
The mean age of patients at surgery (all types of implants) increased until the mid-nineties when it started to decrease.



In UKA, the mean age of patients at surgery has decreased sharply in recent years which coincides with the introduction of mini-invasive surgery.



The mean age at surgery was lower for TKA than UKA when TKA was introduced in the seventies (cp the figure above).



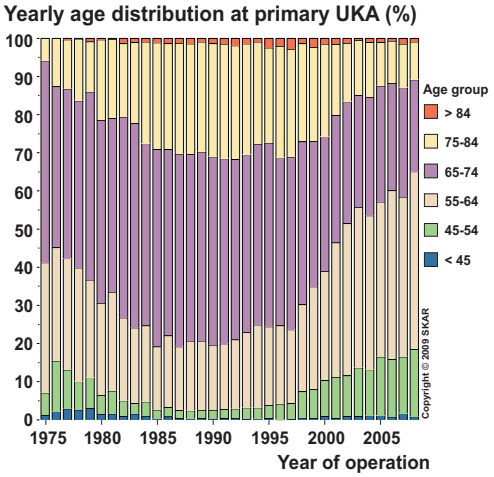
The proportion of males has increased slightly over the years.

Knee arthroplasty is more common in females than in males. At the start of the registration, females accounted for about 70% of the operations. As the figure above shows, the proportion of men has been slowly increasing so at present they account for 41%. Separate analyses of OA and RA show that it is mainly in OA that the proportion of men has increased. In RA men account only for one fourth of the operations and the proportion has not changed.

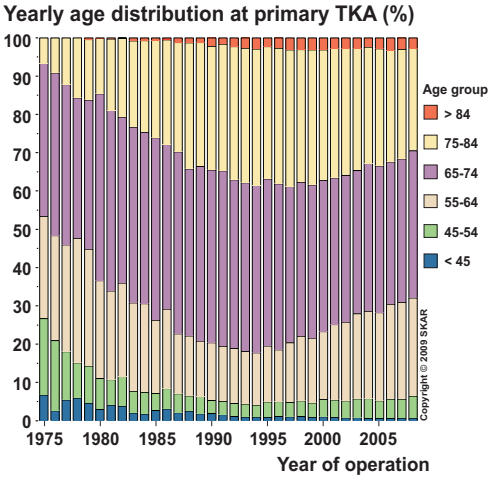
The figure to the right shows the relative number of operations performed on the different age groups over a period of more than thirty years. In a somewhat different manner than the mean age (last page) it shows how the relative proportion of the older groups increased until the mid-nineties after which their share again started to diminish.

The figures below show the age distribution for UKA respective TKA. It is evident that when the registration began in the seventies, the relative proportion of the youngest age groups was higher for TKA than for UKA.

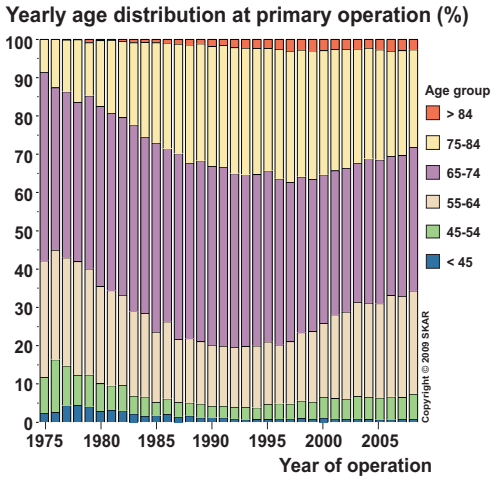
In UKA the relative proportion of patients less than 64 years of age has doubled after 1998, i.e. during the time when mini-invasive surgery catches on in Sweden. However, it has to be kept in mind that the actual number of UKA´s has diminished by 31% since 1998 in contrast to TKA which has doubled in number of operations. This implies that although the relative number of TKA among younger age groups has not increased as much as for UKA, the actual number of patients 45-65 years of age having a TKA tripled. This can be explained by an increased confidence that knee arthroplasty is of benefit for younger patients.



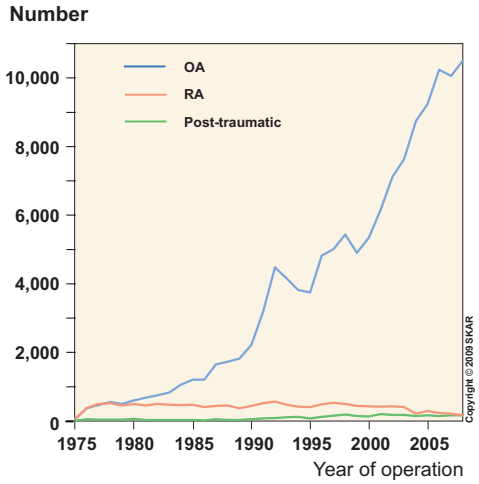
The relative distribution of primary UKA arthroplasties among different age groups.



The relative distribution of primary TKA arthroplasties among different age groups.



The relative distribution of primary arthroplasties among different age groups (all types of implants).



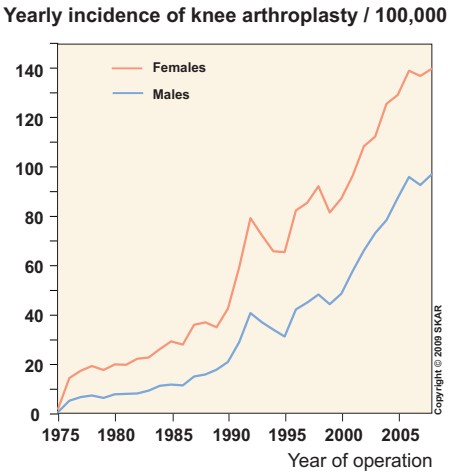
The yearly number of arthroplasties for different diagnoses..

In the eighties, the use of knee arthroplasty really started to increase (graph above) mainly because of the increased treatment of osteoarthritic patients. On the other hand, the number of operations for rheumatoid arthritis lessened, especially during the last few years which may be explained by the advance of new types of medical treatment. The number of operations for posttraumatic conditions has only increased slightly during the years. During the last decade, these three diagnoses were stated as the reason for surgery in 98% of cases.

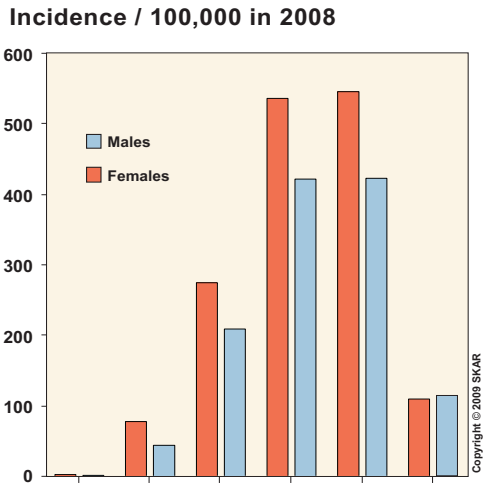
Incidence and prevalence

When the number of primary knee arthroplasties is divided by the number of inhabitants it can be characterized as the incidence of knee arthroplasty. As the graph to the right shows, the increase in incidence which started in the late eighties has still not culminated. As this is the incidence for the whole population (all ages) a small part of the increase in incidence reflects aging of the population over time.

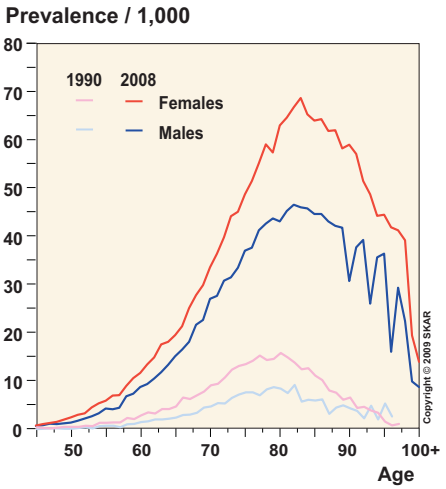
In the year 2000, the register published an article in which it was estimated how projected changes in the age distribution in Sweden could affect the demand for knee arthroplasty surgery. Using the incidence observed during 1996-1997, it was found that by 2030 only aging of the population would call for an increase in the number of operations by 36% to 7,580 operations. That this number was already reached in 2002 shows that aging only explains a small part of the observed increase in incidence.



Incidence of primary knee arthroplasty per 100,000 inhabitants (all types of implants).



Incidence of primary knee arthroplasty in 2008 per 100,000 inhabitants (males and females) in the different age groups.



The prevalence of knee arthroplasty in 1990 and 2008. One of fifteen elderly women has a knee arthroplasty..

The figure to the left shows the age-specific incidence for different age groups in 2007. It is highest among those between 65 and 84 years of age. At this age, knee arthroplasty is almost 10 times more common than among those 45-54 years of age and 3-5 times more common than among those 85 years or older. Knee arthroplasty is more common in women in all age groups but the oldest one. As the incidence is so dependent on age and because the age distribution among different nations may vary, it is difficult to compare different countries without performing some form of age standardization.

The increase in the number of operations causes a rise in the number of patients walking around with knee implants. The graph on the left shows the prevalence in 2007 i.e. the number of patients per 1,000 inhabitants in different age groups with a knee implant. For both men and women it peaks around 80-85 years of age. Comparing the prevalence in 1990 and 2008 (figure left), it can be seen how fast the progress has been during the last 18 years. In 1990, 1.6% of all older women and 0.9% of the men had at least one knee arthroplasty. In 2008 the numbers were 6.9% and 4.7% respectively, an increase by 4-5. In the future this will be reflected in the need for revisions and the risk of periprosthetic fractures in accidents.

In 2007, it seemed that the increase in incidence had halted (figure above). However, as the numbers for 2008 again show some increase, it seems that the top of the curve has not been reached.

Incidence in Sweden over time (number of arthroplasties/100,000 inhabitants)

Women

Age group	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2000–2005	2006–2008
<45	1.1	1.0	0.9	1.1	1.5	1.8	1.8
45-54	14.6	11.6	11.4	15.7	27.5	49.9	68.0
55-64	40.1	44.6	57.4	104.1	133.9	199.0	269.5
65-74	75.6	107.9	158.0	306.7	373.3	476.6	538.6
75-84	45.9	81.9	143.7	305.7	385.0	479.4	557.3
>84	2.7	7.9	19.2	54.5	82.6	92.5	116.6
Total	17.9	24.2	35.9	68.5	85.9	114.4	138.6

Men

Age group	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2000–2005	2006–2008
<45	0.5	0.3	0.4	0.4	0.7	0.9	1.4
45-54	6.0	4.8	4.5	8.9	14.4	30.0	43.0
55-64	17.4	20.3	28.4	64.8	81.5	149.0	197.9
65-74	31.4	50.6	81.5	176.6	239.5	347.1	423.3
75-84	20.9	42.5	91.7	193.1	246.3	342.5	427.1
>84	3.9	8.4	22.4	51.2	71.3	89.4	124.1
Total	6.9	9.9	16.5	34.5	45.9	72.8	95.3

Number of primary arthroplasties per unit and year

Hospital	1975-2003	2004	2005	2006	2007	2008	Total	Percent
Akademiska sjukhuset	1,827	143	111	131	119	109	2,440	1,6
Alingsås	451	97	145	164	187	183	1,227	0.8
Arvika	368	124	120	84	74	156	926	0.6
Avesta	67						67	0.0
Boden	1,620						1,620	1.1
Bollnäs / Söderhamn	758	201	242	230	228	247	1,906	1.3
Borås	1,804	116	125	112	143	93	2,393	1.6
Carlanderska			21	31	28	22	102	0.1
Dalslands sjukhus	81						81	0.1
Danderyd	1,598	125	172	186	218	225	2,524	1.7
Eksjö-Nässjö	1,710	106	114	98	118	119	2,265	1.5
Elisabethsjukhuset	54	68	88	76	107	108	501	0.3
Enköping	482	104	144	183	194	197	1,304	0.9
Eskilstuna	1,458	21	40	57	48	71	1,695	1.1
Fagersta / Västerås	71						71	0.0
Falköping	729	137	122	132	122	113	1,355	0.9
Falun	2,571	264	150	180	223	198	3,586	2.4
Frölunda SpecSjukhus	179	68	94	127	120	123	711	0.5
Gällivare	723	72	81	120	93	46	1,135	0.8
Gävle	2,513	77	67	63	68	48	2,836	1.9
Halmstad	1,557	128	160	196	161	127	2,329	1.6
Helsingborg	1,555	51	43	18	14	13	1,694	1.1
Huddinge	1,634	116	80	76	159	155	2,220	1.5
Hudiksvall	843	73	79	73	86	62	1,216	0.8
Hässleholm	2,191	434	529	527	518	557	4,756	3.2
Jönköping	1,486	136	106	107	99	142	2,076	1.4
Kalix	181	34					215	0.1
Kalmar	1,511	132	134	130	102	119	2,128	1.4
Karlshamn	965	166	184	178	169	205	1,867	1.2
Karlskoga	1,004	95	73	92	105	98	1,467	1.0
Karlskrona	1,098	7	6	6			1,117	0.7
Karlstad	2,363	200	170	214	232	210	3,389	2.3
Karolinska	1,085	178	280	121	162	233	2,059	1.4
Kristianstad	1,297						1,297	0.9
Kristinehamn	252						252	0.2
Kullbergska sjukhuset	604	96	121	125	96	288	1,330	0.9
Kungsbacka	10	11	12	4			37	0.0
Kungälv	682	68	164	134	183	140	1,371	0.9

(cont.)

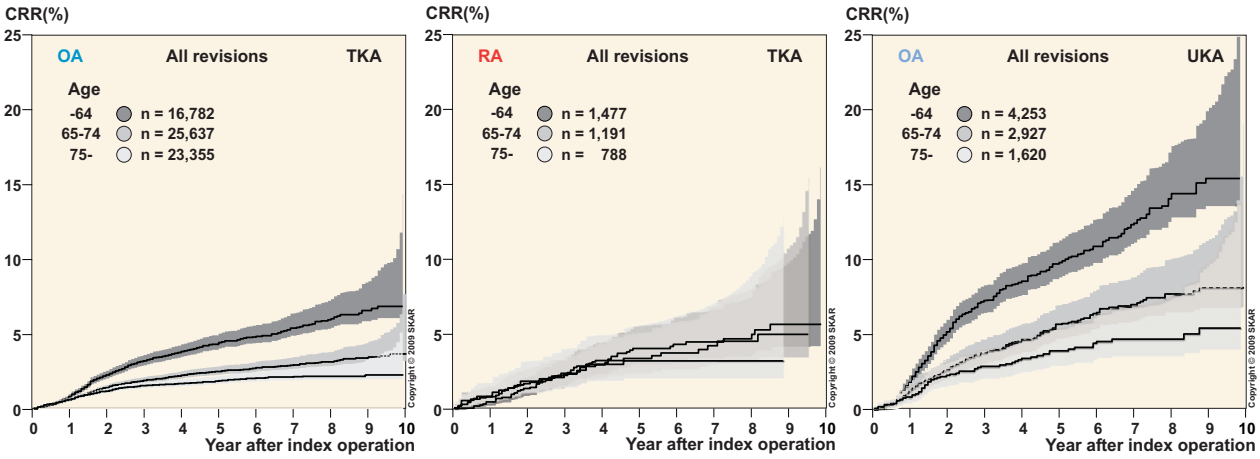
Number of primary arthroplasties per unit and year (cont.)

Hospital	1975-2003	2004	2005	2006	2007	2008	Total	Percent
Köping	769	94	99	246	215	103	1,526	1.0
Landskrona	1,702	216					1,918	1.3
Lidköping	535	124	186	160	147	136	1,288	0.9
Lindesberg	813	84	117	119	95	84	1,312	0.9
Linköping	1,699	33					1,732	1.2
Linköping medical cent	12						12	0.0
Ljungby	881	87	86	83	73	66	1,276	0.9
Ludvika	338						338	0.2
Luleå	2						2	0.0
Lund	2,317	44	51	40	26	21	2,499	1.7
Lycksele	268	40	61	59	34	39	501	0.3
Löwenströmska	409						409	0.3
Malmö	1,979	31	46	56	27	26	2,165	1.4
Mora	927	98	98	98	99	114	1,434	1.0
Motala	479	282	409	447	357	391	2,365	1.6
Movement Halmstad	7	6	63	98	132	170	476	0.3
Mölndal	948	70	88	2	107	140	1,355	0.9
Nacka / Södersjukhuset	203						203	0.1
Nacka-Proxima	1		8	68	37	16	130	0.1
Norrköping	1,869	23				116	2,008	1.3
Norrtälje	549	66	79	95	79	89	957	0.6
Nyköping	733	72	96	105	102	119	1,227	0.8
OrthoCenter IFK klin	41	84	92	87	20	83	407	0.3
Ortopediska huset	471	189	228	411	422	378	2,099	1.4
Oskarshamn	694	113	187	253	265	304	1,816	1.2
Piteå	289	84	179	261	292	277	1,382	0.9
S:t Göran	4,029	447	419	471	224	298	5,888	3.9
Sabbatsberg	629						629	0.4
Sabbatsbergs närsjh	669	152					821	0.5
Sahlgrenska	1,252	94	99	70	4	4	1,523	1.0
Sala	115						115	0.1
Sandviken	301						301	0.2
Sergelkliniken Gbg	103	57					160	0.1
Simrishamn	608	209	204				1,021	0.7
Skellefteå	662	83	90	96	51	77	1,059	0.7
Skene	703	70	68	72	89	83	1,085	0.7
Skövde	1,933	70	104	107	94	87	2,395	1.6
Sollefteå	474	103	107	119	108	81	992	0.7
Sophiahemmet	589	125	176	112	106	101	1,209	0.8
Spenshult					54	135	189	0.1
Stockholms Specialistvård	211	124	143	158	185	196	1,017	0.7
Sunderby sjukhus	217	66	38	32	22	7	382	0.3
Sundsvall	1,988	144	75	85	89	87	2,468	1.7
Säffle	484						484	0.3
Söderhamn	279						279	0.2
Södersjukhuset	2,414	101	127	311	330	352	3,635	2.4
Södertälje	493	84	81	103	124	143	1,028	0.7
Torsby	811	69	92	77	92	90	1,231	0.8
Trelleborg	1,775	233	396	523	553	479	3,959	2.6
Uddevalla	2,027	115	185	185	180	177	2,869	1.9
Umeå	1,485	109	139	162	138	120	2,153	1.4
Varberg	1,461	140	125	173	179	150	2,228	1.5
Visby	761	42	46	80	101	87	1,117	0.7
Vänersborg-NÄL	939						939	0.6
Värnamo	1,013	113	94	114	125	131	1,590	1.1
Västervik	1,045	124	118	98	88	98	1,571	1.1
Västerås	1,443	55	82	86	84	172	1,922	1.3
Växjö	1,286	81	81	107	127	100	1,782	1.2
Ystad	1,052	69	48	1			1,170	0.8
Ängelholm	956	149	54	169	164	145	1,637	1.1
Örebro	2,205	133	119	139	156	153	2,905	1.9
Örnsköldsvik	925	196	150	146	105	105	1,627	1.1
Östersund	1,188	83	111	110	94	82	1,668	1.1
Östra sjukhuset	1,537	68	75	120	149	116	2,065	1.4
Total	**98,379**	**9,196**	**9,796**	**10,689**	**10,520**	**10,936**	**149,516**	**100.0**

Factors that influence the revision rate

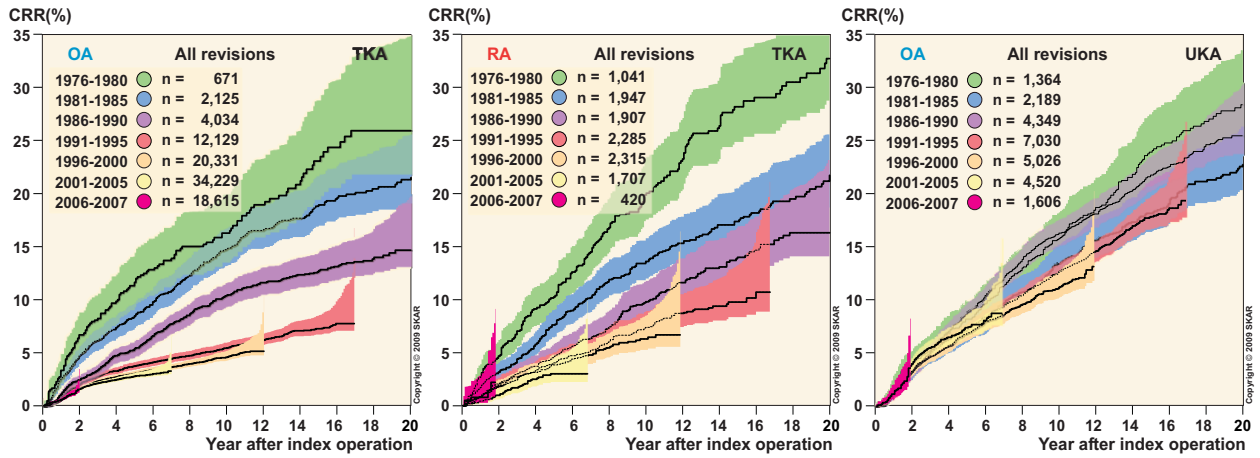
Primary disease – It became evident early that patients with different primary disease, e.g. rheumatoid arthritis (RA) and osteoarthritis (OA), also were different with respect to outcome. This was especially evident after UKA for which patients with OA and RA had large differences in CRR. Therefore, the registry has always produced separate curves for these diagnoses.

Age – The effect that the age of the patients has on the CRR can be illustrated by analyzing different age groups separately. For OA the age has a considerable effect on the rate of revision both in TKA and UKA. One can wonder why this is the case. A possible explanation is that the younger patients have a higher level of activity, higher demand of pain-relief and a state of health that more often allows for revision surgery. In RA (TKA) there is no similar effect of age to be found which can be due to the fact that the younger RA patients have multiple joint disease, a lower physical level, a higher pain threshold and poorer general health which may reduce the likelihood of being offered revision surgery.

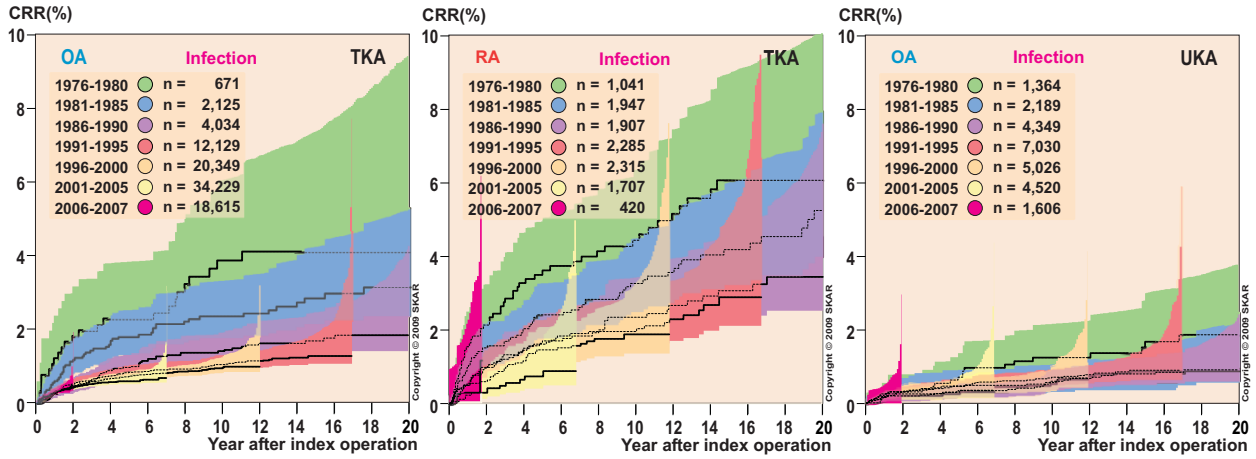


The differences in CRR (1998–2007) between the 3 age groups <65, 65–75, >75 were significant for OA operated on with TKA and UKA but nor for RA operated on with TKA.

Year of operation – For TKA there has been a constant reduction in risk of revision over time. The reduction can't only be explained by an increasing mean age of patients at surgery. Even if improved implants may provide some explanation, reduction has also been seen for unchanged implants (Lewold et al. 1993). This indicates improvement in technique (cementing/seating) or in patient selection. Therefore, we take into account the time-period during which the operations were made, when comparing implants by Cox regression. Improvement with time has not been seen for the UKA, which probably is caused by some newer models and methods with



Comparing the CRR of different time periods, one finds for TKA, that the revision rate has decreased over the years. This is not at all as obvious for UKA. After TKA for RA it seems that the CRR has increased somewhat 2006-2007, but the numbers are small.



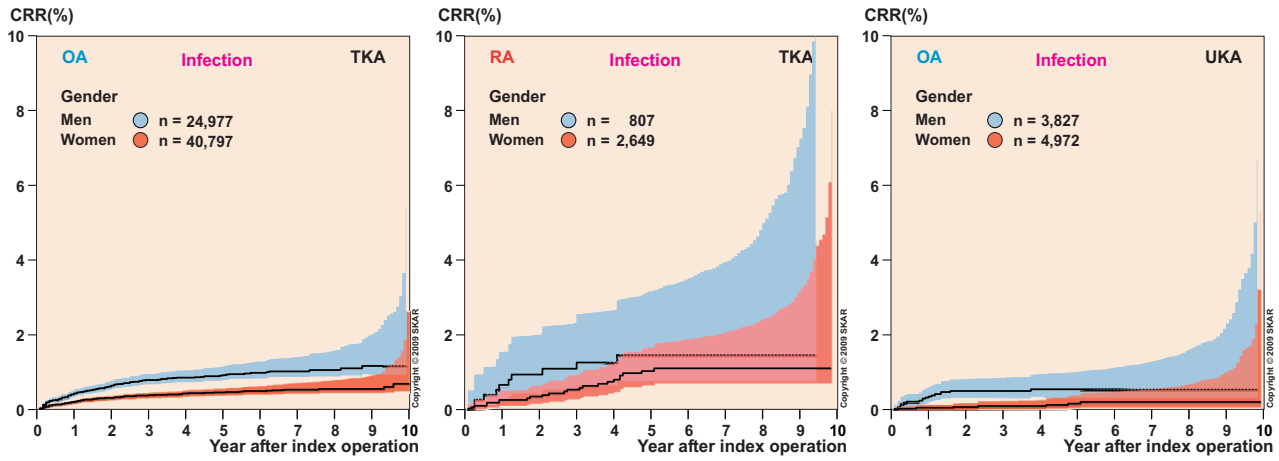
Comparing the CRR of operations performed during different time periods, using only revision for infection as end-point, we found improvement with time for both TKA and UKA.

inferior results. Furthermore, the number of UKA operations has decreased, reducing the surgical routine which has been found to affect the revision rate. Further, changes in implants, instruments, surgical technique and approach may have resulted in a new or prolonged learning curve.

When the Knee Register estimates the risk of revision due to infection, the first revision due to infection in the affected knee counts. It does not matter if it is the primary or any subsequent revision. Over time we have seen a reduction in this risk both for OA and RA. However, infection as the proportion of the total revision-burden has not diminished as other types of complications have also diminished. Unicompartmental implants and patients with OA are found to have significantly lower risk for infection than TKA and patients with RA, respectively.

Gender – When analyzing OA in the period 1998-2007 (Cox regression), no significant difference in CRR was found between the sexes, whether it was for TKA or UKA. Overall, there was neither any significant difference between the sexes for RA (TKA). However, there was a gender difference regarding revision for infection (see below).

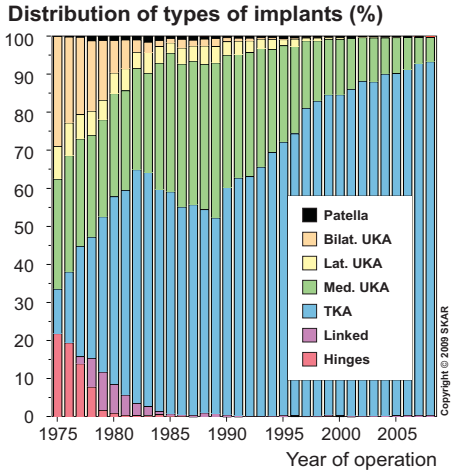
It is well known that RA patients have a greater risk of infection which has been ascribed to the effect of corticosteroid and immunosuppressive medications. Still, it is not obvious why men, more often than women, have their knee arthroplasties revised for infection. Either males are more prone to infections or they more often than females are being offered revision surgery for their infected knee implants. The latter is contradicted by the fact that in other contexts men have also been found to be more susceptible to infections than women.



Using the end-point revision for infection, the CRR (1998–2007) shows in TKA for OA that men are more affected than women (RR 2.0). The same tendency is true for RA, although not significant. UKA with its smaller implant size does better than the larger TKA but even in UKA men have 3.6 times the risk of women of becoming revised for infection. In TKA, patients with RA are more affected than those with OA (RR 2.0).

Type of implant – The modern condylar tricompartmental knee implant (TKA) was developed in the seventies when hinged and unicondylar implants were already available. When the register started in 1975, TKA had just been introduced in Sweden, which is the reason for hinges and uni's amounting for the larger part of the surgery at the time (figure right). It was also common to combine two uni's (bilateral UKA) when the knee disease affected more than one compartment. As the use of TKA became common, the surgeons quit using two UKA's in one knee. Today, hinges, linked and stabilized implants are mainly used for difficult primary cases, trauma, malignancies and revisions.

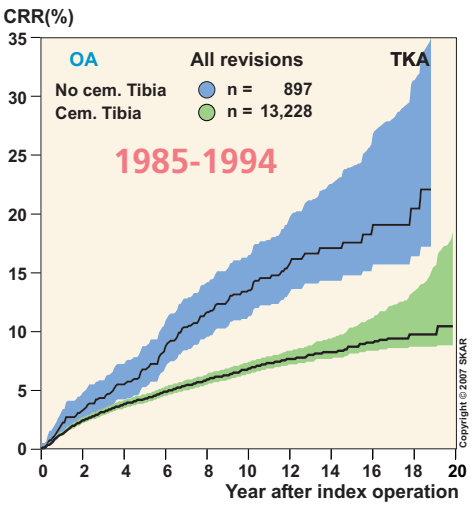
The use of UKA has diminished during the years. Now, TKA is used for the majority of primary cases but UKA in a subgroup of patients with unicompartmental disease. The reason may be that UKA has been found to have a substantially higher CRR than TKA (see figures on page 12). However, in UKA the number of serious complications such as infections/arthrodeses/amputations is much less and when patients were asked in a mail inquiry, how satisfied they were with their knee, it did not seem to be any difference between TKA and UKA.



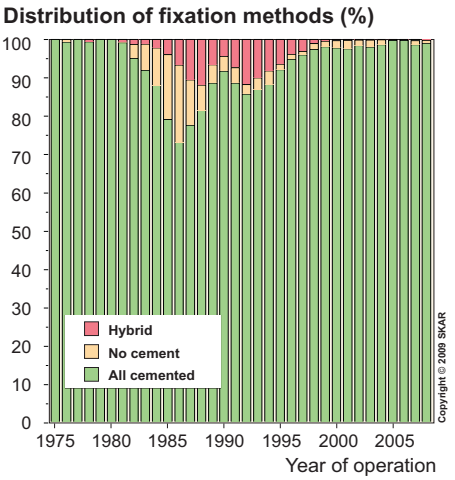
The relative yearly distribution of implant types used for primary surgery.

If a primary UKA, at a later time, is revised to a TKA, the risk of re-revision is not significantly increased compared to the risk of revision if the patient had primarily been treated with a TKA. In summary we conclude that it cannot be considered wrong to use UKA implants in OA patients with unicompartmental disease.

Use of bone-cement – As the figure to the right shows, bone-cement has been used in the majority of arthroplasties inserted in recent years. The number of uncemented cases has become so small that it is no longer possible to perform meaningful comparisons. However, for the period 1985–1994, when uncemented implants were relatively common, we found that the risk of revision was higher if the tibial component was left uncemented (figure to the left).



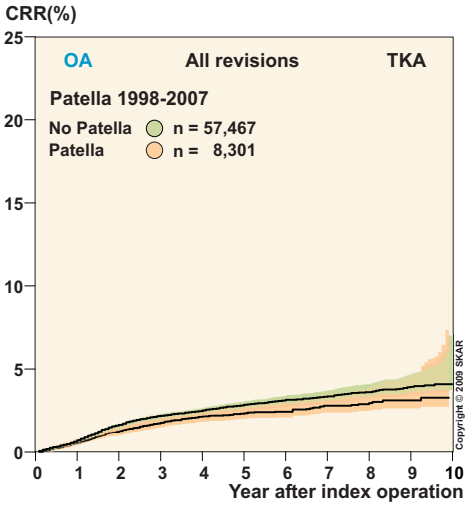
The CRR for TKA inserted 1985-1994 in which the tibial component was fixed with or without cement.



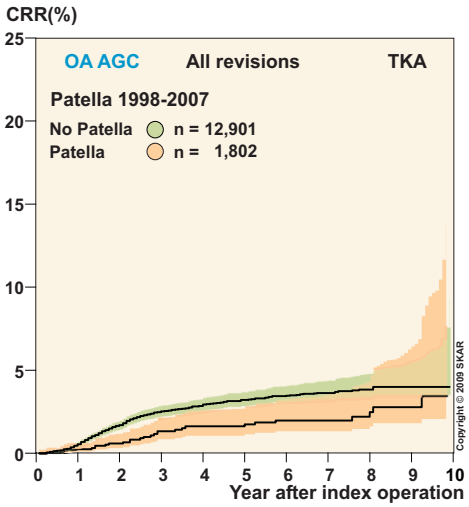
The relative yearly distribution regarding the use of cement for fixation.

Cox regression, adjusting for age, gender, year of operation and use of patellar component shows that the risk for TKA with uncemented tibia component was 1.5 (1.2-2.8) times higher than for those cemented. This is in agreement with the results of the Finnish implant register which also has found substantially increased risk of revision for uncemented implants.

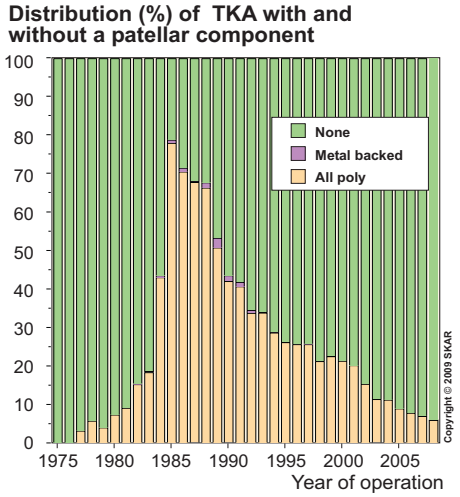
Patellar button in TKA – Estimating how the use of a patellar button affects the revision rate is complex. The use of a patellar button varies with the brand of prosthesis used and its use also has lessened in recent years. Earlier, when analyzing all TKA implants together, we did not find that the use of patellar button influenced the revision rate. However, when analyzing different time-periods we found that during the eighties, when patellar buttons were used in half of the cases, its use had a negative effect. Since then its use has continuously diminished and in 2008 a button was used in less than 10% of the TKA cases. At the same time, as we have described in previous reports, the curves have turned to the advantage of the patellar button.



CRR during the current 10-year period for all TKA OA, with and without patellar component respectively.



CRR during the current 10-year period for all AGC OA, with and without patellar component respectively.



The figure shows the yearly distribution regarding the use of patellar button in TKA.

However, it has to be kept in mind that revisions for femoropatellar symptoms generally are performed relatively soon after the primary operation while revisions for wear or loosening of the patellar component occur later on. This in combination with our previous finding that patients who have had patellar resurfacing more often are satisfied with their knee, at least initially, speaks for a more liberal use of the patellar button, at least in the elderly.

For the current period (1998–2007) we found that OA patients that underwent surgery using TKA without a patellar button were at 1.23 (1.05-1.44) times higher risk for revision than the patients operated on with a button (see figure left). If only AGC implants were analyzed, the risk for revision without a patellar button was 1.74 (1.18-2.56) times higher (see figure left below). For RA, we also found significantly higher risk when not using a button (times 1.81 (1.05-3.12)). The increased frequency of revisions is caused by the need for secondary patellar resurfacing because of femoropatellar pain.

It can then be debated if one should take the use of patellar button into consideration when units and implants are compared with respect to risk of revision. In the figures, we have chosen to describe the total CRR of all implants (with and without a button). That way one can get a general picture of the results for certain groups of patients and implants. When comparing the risk-ratios of the implants (page 30-31), we separately account for the results of TKA with, and without, a patellar button. Finally, when comparing the risk of revision for the different units (page 37), we include the use of patellar button in the regression analysis.

cont. Use of patellar button – The use of patellar button varies between countries. In its annual report for 2007, the Danish knee arthroplasty register (http://www.dkar.dk) reports that a patellar button was used in 70% of TKA cases (2006) while it was only used in 5% of cases in Norway (2007) according to the Norwegian arthroplasty register report 2008 (http://www.haukeland.no/nrl/).
According to the 2008 annual report of the Australian Joint replacement Register (http://www.dmac.adelaide.edu.au/aoanjrr/index.jsp), patellar button was used in 45% of the TKA cases in 2007. It was also reported that compared to TKA using a patellar button, TKA without a button had 1.3 (1.2-1.4) times higher risk of becoming revised which is similar to the Swedish findings.

The reasons are unclear why the surgeons in the mentioned countries and regions differ so much with respect to use of patellar button. Probably, there is a combination of reasons such as education, tradition, experience (good or bad) or marketing policies governed by the manufacturers.

Implant model (brand) – The model is the factor that generates most interest and most often is related to the result after knee arthroplasty. As can be seen from what has been said previously, the results are not only affected by the model or design of the implants but also by other factors such as the so called "case-mix". In the analyses, we try to limit the effect of the case-mix on results by adjusting for factors such as diagnosis, gender, age and the time period during which the operations were performed.
An important factor which the register is unable to adjust for is the surgical routine of the individual surgeons. It is obvious that surgeons may be more or less competent with respect to arthroplasty surgery, which may influence the results for specific models, especially if use of that model has been limited to a few surgeons or hospitals. Just as it may be claimed that deviating results are being influenced by surgical skill, it could be debated if it is at all fair to account for the results of specific models. Responding to this, we can only say that the risk of revision for specific brands shows what its users could bring about with that particular model. The final result is determined by a combination of factors including design, material, durability, accompanying instruments, user-friendliness, safety marginal's (how the implant behaves if it is not inserted exactly) together with the surgeon's skill and training of using the instruments/implant as well as selecting the appropriate patients for the surgery. The producers together with the distributors have an opportunity to influence most of these factors. Therefore, it can't be considered inappropriate to associate the model to the result, in spite of the outcome being affected not only by design, material and durability.

Historically, the most commonly used implants in Sweden have also been those with the lowest CRR. This may be due to a good design but also due to the increased surgical routine when the same implant is used often. Models that have been found to have considerably inferior results have most often been withdrawn from the Swedish market. An exception is the Oxford implant that initially had inferior results but that after modifications and increased training of surgeons showed improved results leading to continued use.

Type of operation and implants in 2008

10 936* primary arthroplasties reported in 2007 by type and region

TYPE	Stockholm Gotland	Uppsala Örebro	Southeast	South	West	North
Hinge	1	15	5	15	16	2
TKA	2,104	2,395	1,341	1,549	1,867	898
UKA medial	162	217	74	44	194	17
UKA lateral	.	.	.	.	2	.
Patella	6	.	.	4	3	4
Total:,	2,273	2,627	1,420	1,612	2,082	921

*Unknown unitdand for one case

Implants for primary TKA in 2008

	Number	Percent
NexGen	3,787	37.3
PFC Sigma	2,807	27.6
AGC	1,163	11.5
Duracon	666	6.6
Triathlon TKA	579	5.7
Vanguard	529	5.2
Profix	211	2.1
PFC Mobile Bearing	169	1.7
F/S MIII	105	1.0
Legion	5	0.0
Other*	134	1.3
Total,:	10,155	100

*Mainly revision models

Implants for primary UKA in 2008

	Number	Percent
Link UKA	243	34.2
Oxford-UKA	216	30.4
MillerGalante-UKA	96	13.5
Genesis	75	10.6
ZUK	62	8.7
Preservation	18	2.5
Total :	710	100

All the 76 units performing elective knee arthroplasty surgery reported to the registry during 2008. Although a few reports may turn up at a later time, they are only expected to have a small effect on the number of operations. The number of reported primary arthroplasties increased from 10,380 in 2007 to 10,936, or by 5.4%. For TKA there was an increase of 5.8% while UKA decreased by 1,4%.

In 2008, 668 revisions were performed of which 128 were secondary revisions. In 467 of the revisions the primary procedure had been a TKA and in 188 cases a UKA. One has to take into consideration that since 1996 the use of UKA has been reduced by half while the use of TKA has more than doubled. Thus, the proportion of primaries and revisions does not give a true picture of the risk for revision which is better estimated using survival statistics.

The 3 most common implants for primary TKA in each region in 2008

	Model 1	n	Model 2	n	Model 3	n	Other
Stockholm/Gotland	NexGen	820	PFC Sigma	806	Duracon	290	188
Uppsala/Örebro	NexGen	1,163	PFC Sigma	613	AGC	440	179
Southeast	NexGen	495	PFC Sigma	462	AGC	222	162
South	Triathlon	488	PFC Sigma	472	AGC	179	410
West	NexGen	992	Vanguard	231	AGC	221	423
North	NexGen	316	PFC Sigma	314	AGC	97	171

The 3 most common implants for primary UKA in each region in 2008

	Model 1	n	Model 2	n	Model 3	n	Other
Stockholm/Gotland	Oxford	59	MillerGalante	57	Link	34	12
Uppsala/Örebro	Link	147	Genesis	42	MillerGalante	13	15
Southeast	Genesis	33	Oxford	20	Link	12	9
South	Oxford	22	Link	22	–	–	–
West	Oxford	115	ZUK	51	MillerGalante	15	15
North	Link	13	MillerGalante	2	ZUK	2	–

Bone cement and minimally invasive surgery in 2008

Use of cement in primary surgery during 2008

	Primary TKA	Primary UKA
No component without cement	10,053	710
Only the femoral component without cement	3	–
Only the tibial component without cement	18	–
The femur- and tibial components without cement	81	–
Only the patellar button without cement	0	–
Total	10,155	710

	Number	Percent	Number	Percent
Refobacin-bonecement	5,242	52.0	382	53.8
Palacos Genta	4,337	43.1	310	43.7
Cemex Genta	432	4.3	14	2.0
CMW SmartSet	17	0.2	–	–
CMW SmartSet Genta	17	0.2	–	–
Refobacin revision	2	0.0	–	–
Mixed by surgeon	1	0.0	–	–
Information missing	27	0.3	4	0.6
Total:	10,074	100	710	100
All components without cement	81	–	0	–
Grand Total	10,155		710	

NB Handwriting the type of cement on the report form may be a source of error.
The units are encouraged to use the sticker that comes with the cement package.

Type of bone cement

In Sweden, the use of bone cement is the most common method for fixing components to the bone. Almost all the cement contains antibiotics, mostly gentamicin.

During 2008, 99.2% of the TKA´s were inserted using cement for fixation (99% in 2007) and all the UKA´s were cemented. As the use of cement has become so common, the variation is minimal and statistical comparisons are not meaningful.

Some units have the habit of handwriting the name of the cement, which is a source of error. We want to remind the surgical units to use the stickers normally to be found in the cement packages.

Minimally invasive surgery in UKA

For UKA, we have registered whether the implant was inserted by a mini-arthrotomy since 1999.

Our definition of mini-incision implies that the surgeon gains access to the knee joint by the use of a very small arthrotomy and without dislocating / everting the patella. The benefit of the procedure has been claimed to result in less traumatic surgery, quicker rehabilitation and shorter hospital stay.

From the start of the registration in 1999, the popularity of minimally invasive surgery for UKA continued to increase until 2003 when it was being used in 58% of cases. In 2004 the proportion of MIS diminished to 53% after which it increased again to 61% of cases in 2007. In 2008, MIS was used in 56% of cases. Thus the use of MIS seems to have stabilized around this level.

The Register has previously reported that there were indications that the mini-incision might increase the revision rate. Further analyses suggest that the method may initiate a new learning process which however can be shortened if the surgeons are offered training before they start using the method. After up to eight years of follow-up we have not found significant increase in the revision rate of MIS compared to the standard arthrotomy.

The type of incision for 710 primary UKA in 2008

	Standard incision	Mini-incision	Missing
Link	146	84	13
Genesis	44	26	5
Oxford	40	165	11
MillerGalante	21	69	6
ZUK	10	42	10
Preservation	5	13	–
Total	266	399	45

The use of patellar button for TKA in 2008

The use of patellar button is heavily related to the implant model used. As can be seen from the table to the right, surgeons using PFC Mobile Bearing implants often resurface the patella while those who use NexGen and Vanguard infrequently do so.

As last year, patellar button was most seldom used in the regions; Uppsala-Örebro and North. The two regions that relatively most often used a button were the Southeast and South (see figure below). Overall, the differences between the regions have diminished somewhat since 2006.

It is not only in Sweden that geographical variations are to be found. The Australian arthroplasty register (http://www.dmac.adelaide.edu.au/aoanjrr/index) reports for 2008 that the difference in use of patellar button between the different states approached 30%.

In Sweden, females operated on with TKA have their patella resurfaced slightly more often than males. In the whole material, from the start to the end of 2008, 20.1% of the women had their patella resurfaced compared to 17.0% of the males which is a significant difference. An explanation that has been suggested claims that femoropatellar pain is more common in females. However, during 2008 5.2% of the men had a patellar button compared to 6.0% of the women (n.s.).

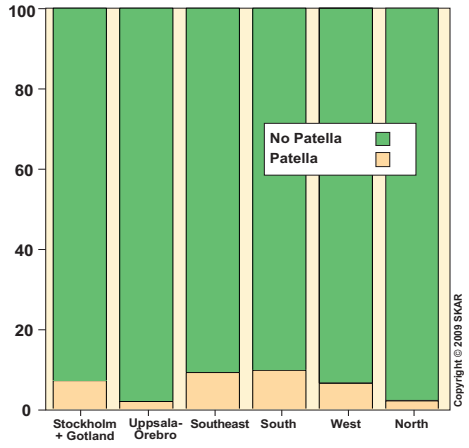
Use of patellar button with different TKA implants in 2008

	No patella button	%	Patella button	%
NexGen	3,733	98.6	53	1.4
PFC Sigma	2,721	96.9	85	3.0
AGC	953	81.9	210	18.1
Duracon	554	83.2	111	16.7
Triathlon TKA	552	95.3	27	4.7
Vanguard	520	98.3	9	1.7
Profix	198	93.8	13	6.2
F/S MIII	101	96.2	4	3.8
PFC Mobile Bearing	98	58.0	71	42.0
Other	121	87.1	18	12.9
Total	9,551	94.1	601	5.9

Looking at the relative use of patellar button in the different age groups during 2008 (see figure below), it can be noted that patellar resurfacing is used in approximately the same percentage of cases in all the age groups but the youngest, in which it was infrequently used. This is a change compared to 2006 when the two youngest age groups most often had patellar resurfacing. However, the numbers are few, why the finding may be a coincidence.

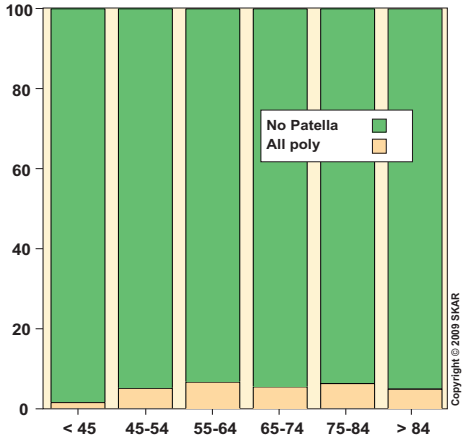
Some discussion regarding how the frequency of revisions is influenced by the use of patellar button can be found on page 15 together with CRR curves for TKA inserted during the current period of 1998-2007, with and without a button respectively.

Distribution (%) of patellar resurfacing in the regions 2008



The figure shows the relative proportion in 2008 of TKA with and without patellar button in the different regions.

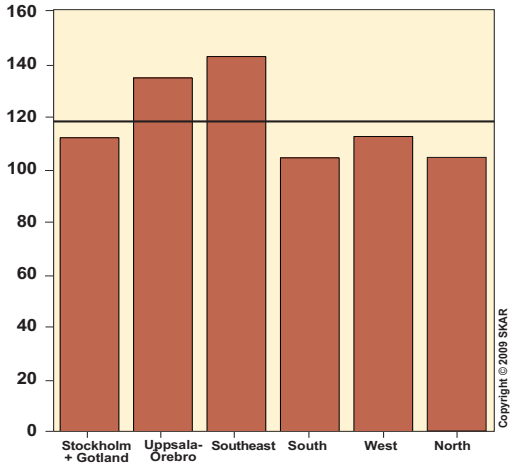
Distribution (%) of patellar resurfacing in different age groups in 2008



The figure shows the relative proportion in 2008 of TKA with and without patellar button in the different age-groups.

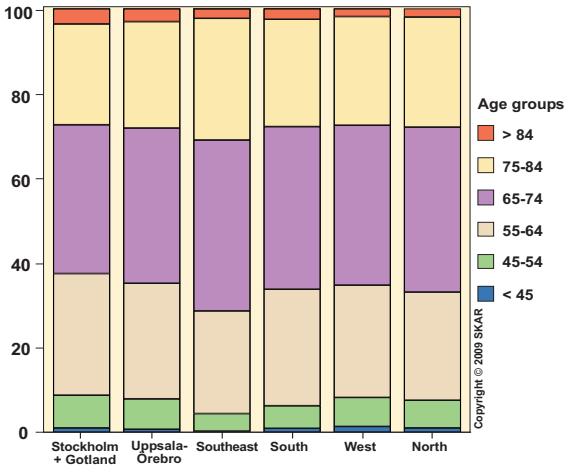
Age distribution and incidence in the regions 2008

Incidence per 100 000 in the regions in 2008 (all types of primary implants)



The incidence for each of the regions. It is highest in the Southeast and lowest in the South & North regions (the black line shows the mean for the whole country (118,6)).

Distribution (%) of gender in the regions during 2008 (all types of primary implants)



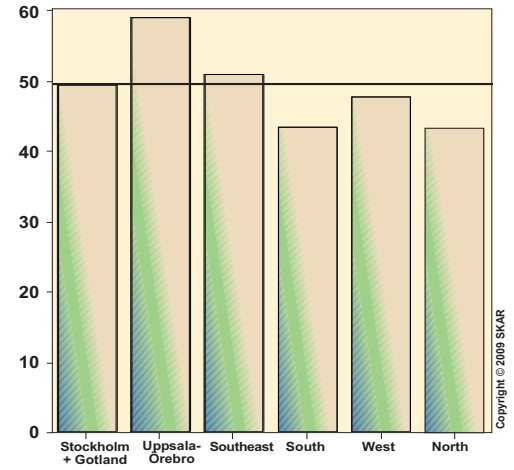
The age distribution at primary surgery varied less in the regions during 2008 than in 2007. The Southeast still has the relatively lowest proportion of patients less than 64 years of age.

The figure above shows the incidence of primary knee arthroplasty per 100,000 inhabitants in the respective regions. The incidence is the highest in the Uppsala-Örebro and the Southeast regions but lowest in the South and North regions. Compared to 2007 the incidence has increased in Stockholm-Gotland, Uppsala-Örebro and the Southeast regions but decreased in the North region.

The figure above to the right shows the relative distribution in the number of operations among the different age groups in the regions. Even if such summary can provide information on the distribution of resources, the variation in the age distribution can't be used to decide if the principles of treatment differ in the regions as it may be caused by variations in the age of their inhabitants.

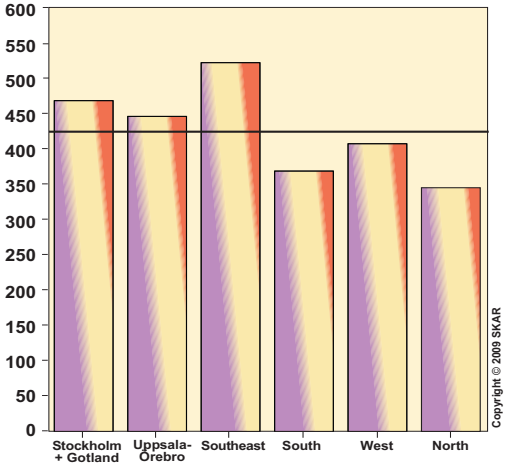
The figures below show the incidence of knee arthroplasty among patients less than 65 years of age (left) and those 65 years and older (right). Compared to 2007, the incidence among the younger has increased in the Uppsala-Örebro and Southeast regions but decreased in the North. Among the older, the incidence has increased in Stockholm-Gotland and Southeast regions but decreased in the South, West and North regions.

Incidence in 2008 for younger than 65 per 100,000 (all types of primary implants)



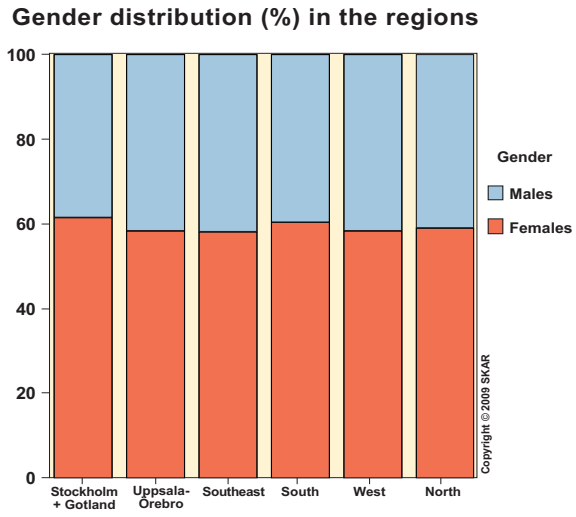
The incidence per inhabitants younger than 65 years of age is lowest in the Southeast region. (the black line shows the mean for the whole country (49,8)).

Incidence in 2008 for 65 years or older per 100,000 (all types of primary implants)



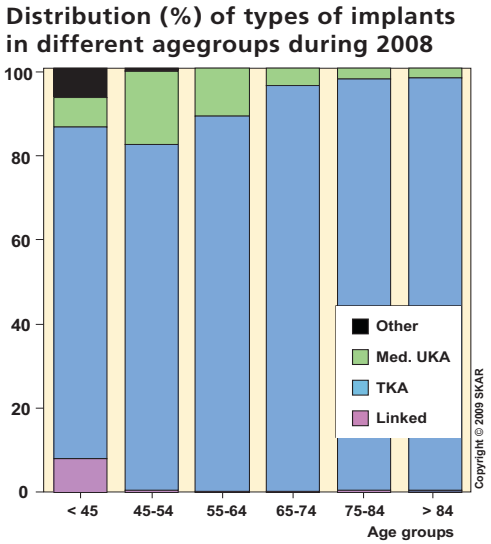
The incidence per inhabitants that are 65 years of age or older is lowest in the North and South regions. (the black line shows the mean for the whole country (426,5)).

Gender distribution in the regions



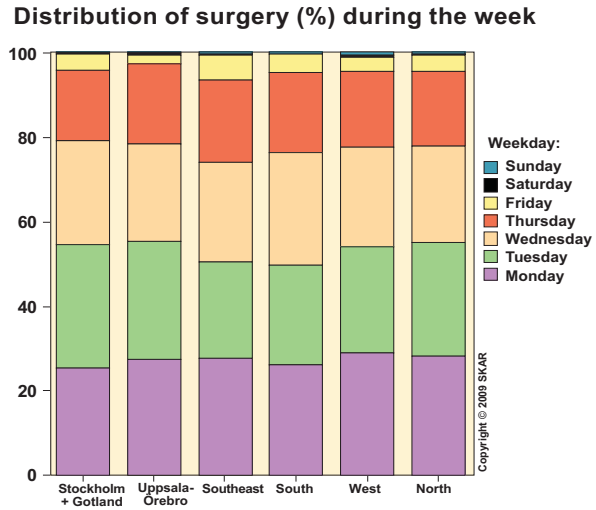
The proportion of females is around 60% in all the regions. Stockholm-Gotland and the South region have slightly higher proportion of women than the other regions.

Type of implants in different age groups

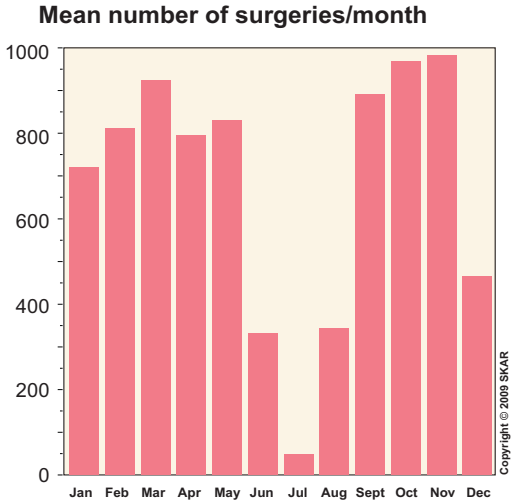


Uncommon models are relatively most often used in patients younger the 45 years. The relative high proportion of linked implant is caused by serious conditions (tumors, trauma etc.)

Distribution of surgery on the weekdays and months 1998-2007



Deistribution of surgery on the weekdays 1998-2007. Surgery on Fridays and weekends is uncommon.



The mean number of primary knee arthroplasties inserted each month during 1998-2007.

Knee arthroplasty is seldom performed on Fridays and weekends. The reasons are among other, reduced working hours on Fridays and the lack of rehabilitation during the weekends. During the 10-year period, surgeries on Fridays were relatively more common in the Southeast region and least frequent in the Uppsala-Örebro region.

The picture above to the right shows the mean number of operations per month during 1998-2007.

It is obvious how the production diminishes during the summer months. The number of operations is also low during the Christmas month. The reasons for the number of surgeries never reaching maximum during the first half of the year are probably the numerous days off, including the winter sport holidays and Easter.

In summary, this implies that no knee arthroplasties are being performed for 3 months a year.

Implants for primary arthroplasty 1998–2007

To be able to account for the reasonably long-term results of relatively modern implant types, the register usually use the latest 10-year period that is available for analysis.

As there is always some delay related to the control of reported revisions, and because a low number of failures may have a large effect on the results, the period used for analysis finishes one year before the period for which primaries are reported.

Operations that are performed early on during the analyzed period have a relatively large influence on the cumulative revision rate. Subsequently, older models have a large impact on results.

Implants that are specially made for being used in revision surgery or standard models with extra long stems (5cm or longer) are classified as revision models and are not included in the analysis of standard models.

Implants for primary TKA during 1998–2007

	Number	Percent
PFC,Sigma	20,125	28.4
AGC	15,973	22.5
NexGen	11,671	16.4
Duracon	7,998	11.3
F/S,MIII	7,471	10.5
Kinemax	1,864	2.6
Scan	1,159	1.6
Profix	905	1.3
PFC	717	1.0
Triathlon	673	0.9
Natural	502	0.7
Vanguard	468	0.7
PFC,Mobile,bearing	373	0.5
AMK	367	0.5
LCS	363	0.5
MillerGalante2	163	0.2
F/S,unspec	35	0.0
NexGen,Mobile,bearing	28	0.0
Oxford,Rotating,TKA	26	0.0
Axiom	23	0.0
MillerGalante,unspec	14	0.0
Performance	14	0.0
Evolution	12	0.0
Other	28	0.0
Total,:	70,972	100

Revision Models* for primary TKA i during 1998–2007

	Number	Percent
PFC Revision	177	27.8
AGC Revision	169	26.5
Duracon Revision	110	17.3
NexGen Revision	93	14.6
Profix Revision	37	5.8
Freeman revision	24	3.8
Other	27	4.2
Total :	637	100

*"Revision models" are implants made specifically for revisions, or ordinary models where extra long stems (5 cm or more) have been used.

Hinged implants (primary) during 1998–2007

	Number	Percent
Rotalink	215	68.3
NexGen rotating hinge	28	8.9
Noiles rotating hinge	22	7.0
Kotz	20	6.3
Stryker/Howm rotating hinge	17	5.4
Other	13	4.1
Total	315	100

Implants for primary UKA during 1998–2007

	Number	Percent
Link	3,903	42.9
MillerGalante	2,530	27.8
Oxford	1,335	14.7
Genesis	536	5.9
PFC	231	2.5
Duracon	148	1.6
Preservation	131	1.4
ZUK	99	1.1
Allegretto	90	1.0
EIUS,Uni	47	0.5
Marmor	28	0.3
Brigham	15	0.2
Repicci	1	0.0
Total	9,094	100

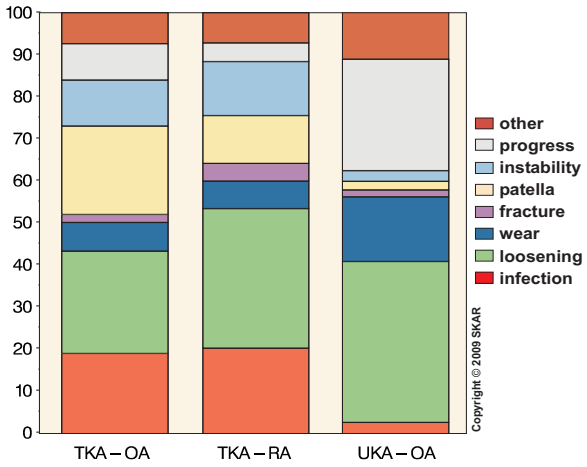
Patello-femoral implants during 1998–2007

	Number	Percent
Lubinus/Link	54	40.6
Richard/Blazina	45	33.8
Avon	29	21.8
LCS	4	3.0
Journey	1	0.8
Total	132	100

Revisions during 1998–2007

During the period, 4,459 revisions were performed. 2,112 were revisions of TKA´s for OA, 338 of TKA´s for RA and 1,593 revisions of UKA´s for OA were performed during the 10-year period. The indications for the revisions are shown in the diagram to the right. Note that the primary operations may have been performed before the accounted 10-year period. Loosening remains the dominant reason for revision. ”Progression” in TKA mainly reflects revisions performed for femoropatellar arthrosis/ arthritis. ”Patella” includes all kind of problems with the patella in patients that had their primaries inserted with or without a patellar button (excluding loosening and wear). Please note that the distribution of the indications does not have to reflect the risk for revision. The sharp increase in the number of primaries over the years leads to overrepresentation of early revisions.

Distribution (%) of indications for revision 1998-2007



Type of revision 1998–2007 in which the primary was a TKA/OA

	Number	Percent
Linked implant	164	7.8
TKA	552	26.1
Exchange of femur comp.	29	1.4
Exchange of tibia comp.	146	6.9
Exchange of disc/inlay	250	11.8
Patella addition	603	28.6
Patella exchange	32	1.5
Patella removal	9	0.4
Total implant removal	281	13.3
Arthrodesis	32	1.5
Amputation	14	0.7
Total	2,112	100

Type of revision 1998–2007 in which the primary was a TKA/RA

	Number	Percent
Hinged implant	55	16.3
TKA	111	32.8
Exchange of femur comp.	6	1.8
Exchange of tibia comp.	13	3.8
Exchange of disc/inlay	28	8.3
Patella addition	51	15.1
Patella exchange	2	0.6
Patella removal	2	0.6
Total implant removal	50	14.8
Arthrodesis	8	2.4
Amputation	12	3.6
Total	338	100

Type of revision 1998–2007 in which the primary was a UKA/OA

	Number	Percent
Hinged implant	1	0.1
Linked implant	25	1.6
TKA	1,473	92.5
Medial UKA	20	1.3
Lateral UKA	2	0.1
Exchange of femur comp.	2	0.1
Exchange of tibia comp.	13	0.8
Exchange of meniscus/inlay	11	0.7
Patella addition	6	0.4
Patella exchange	0	0.0
Patella removal	1	0.1
Total implant removal	36	2.3
Amputation	3	0.2
Total	1,593	100

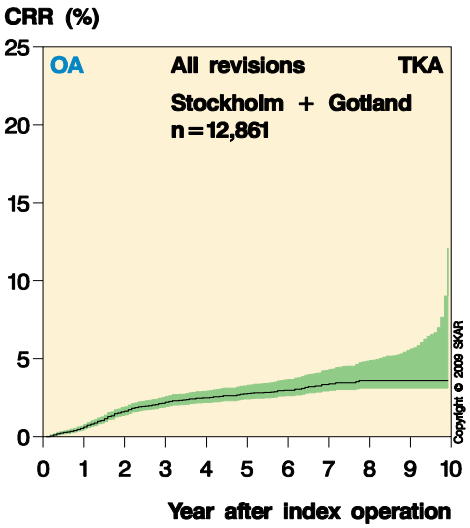
The tables show the different types of revisions (first) that were performed during 1998-2007. There are separate tables depending on the type of primary surgery (TKA/OA, TKA/ RA, UKA/OA). It should be noted that only one type is permitted for each revision. This implies that exclusive patellar surgery is listed, but not patellar surgery done in combination with exchange of other components.

TKA revisions only affecting the patella are common (30% in OA and 16% in RA). Extensive revisions (linked implants, arthrodesis, amputations) seem more common in RA. For UKA, it is satisfying to note that revisions using a new UKA are few, as these type of revisions have been found to have a very high rate of re-revision.

Primary TKA implants for OA in the regions during 1998–2007

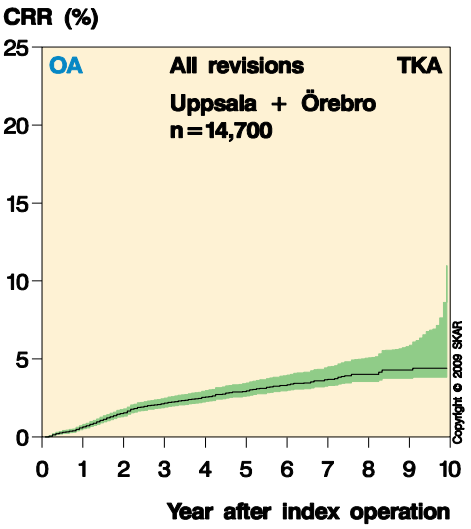
Stockholm + Gotland
Implants for primary TKA in OA 1998–2007

	Number	Percent
PFC Sigma	7,350	57.1
Duracon	1,516	11.8
F/S MIII	1,328	10.3
NexGen	1,085	8.4
Kinemax	498	3.9
AGC	415	3.2
PFC	270	2.1
PFC Mobile Bearing	98	0.8
Natural	72	0.6
AMK	62	0.5
Vanguard	38	0.3
Triathlon TKA	33	0.3
Profix	30	0.2
Other	66	0.5
Total:	12,861	100.0



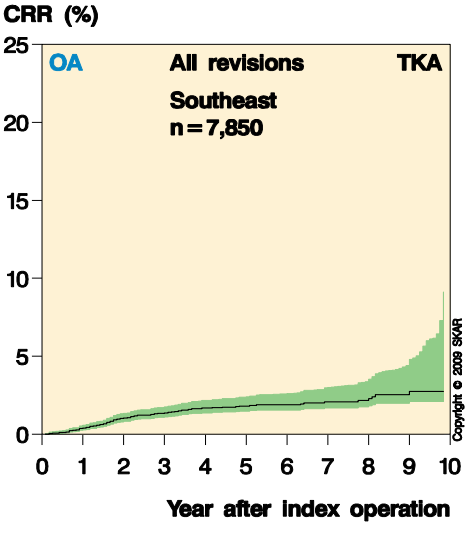
Uppsala+Örebro
Implants for primary TKA in OA 1998–2007

	Number	Percent
AGC	3,942	26.8
NexGen	3,819	26.0
F/S MIII	3,075	20.9
PFC Sigma	1,457	9.9
Kinemax	1,172	8.0
Duracon	404	2.7
Natural	268	1.8
AMK	205	1.4
MillerGalante2	141	1.0
Scan	74	0.5
NexGen Mobile bearing	28	0.2
PFC	26	0.2
Profix	21	0.1
Vanguard	17	0.1
Other	51	0.3
Total	14,700	100



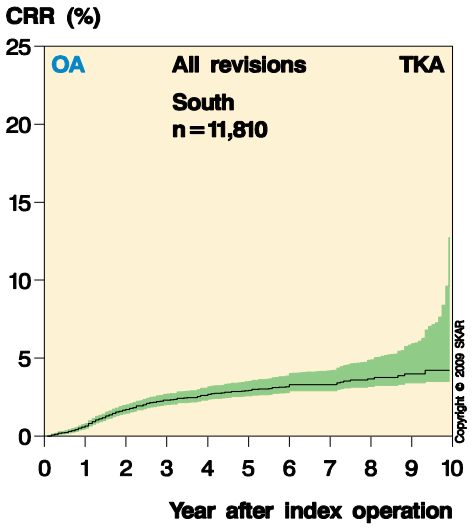
Southeast
Implants for primary TKA in OA 1998–2007

	Number	Percent
NexGen	2,577	32.8
PFC Sigma	2,534	32.3
AGC	2,321	29.6
Duracon	118	1.5
PFC	91	1.2
Vanguard	57	0.7
Triathlon TKA	39	0.5
Profix	21	0.3
PFC Mobile Bearing	19	0.2
Evolution	11	0.1
Scan	10	0.1
Other	52	0.7
Total	7,850	100



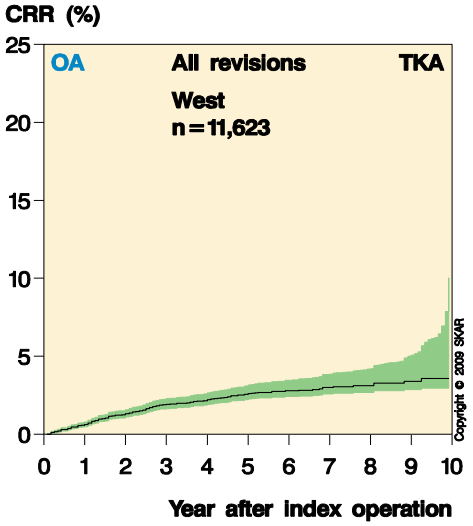
South
Implants for primary TKA in OA 1998–2007

	Number	Percent
PFC Sigma	4,114	34.8
Duracon	3,202	27.1
AGC	2,603	22.0
Triathlon TKA	572	4.8
Scan	547	4.6
PFC Mobile Bearing	180	1.5
Vanguard	163	1.4
PFC	104	0.9
Profix	97	0.8
LCS	44	0.4
Oxford Rotating TKA	22	0.2
F/S MIII	21	0.2
Other	141	1.2
Total	11,810	100



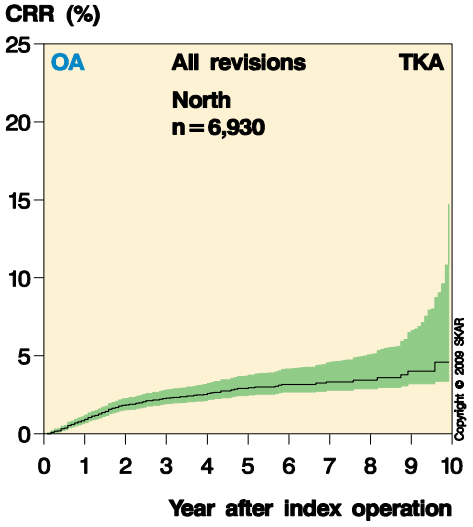
West
Implants for primary TKA in OA 1998–2007

	Number	Percent
AGC	3,597	30.9
F/S MIII	2,395	20.6
NexGen	1,921	16.5
PFC Sigma	1,522	13.1
Duracon	1,484	12.8
Scan	262	2.3
Natural	133	1.1
Vanguard	130	1.1
PFC	34	0.3
F/S unspec	28	0.2
Axiom	15	0.1
PFC Mobile Bearing	14	0.1
MillerGalante unspec	12	0.1
Other	76	0.7
Total	11,623	100



North
Implants for primary TKA in OA 1998–2007

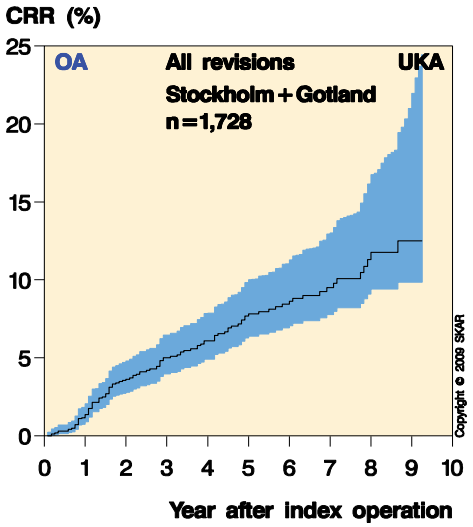
	Number	Percent
AGC	1,826	26.3
PFC Sigma	1,720	24.8
NexGen	1,621	23.4
Duracon	700	10.1
Profix	575	8.3
LCS	261	3.8
PFC	93	1.3
AMK	31	0.4
PFC Mobile Bearing	23	0.3
Performance	13	0.2
Scan	12	0.2
Other	55	0.8
Total	6,930	100



Primary UKA implants for OA in the regions during 1998–2007

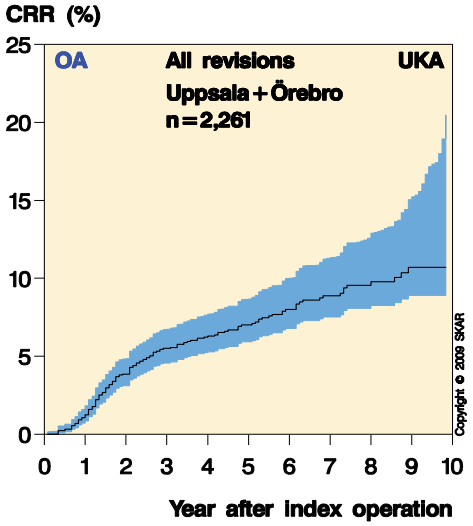
Stockholm + Gotland
Implants for primary UKA in OA 1998–2007

	Number	Percent
MillerGalante	1,164	67.4
Link	282	16.3
Oxford	179	10.4
Allegretto	35	2.0
Preservation	33	1.9
Genesis	16	0.9
Brigham	10	0.6
Other	9	0.5
Total:	**1,728**	**100**



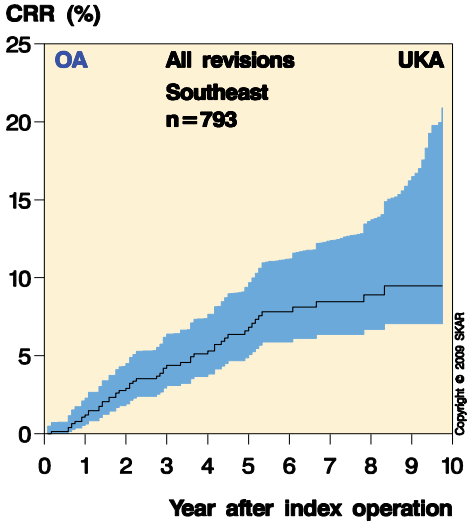
Uppsala+Örebro
Implants for primary UKA in OA 1998–2007

	Number	Percent
Link	1,653	73.1
Genesis	218	9.6
MillerGalante	146	6.5
PFC	114	5.0
Preservation	82	3.6
Marmor	17	0.8
Allegretto	12	0.5
ZUK	12	0.5
Other	7	0.3
Total:	**2,261**	**100**



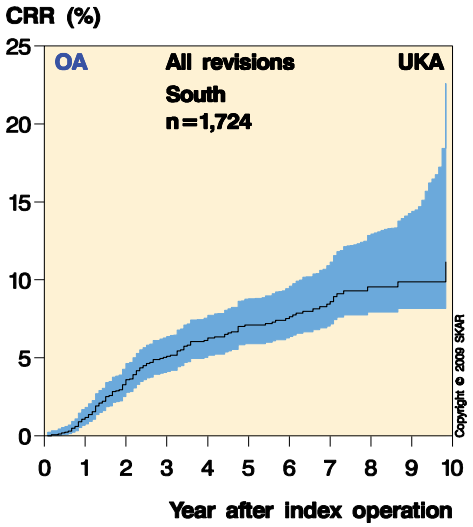
Southeast
Implants for primary UKA in OA 1998–2007

	Number	Percent
Link	297	37.5
Genesis	242	30.5
MillerGalante	118	14.9
Duracon	46	5.8
PFC	33	4.2
Oxford	28	3.5
Allegretto	18	2.3
Other	11	1.4
Total:	**793**	**100**



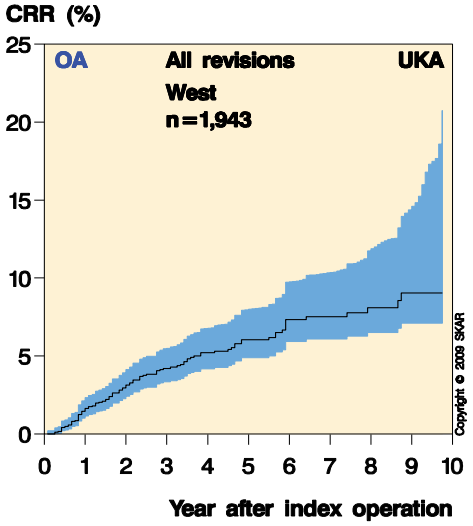
South
Implants for primary UKA in OA 1998–2007

	Number	Percent
Link	1,114	64.6
Oxford	195	11.3
MillerGalante	175	10.2
PFC	67	3.9
Duracon	65	3.8
EIUS	41	2.4
Genesis	33	1.9
Allegretto	18	1.0
Other	16	0.9
Total:	1,724	100



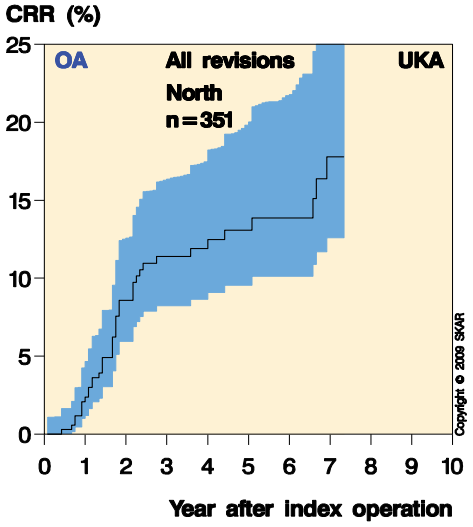
West
Implants for primary UKA in OA 1998–2007

	Number	Percent
Oxford	884	45.5
MillerGalante	754	38.8
Link	218	11.2
ZUK	57	2.9
Duracon	23	1.2
Other	7	0.4
Total:	1,943	100



North
Implants for primary UKA in OA 1998–2007

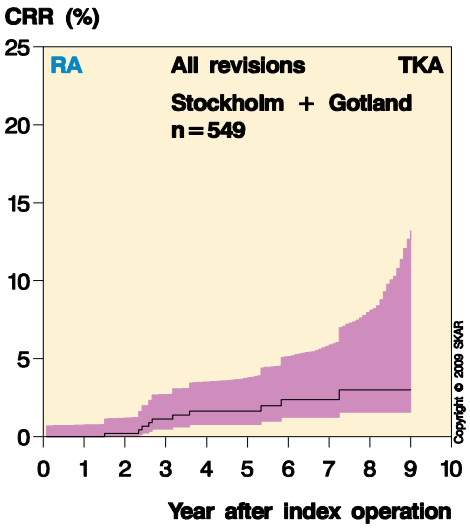
	Number	Percent
Link	233	
MillerGalante	82	
ZUK	18	
Oxford	13	
Other	5	
Total	351	100



Primary TKA implants for RA in the regions during 1998–2007

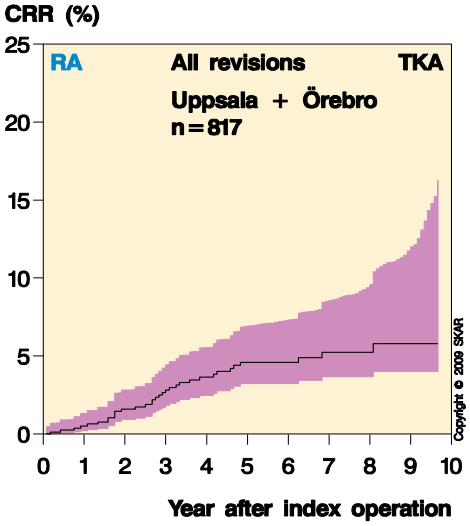
Stockholm + Gotland
Implants for primary TKA in RA 1998–2007

	Number	Percent
PFC Sigma	318	57.9
Duracon	107	19.5
PFC	23	4.2
Kinemax	19	3.5
AGC	18	3.3
NexGen	15	2.7
PFC Mobile Bearing	10	1.8
F/S MIII	10	1.8
Other	29	5.3
Total	549	100



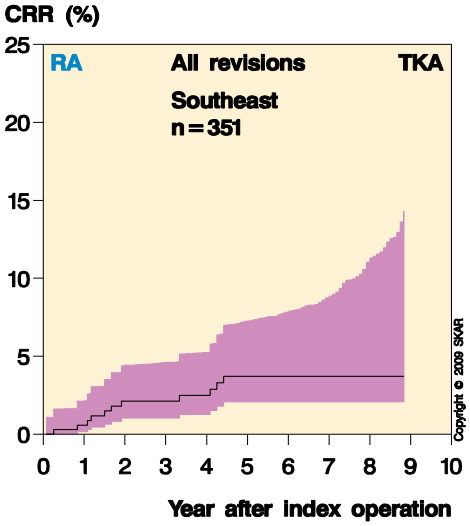
Uppsala+Örebro
Implants for primary TKA in RA 1998–2007

	Number	Percent
AGC	244	29.9
F/S MIII	233	28.5
NexGen	123	15.1
Kinemax	103	12.6
PFC Sigma	33	4.0
Scan	22	2.7
MillerGalante2	18	2.2
Other	41	5.0
Total	817	100



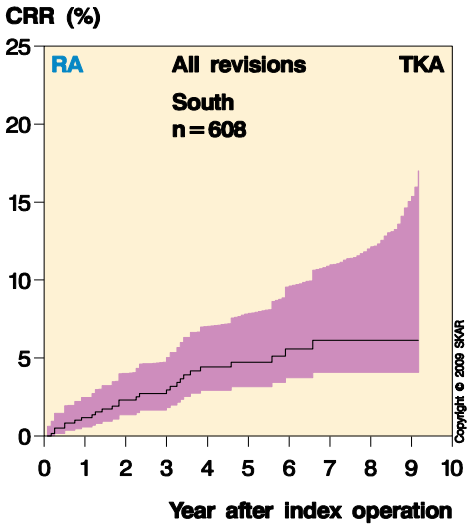
Southeast
Implants for primary TKA in RA 1998–2007

	Number	Percent
NexGen	138	39.3
AGC	98	27.9
PFC Sigma	83	23.6
PFC	10	2.8
Other	22	6.3
Total	351	100



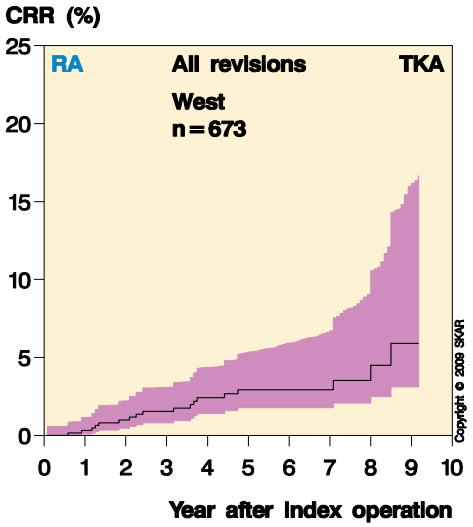
South
Implants for primary TKA in RA 1998–2007

	Number	Percent
PFC Sigma	162	26.6
Scan	134	22.0
AGC	116	19.1
Duracon	94	15.5
Vanguard	32	5.3
Profix	17	2.8
PFC	16	2.6
Other	37	3.8
Total	608	100



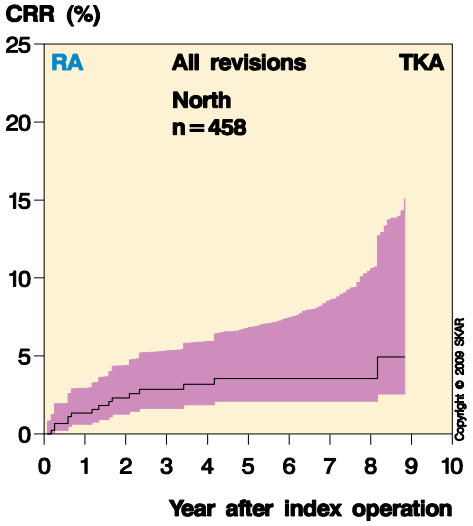
West
Implants for primary TKA in RA 1998–2007

	Number	Percent
AGC	245	36.4
F/S MIII	163	24.2
PFC Sigma	95	14.1
Duracon	69	10.3
Scan	42	6.2
NexGen	29	4.3
Other	30	4.5
Total	673	100



North
Implants for primary TKA in RA 1998–2007

	Number	Percent
PFC Sigma	122	26.6
AGC	107	23.4
Profix	66	14.4
Duracon	59	12.9
NexGen	37	8.1
LCS	21	4.6
PFC	18	3.9
Other	28	6.1
Total	458	100



The relative risk for implants used in primary arthroplasty during 1998–2007

The registry typically uses the latest 10-year period available for analysis. Unfortunately, this implies that the number of implants available for analysis may increase or decrease, depending on the model, which in turn may affect results.

For the second time we now include the TKA implants PFC mobile bearing, Triathlon and Vanguard, as well as the UKA implant Preservation of which almost all (98%) are of the fixed bearing type.

The risk of revision is one of the many measures of outcome. Although not accounted for here, the type of the revision should also be considered.

Deliberately avoiding primary use of patellar button while preparing for a secondary resurfacing, when needed, increases the risk of revision. Therefore, we have decided to separately account for OA/TKA when used with and without a patellar button (see next page).

Below you will find tables for the most common TKA and UKA models in which Cox regression, adjusting for age, gender and year of operation, has been used to estimate the risk for revision.

For TKA inserted for OA, the implants with significantly lower or higher risk than the reference implant AGC are the same as in last 2 annual reports.

The risk of revision (RR) with 95% confidence intervals. AGC is the reference in TKA and Link in UKA. The Cox regression adjusts for differences in gender, age and year of operation.

OA / TKA	n	p–value	RR	95% CI
AGC	14,704		ref.	
F/S MIII	6,819	0.04	0.82	0.67-0.99
PFC	618	0.04	1.48	1.01-2.15
PFC-Sigma	18,697	0.10	0.88	0.76-1.02
Scan	905	0.14	1.29	0.92-1.82
Kinemax	1,679	<0.01	1.67	1.32-2.12
Duracon	7,424	0.80	0.98	0.82-1.17
MillerGalante II	144	0.91	1.05	0.43-2.55
Profix	752	0.76	0.92	0.55-1.55
AMK	322	0.01	1.81	1.15-2.84
NexGen	11,059	<0.01	0.47	0.37-0.58
LCS	305	0.22	0.60	0.27-1.35
Natural II	473	0.87	0.94	0.49-1.84
PFC mobile bearing	342	0.91	0.96	0.45-2.04
Triathlon TKA	651	0.71	0.83	0.31-2.23
Vanguard	411	0.07	1.99	0.94-4.24
Other	469	0.06	1.58	0.99-2.54
Gender (male is ref.)		0.66	1.02	0.92-1.14
Age (per year)		<0.01	0.96	0.96-0.97
Year of op. (per year)		0.28	1.01	0.99-1.04

RA / TKA	n	p–value	RR	95% CI
AGC	828		ref.	
F/S MIII	407	0.06	0.51	0.25-1.02
PFC	69	0.42	0.61	0.18-2.03
PFC-Sigma	813	0.02	0.47	0.25-0.87
Scan	199	0.33	1.37	0.73-2.54
Kinemax	122	0.38	1.39	0.67-2.90
Duracon	343	0.96	1.02	0.55-1.89
MillerGalante II	18	0.87	0.84	0.11-6.23
Profix	87	0.71	0.76	0.18-3.19
AMK	19	0.84	0.81	0.11-5.98
NexGen	344	0.02	0.17	0.04-0.71
LCS	*23*	*0.98*	*<0.01*	
Natural II	17	0.28	3.05	0.41-22.91
PFC mobile bearing	14	0.20	3.79	0.50-28.58
Triathlon TKA	*5*	*1.00*	*<0.01*	
Vanguard	38	0.01	6.80	1.47-31.53
Other	110	0.78	0.84	0.26-2.74
Gender (male is ref.)		0.81	0.95	0.61-1.46
Age (per year)		0.66	1.00	0.99-1.02
Year of op. (per year)		0.06	0.91	0.82-1.00

Implants lacking sufficient numbers for analysis are shown in italics

OA / UKA	n	p–value	RR	95% CI
Link	3,797		ref.	
Marmor/Richards	28	0.64	1.32	0.42-4.14
Brigham	14	0.61	1.44	0.36-5.82
Oxford	1,299	0.47	1.11	0.84-1.46
MillerGalante	2,439	0.41	1.09	0.89-1.32
Duracon	136	0.05	1.68	1.01-2.81
PFC	219	<0.01	1.90	1.31-2.76
Allegretto	85	0.32	1.35	0.75-2.43
Genesis	514	0.52	1.13	0.77-1.66
Preservation	125	0.06	1.89	0.96-3.72
Other	144	0.44	0.64	0.20-2.00
Gender (male is ref.)		0.41	0.93	0.79-1.10
Age (per year)		<0.01	0.95	0.94-0.96
Year of op. (per year)		0.94	1.00	0.96-1.04

As last year, there is a significantly less risk for the PFC-Sigma and NexGen in TKA for RA. The new Vanguard has a significantly increased risk but the analysis is based on the first 38 implants inserted for RA.

In UKA for OA, PFC and Duracon have significantly higher risk than the reference implant, Link but these two implants have not been used since 2003 and 2002, respectively.

As previously there is no difference depending on gender. In OA, but not RA, the risk of revision significantly decreases with increasing age.

The risk of revision (RR) with 95% confidence intervals for TKA/OA inserted without and with a patellar component respectively. In the lower right table, F/S MIII is used as reference instead of AGC.

Without patella button

OA / TKA	n	p–value	RR	95% CI
AGC	12,901		ref.	
F/S MIII	3,060	0.69	0.95	0.72-1.24
PFC	516	0.24	1.29	0.84-1.97
PFC-Sigma	17,625	0.04	0.85	0.73-1.00
Scan	898	0.32	1.19	0.84-1.69
Kinemax	1,243	<0.01	1.58	1.21-2.07
Duracon	6,769	0.56	0.95	0.79-1.14
MillerGalante II	143	0.98	0.99	0.41-2.40
Profix	673	0.57	0.85	0.49-1.48
AMK	304	0.10	1.51	0.92-2.46
NexGen	10,893	<0.01	0.44	0.35-0.55
LCS	305	0.17	0.57	0.25-1.27
Natural II	445	0.98	0.99	0.51-1.93
PFC mobile bearing	287	0.89	0.95	0.45-2.02
Triathlon TKA	618	0.75	0.85	0.32-2.29
Vanguard	397	0.06	2.04	0.96-4.35
Other	390	0.08	1.60	0.95-2.68
Gender (male is ref.)		0.55	1.04	0.92-1.16
Age (per year)		<0.01	0.96	0.95-0.97
Year of op. (per year)		0.52	1.01	0.98-1.04

With patella button

OA / TKA	n	p–value	RR	95% CI
AGC	1,802		ref.	
F/S MIII	3,757	0.45	1.18	0.77-1.82
PFC	102	0.01	3.08	1.31-7.25
PFC-Sigma	1,071	0.58	1.18	0.66-2.09
Scan	7	0.08	6.17	0.83-45.83
Kinemax	435	<0.01	2.71	1.54-4.78
Duracon	655	0.52	1.26	0.62-2.56
MillerGalante II	*1*	*1.00*	*<0.01*	
Profix	79	0.34	2.02	0.48-8.53
AMK	18	<0.01	8.81	2.65-29.24
NexGen	165	0.39	1.59	0.56-4.55
LCS				
Natural II	*28*	*0.98*	*<0.01*	
PFC mobile bearing	*55*	*0.99*	*<0.01*	
Triathlon TKA	*33*	*0.99*	*<0.01*	
Vanguard	*14*	*0.99*	*<0.01*	
Other	79	0.25	2.02	0.61-6.66
Gender (male is ref.)		0.77	0.96	0.70-1.30
Age (per year)		<0.01	0.97	0.96-0.99
Year of op. (per year)		0.85	1.01	0.94-1.08

Implants lacking sufficient numbers for analysis are shown in italics

Differentiating between TKA inserted with and without patellar button reduces the number of implants available for analysis, which can make it more difficult to demonstrate small differences.

Using AGC as a reference, when no patellar button is used (table above), PFC´s advantage is now significant which it wasn´t last year. The PFC and AMK have no longer significantly higher risk which is probably an effect of fewer implants being available for analysis.

With AGC as a reference, when a patellar button is used (table above right), three implants have a significantly higher risk than the reference. They also had higher risk in the combined material (opposite page).

If F/S MIII instead of AGC is used as a reference for implants inserted with a patellar button (table to the right) it still is the same three implants that significantly differ.

None of the significantly inferior models were in use in Sweden during 2008.

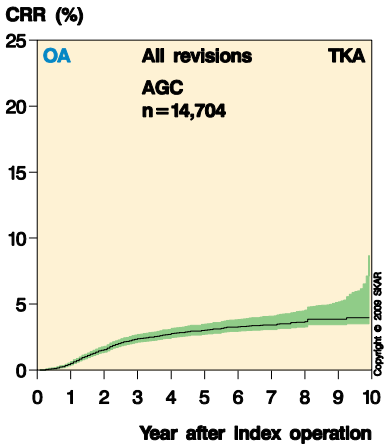
With patella button but using F/S MIII as a reference

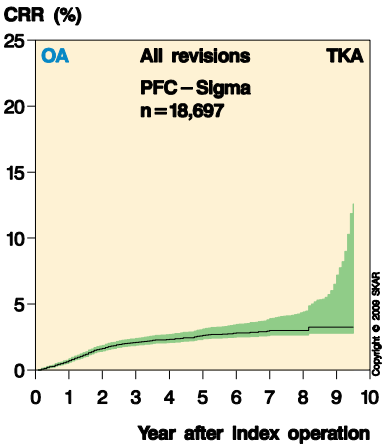
OA / TKA	n	p–value	RR	95% CI
F/S MIII	3,757		ref.	
AGC	1,802	0.47	0.85	0.55-1.31
PFC	102	0.02	2.61	1.17-5.81
PFC-Sigma	1,071	0.99	1.00	0.61-1.64
Scan	7	0.10	5.22	0.72-37.95
Kinemax	435	<0.01	2.31	1.43-3.74
Duracon	655	0.81	1.08	0.57-2.06
MillerGalante II	*1*	*0.99*	*<0.01*	
Profix	79	0.44	1.73	0.42-7.09
AMK	18	<0.01	7.47	2.34-23.87
NexGen	165	0.55	1.36	0.50-3.74
LCS				
Natural II	*28*	*0.97*	*<0.01*	
PFC mobile bearing	*55*			
Triathlon TKA	*33*			
Vanguard	*14*			
Other	79	0.36	1.72	0.54-5.45
Gender (male is ref.)		0.77	0.96	0.70-1.30
Age (per year)		<0.01	0.97	0.96-0.99
Year of op. (per year)		0.92	1.00	0.94-1.07

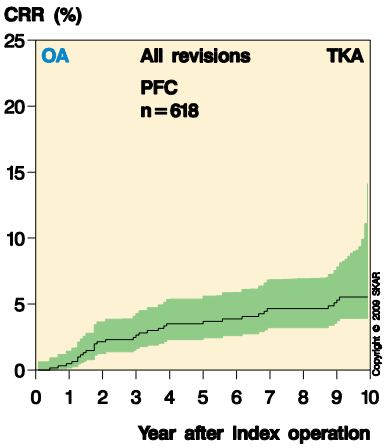
Implants lacking sufficient numbers for analysis are shown in italics

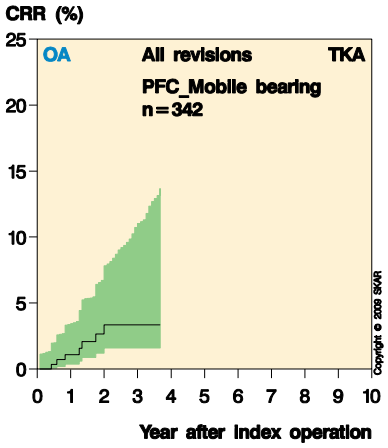
Significant difference with higher risk ratio.
Significant difference with lower risk ratio.

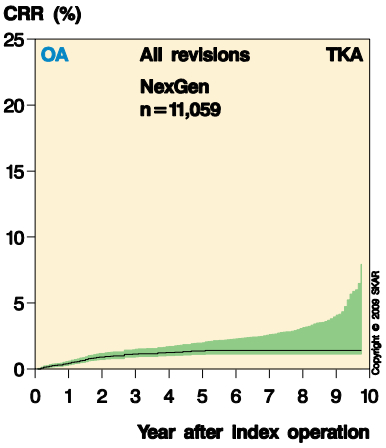
CRR for commonly used TKA implants in OA during 1998–2007

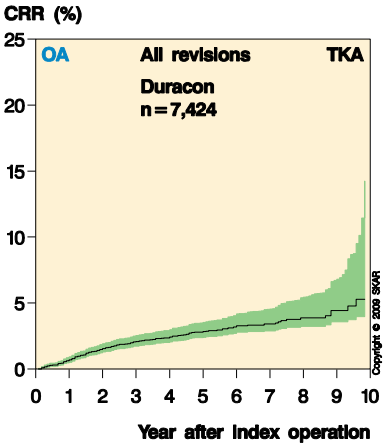


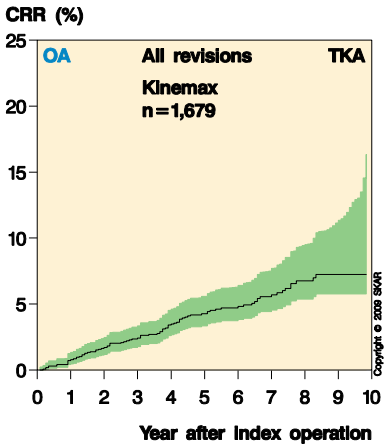


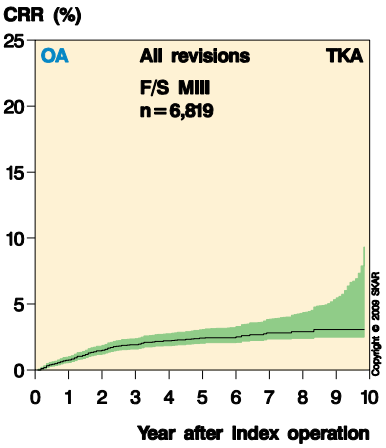


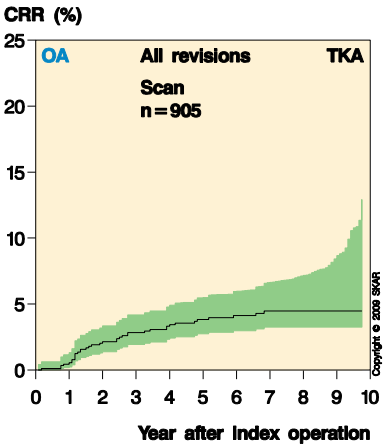


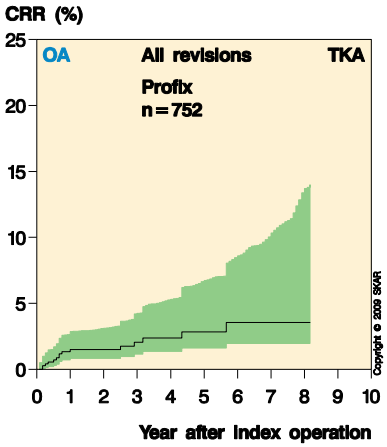











CRR (%)
OA
All revisions
TKA
Profix
n=752
Year after index operation
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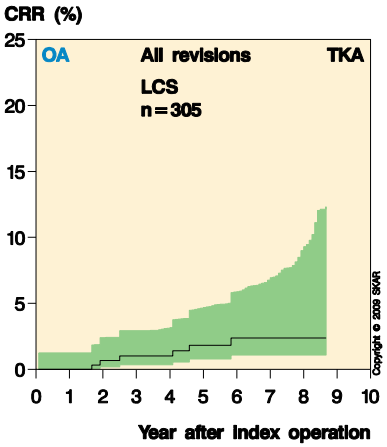
CRR (%)
OA
All revisions
TKA
LCS
n=305
Year after index operation
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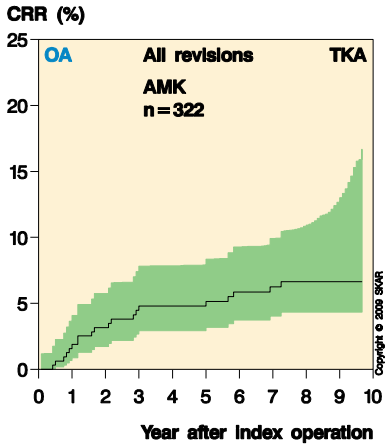
CRR (%)
OA
All revisions
TKA
AMK
n=322
Year after index operation
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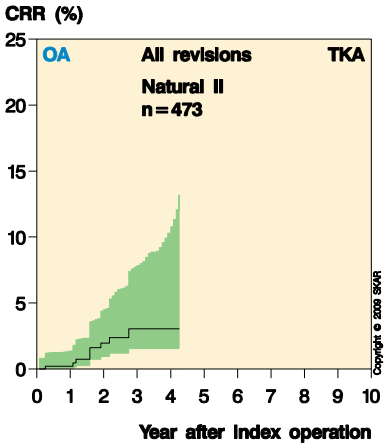
CRR (%)
OA
All revisions
TKA
Natural II
n=473
Year after index operation
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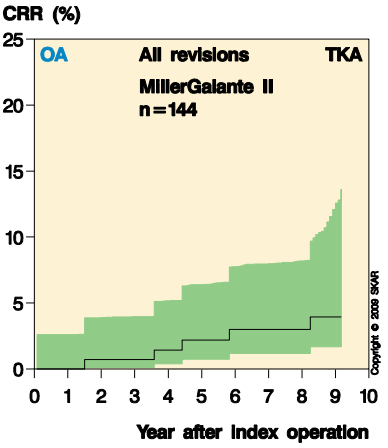
CRR (%)
OA
All revisions
TKA
MillerGalante II
n=144
Year after index operation
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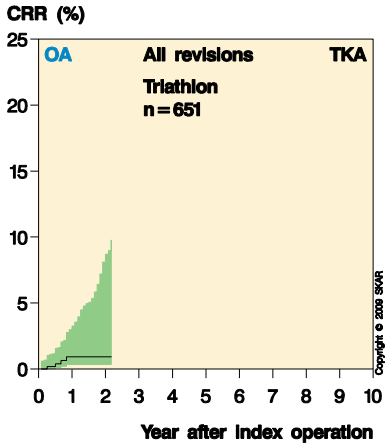
CRR (%)
OA
All revisions
TKA
Triathlon
n=651
Year after index operation
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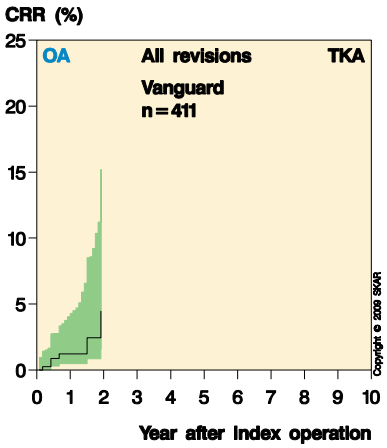
CRR (%)
OA
All revisions
TKA
Vanguard
n=411
Year after index operation
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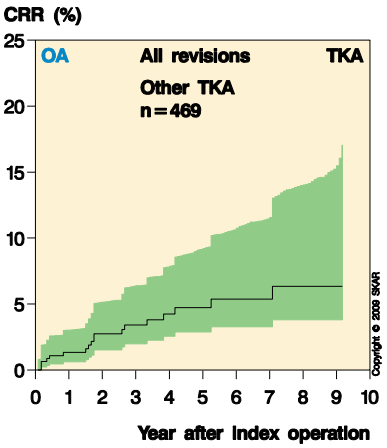
CRR (%)
OA
All revisions
TKA
Other TKA
n=469
Year after index operation
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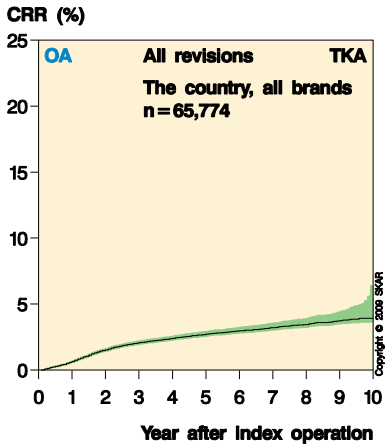
CRR (%)
OA
All revisions
TKA
The country, all brands
n=65,774
Year after index operation
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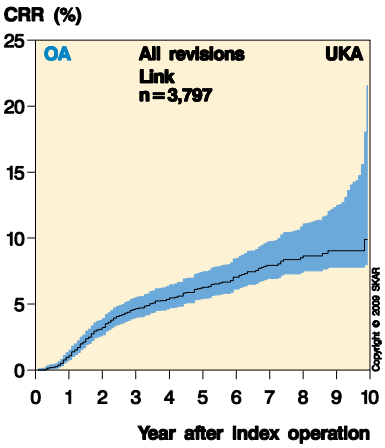
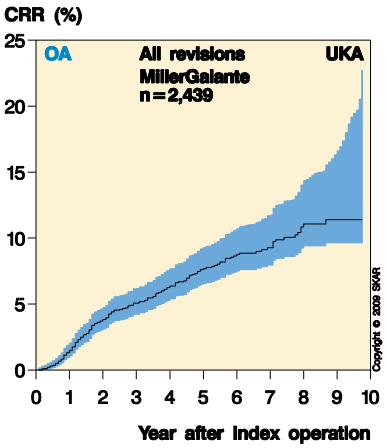
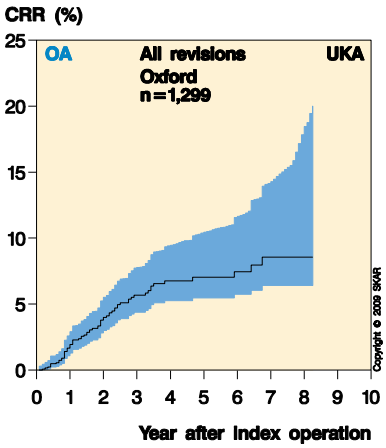
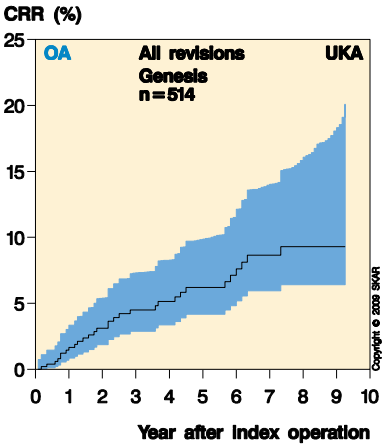
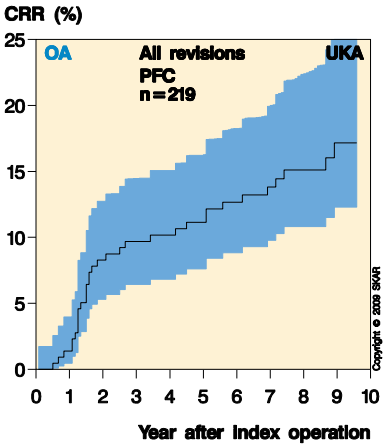
CRR for commonly used UKA implants in OA during 1998–2007

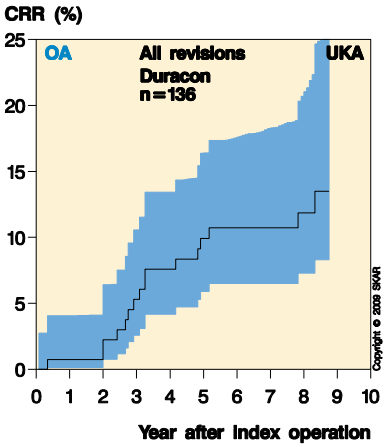


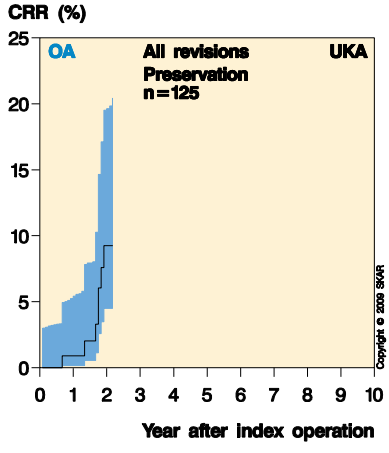


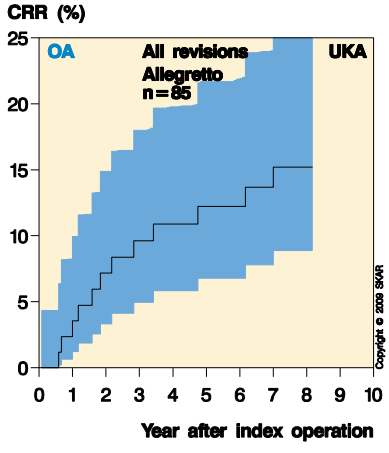


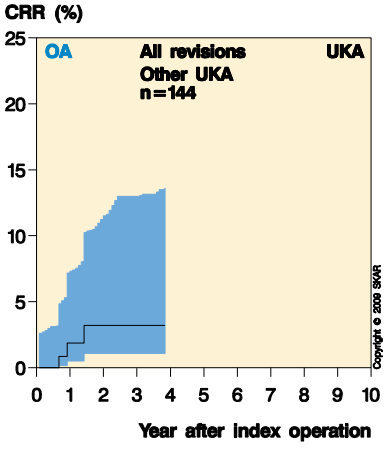


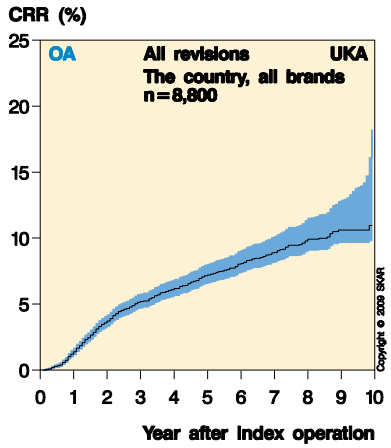












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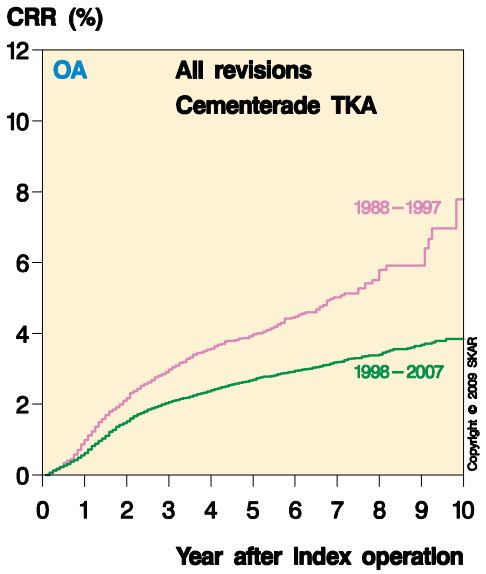
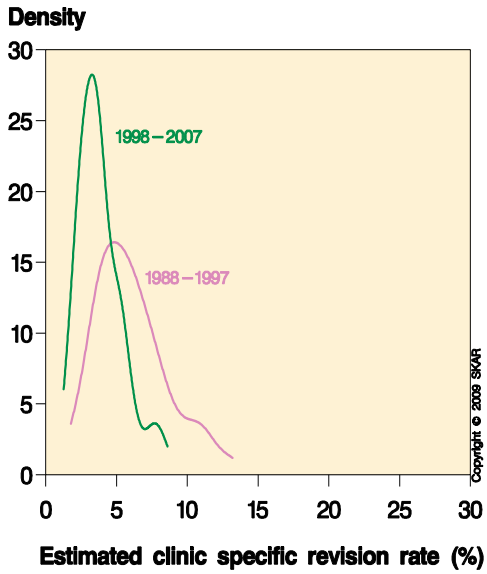
Relative risk of revision over time (cemented TKA/OA)

The figure below shows the overall risk of revision for the current 10-year period (1997-2006) as well as for the previous period (1987-1996). As in the previous reports, it can be observed that the risk of revision for the current period has been reduced to half that of the previous period.

When the absolute specific risk of revision for the units is plotted for both periods (figure below left), it can be seen that the risk has become lower and the distribution has diminished. This implies that the results have improved overall and at the same time the results for the different units have become more similar (less spread in results).



Total CRR for cemented TKA in OA during the 2 periods 1988–1997 and 1998–2007. Implants inserted during the latter period have half the risk of becoming revised.

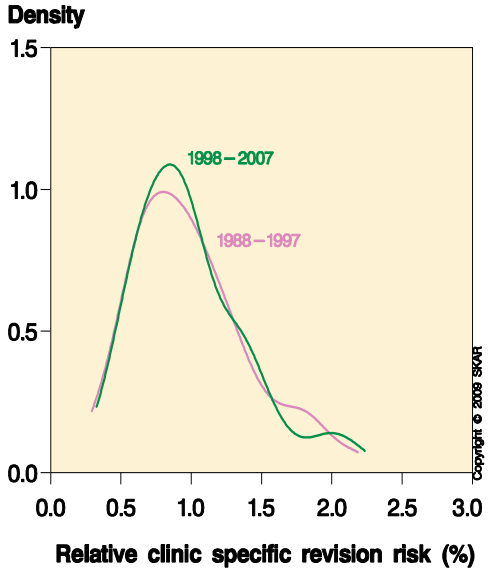


Plotting the estimated absolute clinicspecifi c risk of revision shows that the absolute distribution has diminished between 1988-1997 and 1998–2007 (x-axis = absolute risk of revision)

However, when looking on the relative specific risk of revision (figure below) it can be seen that the curves for the two periods are much the same shape. This implies that relative difference between the units has not changed between the two periods and that some units still have 1.5-2 times higher or lower risk than the average unit.

The figures also illustrate the (sad) fact that irrespective of whatever improvement, there will always be units with better, respectively worse, results than the average.

The register has been requested to account for hospital specific results. A complete list with the relative risk for each hospital 1998-2007, as compared to the national average, is shown on the opposite page. There were 8 hospitals having significantly better results than the average hospital and 11 with significantly inferior results. One can only speculate on the causes for these differences. An unfortunate choice of implants, methods or surgeons may be the explanation but also a selection of patients with higher risk profile (case-mix). We find it appropriate to point out that the results are based on historical data in which the last implants were inserted 2 years ago and the first 12 years ago. Thus, the results do not have to reflect the current risk for patients undergoing surgery.



Plotting the relative clinicspecific risk of revision, as compared to the national mean, shows that the distribution of relative risk among the hospitals has not changed between 1988–1997 and 1998–2007 (x-axis = relative risk).

Relative risk of revision for hospitals during 1998–2007 (cemented TKA/OA)

The true average result of a certain treatment can only be determined for defined groups of previously treated patients. However, such results only reflect historical circumstances and can't automatically be used to predict future results. The observed average result of a hospital treatment is not constant. Different selections of patients that get the same treatment have different average results. Thus, the hospital specific variability has to be taken into consideration if comparisons of hospitals are to be meaningful.

The table below shows the number of primary operations (TKA for OA) performed at each hospital during the analyzed period and how many of these were revised. The RR (relative risk of revision) is shown with its 95% confidence interval. The RR describes each hospital's deviation from the national average in multiplicative terms. It has been calculated using "the shared gamma frailty model" which takes into consideration that units performing few operations more easily suffer far too optimistic or pessimistic risk estimates. Thus, the method "shrinks" such estimates towards the national mean, relative to the amount of information they are based on.

For further information; Glidden DV & Vittinghoff E. Modelling clustered survival data from multicenter clinical trials. Statistics in Medicine 2004; 23: 369-388.

Finally the observed rank for the hospital is shown together with 95% confidence interval for its ranking, i.e. what rank places lie within the confidence interval. The calculations were performed using Monte Carlo simulation. For further information; Goldstein H, Spiegelhalter DJ. League tables and their limitations: statistical issues in comparisons of institutional performance. J R Statist Soc (A) 1996;159:384-43.

Only units performing more than 50 procedures during the 10-year period were included in the analysis. Only cemented TKA inserted for OA were included. The results are adjusted for differences in sex and gender as well as for differences with respect to if a patellar button had been used or not.

Units with significantly better or worse results than the national average are shown in green and red respectively.

Relative risk of revision for units

code	unit	no. TKA	no. revised	RR	95% CI	rank	95% CI
21001	Linköping	482	2	0.33	0.15-0.73	3	1-27
21014	Motala	1,683	8	0.38	0.21-0.66	4	1-22
10484	Sabbatsbergs närsjh	704	5	0.38	0.20-0.72	4	1-26
52012	Alingsås	851	5	0.45	0.24-0.87	8	1-39
56010	Västerås	457	3	0.49	0.24-1.03	10	1-50
62011	Örnsköldsvik	913	8	0.49	0.28-0.87	10	1-38
22010	Jönköping	849	8	0.51	0.29-0.90	11	2-40
64011	Lycksele	352	2	0.52	0.23-1.14	12	1-58
22012	Värnamo	804	7	0.55	0.30-1.00	13	2-48
50010	Östra sjukhuset	884	9	0.56	0.33-0.97	15	2-45
53011	Lidköping	730	7	0.58	0.32-1.04	15	2-52
65014	Kalix	164	1	0.58	0.24-1.39	15	1-69
12010	Enköping	1,006	9	0.59	0.35-1.02	16	3-50
53010	Falköping	770	8	0.60	0.34-1.05	17	3-51
42011	Varberg	1,137	13	0.60	0.37-0.98	17	4-47
50001	Sahlgrenska	447	5	0.62	0.32-1.19	18	3-59
13010	Eskilstuna	314	3	0.65	0.31-1.36	20	2-68
65012	Gällivare	534	6	0.66	0.36-1.22	21	4-61
21013	Norrköping	486	9	0.68	0.39-1.17	23	5-60
30001	Malmö	256	3	0.69	0.33-1.45	24	3-71
28013	Simrishamn	715	12	0.70	0.43-1.14	24	6-58
13012	Kullbergska sjukhuset	786	10	0.70	0.41-1.18	25	5-60
53013	Skövde	592	8	0.70	0.40-1.23	25	5-63
11001	Karolinska	1,183	18	0.71	0.46-1.07	25	8-54
56012	Köping	1,071	15	0.72	0.46-1.13	26	7-57
41012	Helsingborg	422	7	0.72	0.40-1.30	27	5-66
55012	Lindesberg	713	10	0.73	0.43-1.23	27	6-61
23010	Växjö	665	10	0.76	0.45-1.29	30	7-65

(cont.)

Relative risk of revision for units (cont.)

code	unit	no. TKA	no. revised	RR	95% CI	rank	95% CI
27010	Karlskrona	231	5	0.77	0.40-1.48	30	5-72
55011	Karlskoga	657	10	0.78	0.46-1.32	31	8-66
50080	Sergelkliniken Gbg	140	2	0.79	0.36-1.74	31	3-78
50071	Frölunda Spec.Sjukhus	446	6	0.80	0.43-1.48	32	6-71
13011	Nyköping	497	7	0.80	0.45-1.45	33	7-72
63010	Östersund	717	12	0.83	0.51-1.35	35	11-67
42015	Movement Halmstad	298	2	0.84	0.38-1.86	35	4-80
50480	Carlanderska	62	0	0.84	0.32-2.21	36	3-84
10011	S:t Göran	2,903	57	0.85	0.66-1.10	37	20-55
28011	Ängelholm	924	17	0.86	0.56-1.32	38	14-66
11011	Södertälje	768	14	0.87	0.55-1.38	38	13-69
10015	Sophiahemmet	791	16	0.87	0.56-1.35	38	14-68
55010	Örebro	736	13	0.88	0.55-1.42	39	13-70
27011	Karlshamn	1,092	21	0.91	0.61-1.35	42	18-67
64010	Skellefteå	587	12	0.92	0.56-1.49	42	14-72
24010	Västervik	808	17	0.92	0.60-1.42	43	16-70
57011	Mora	866	18	0.92	0.61-1.41	43	17-70
54013	Säffle	327	7	0.93	0.51-1.69	43	11-77
12481	Elisabethsjukhuset	313	4	0.93	0.47-1.86	43	8-79
42010	Halmstad	1,080	19	0.96	0.62-1.47	45	18-71
54010	Karlstad	1,088	18	0.96	0.63-1.47	46	19-72
52011	Borås	767	14	0.97	0.60-1.56	45	17-74
10013	Södersjukhuset	1,231	23	1.00	0.69-1.46	48	23-72
64001	Umeå	632	13	1.01	0.63-1.63	49	18-76
65016	Sunderby sjukhus	300	8	1.02	0.58-1.79	50	15-79
25010	Kalmar	981	22	1.02	0.69-1.50	50	24-73
11002	Huddinge	650	15	1.04	0.66-1.63	51	21-76
25011	Oskarshamn	1,078	19	1.04	0.69-1.56	51	23-75
28012	Hässleholm	2,917	64	1.05	0.82-1.34	52	33-67
11015	Nacka-Proxima	66	1	1.05	0.44-2.50	52	7-85
57010	Falun	1,619	40	1.07	0.80-1.45	53	31-71
54014	Torsby	668	17	1.11	0.73-1.71	56	26-78
11913	Stockholms Specialistvård	744	16	1.12	0.72-1.73	56	26-78
41010	Landskrona	565	18	1.12	0.73-1.70	56	28-77
26010	Visby	494	12	1.18	0.72-1.93	59	26-81
11010	Danderyd	1,257	32	1.20	0.86-1.68	61	37-77
22011	Eksjö-Nässjö	673	20	1.25	0.83-1.86	63	36-80
62013	Sollefteå	674	18	1.27	0.84-1.94	64	36-81
62010	Sundsvall	873	28	1.29	0.91-1.83	65	41-79
51010	Uddevalla	1,071	30	1.30	0.92-1.82	65	42-79
41001	Lund	164	7	1.33	0.74-2.40	67	28-85
23011	Ljungby	574	20	1.36	0.91-2.03	68	41-82
54012	Arvika	508	14	1.36	0.86-2.16	68	37-83
41013	Ystad	304	13	1.42	0.88-2.29	70	39-84
41011	Trelleborg	2,223	55	1.42	1.10-1.85	70	55-80
52013	Skene	592	22	1.46	0.99-2.15	71	48-83
10016	Ortopediska huset	1,418	39	1.46	1.08-1.98	72	53-82
65010	Boden	105	7	1.47	0.82-2.65	72	35-86
50020	OrthoCenter IFK klin.	188	7	1.47	0.82-2.66	72	35-86
51011	Mölndal	455	19	1.62	1.08-2.44	76	54-85
61010	Gävle	478	22	1.65	1.12-2.42	76	56-85
61012	Hudiksvall	516	22	1.69	1.15-2.48	77	58-85
61011	Bollnäs / Söderhamn	1,043	41	1.90	1.41-2.56	81	70-86
11012	Norrtälje	562	26	1.96	1.35-2.83	81	68-86
51012	Kungälv	1,013	48	1.99	1.51-2.62	82	72-86
54011	Kristinehamn	91	10	2.07	1.23-3.49	83	63-86
12001	Akademiska sjukhuset	873	46	2.12	1.60-2.82	83	75-86
65013	Piteå	1,007	40	2.25	1.67-3.04	84	76-86

Only units that inserted more than 50 TKA for OA during the period are listed

Send to: The Swedish Knee Arthroplasty Register
Klinikgatan 22, Wigerthuset, floor 2
Lund University Hospital
SE-221 85, Lund
Phone. +46-46-171345 Fax +46-46-177167

Patient ID: 19 _____-____
(Unique social security number which includes date of birth)

From: Hospital name (institution No.)

To be used when implant components are inserted, added, exchanged or removed

Date of surgery (y.m.d) 20 __ __ __ __ __

Side (in case of bilateral operation please use 2 forms, one for each side)
☐ 1 Left ☐ 2 Right

Primary arthroplasty ☐ 1 Yes ☐ 2 No

Type of primary arthroplasty:
☐ 1 TKA incl. patella ☐ 2 TKA excl. patella
☐ 3 UKA Medial ☐ 4 UKA Lateral
☐ 5 Patello-femoral ☐ 6 Other (what).....

Reason for primary arthroplasty:
If more than one reason, mark the main reason
☐ 1 OA
☐ 2 RA
☐ 3 Fracture (recent (not older than 3 months))
☐ 4 Fracture sequelae (damage by earlier fracture)
☐ 5 Osteonecrosis
☐ 6 Other (what) .....

Previous surgery of the primary index knee:
☐ 0 No ☐ 1 Osteosynthesis
☐ 2 Osteotomy ☐ 3 Menisceal surgery
☐ 4 Cruciate lig. surgery ☐ 5 Arthroscopy
☐ 6 Other (what) .....

Type of revision:
☐ 1 Total exchange (all previously inserted components exchanged)
☐ 2 Exchange of Femoral component
☐ 3 Exchange of Tibial component
☐ 4 Exchange of Patellar button
☐ 5 Exchange of poly/insert
☐ 6 Total implant removal (all previously inserted components)
☐ 7 Removal of component(s) (what) .....
☐ 8 Addition of component(s) (what) .....
☐ 9 Arthrodesis
☐ 10 Amputation
☐ 11 Other (what) .....

Reason for the revision:
If more than one reason, mark the main reason
☐ 1 Loosening (where) .....
☐ 2 Poly wear (where) .....
☐ 3 Fracture (periprosthetic)
☐ 4 Deep infection
☐ 6 Suspected infection
☐ 7 Instability (not of the patella)
☐ 8 Femoropatellar problem
☐ 9 Suboptimal situs of the previous implant
☐ 8 Other (what) .....

Implant name:
(not needed when implant stickers are provided on the other side)

Cemented parts:

Femur	☐ 1 **Cemented**	☐ 2 **Not Cemented**
Tibia	☐ 1 **Cemented**	☐ 2 **Not Cemented**
Patella	☐ 1 **Cemented**	☐ 2 **Not Cemented**
Femoral stem	☐ 1 **Cemented**	☐ 2 **Not Cemented**
Tibial stem	☐ 1 **Cemented**	☐ 2 **Not Cemented**

Cementsort:
(not needed when sticker(s) for the cement are provided on the other side)

Bone transplantation:
☐ 0 **No** ☐ 1 **Pat. own** ☐ 2 **Bank bone** ☐ 3 **Synthetic bone**

When used, the bone was used in the : (what) .....

Femur	☐ 0 No	☐ 1 Yes
Tibia	☐ 0 No	☐ 1 Yes
Patella	☐ 0 No	☐ 1 Yes

CAS: (computer aided surgery) ☐ 0 No ☐ 1 Yes
If yes, what system was used: .....

MIS: (minimally invasive surgery) ☐ 0 No ☐ 1 Yes

Drainage: ☐ 0 No ☐ 1 Yes

Surgeon (voluntary info) : .....

Anesthesia:
☐ 1 General ☐ 2 Epidural ☐ 3 Spinal ☐ 4 Other .....

Torniquette: ☐ 0 No ☐ 1 Yes

LIA: (local infiltration analgesia)
☐ 0 No ☐ 1 Yes ☐ 2 Catheter left in knee (for later injection)

Trombotic prophylaxis:
☐ 0 No ☐ 1 Yes start pre-op. ☐ 2 Yes start post-op.
Name+dosis: .....
Planned length of treatment: .....

Antibiotica:
☐ 0 No
☐ 1 Yes name + dosis: .....
Start Preop. ☐ 0 No ☐ 1 Yes min. before surgery : .....
Planned length of treatment: .....

ASA classification: (according to anesthesiologist)
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Weight (kg): ..... **Height:** (cm): .....

Start of surgery (skin incision) **Time:** ..... : .....

End of surgery (skin closed) **Time:** ..... : .....

Remember to put stickers on the back !!!

Stickers with part number used on the Femoral side here
(Femur component, stem, augments ....)

Stickers with part number used on the Tibial side here
(Tibia component, insert, stem, augments ....)

Remember sticker(s) for the cement

Other stickers here
(cement, patellar button ....)

<u>In case of revision:</u>
Send a copy of the op.report and discharge letter

Publications :

Stefánsdóttir A, Robertsson O, W-Dahl A, Kiernan S, Gustafsson P, Lidgren L.
Inadequate timing of prophylactic antibiotics in orthopaedic surgery: We can do better.
Acta Orthop. In Press.

Stefánsdóttir A, Johansson D, Knutson K, Lidgren L, Robertsson O.
Microbiology of the infected knee arthroplasty. Report from the Swedish Knee Arthroplasty Register on 426 surgically revised cases.
Scand J Infect Dis. 2009;41(11-12):831-840

Tarasevicius S, Stucinskas J, Robertsson O, Wingstrand H.
Introduction of total knee arthroplasty in Lithuania: Results from the first 10 years.
Acta Orthop. 2009 Feb;80(1):51-4

Stefánsdóttir A, Lidgren L, Robertsson O.
Higher Early Mortality with Simultaneous Rather than Staged Bilateral TKAs: Results From the Swedish Knee Arthroplasty Register.
Clin Orthop Relat Res 2008; 466: 3066-3070.

5. Lidgren L, Robertsson O.
Wear and joint registers: Can national joint implant registers detect unexpected tribological failures?
Tribos Newsletter 2008; Nr 4: 4-5.

Ranstam J, Wagner P, Robertsson O, Lidgren L.
Healthcare quality registers: outcome-oriented ranking of hospitals is unreliable.
J Bone Joint Surg (Br) 2008;90-B:1558-61

Ranstam J, Wagner P, Robertsson O, Lidgren L.
Ranking in health care results in wrong conclusions.
Lakartidningen 2008; Aug 27-Sep 2;105 (35): 2313-4.

Robertsson O and Lidgren L.
The short-term results of 3 common UKA implants during different time periods in Sweden.
J Arthroplasty 2008 Sep; 23 (6): 801-7.

Lidgren L.
Chronic inflammation, joint replacement and malignant lymphoma.
J Bone Joint Surg Br 2008 Jan; 90 (1): 7-10.

Robertsson O.
Knee Arthroplasty Registers. Review.
J Bone Joint Surg (Br) 2007; 89-B: 1-4.

Robertsson O, Stefánsdóttir A, Ranstam J, Lidgren L.
Increased long-term mortality in patients less than 55 years old who have undergone knee replacement for osteoarthritis.
J Bone Joint Surg (Br) 2007 ; 89-B: 599-603.

Robertsson O, Ranstam J and Lidgren L.
Variation in outcome and issues in ranking hospitals: An analysis from the Swedish Knee Arthroplasty Register.
Acta Orthop 2006 Jun;77 (3): 487-93.

Bremander AB, Dunbar M, Knutson K, Petersson I F, Robertsson O.
Revision in previously satisfied knee arthroplasty patients is the result of their call on the physician, not on pre-planned follow-up: A retrospective study of 181 patients who underwent revision within 2 years.
Acta Orthop 2005 Dec; 6 (76): 785-90

Lidgren L, Robertson O.
Acrylic bone cements: clinical developments and current status: Scandinavia.
Orthop Clin North Am 2005 Jan; 36(1): 55-61. vi. Review.

Harrysson O L, Robertsson O, Nayfeh J F.
Higher Cumulative Revision Rate of Knee Arthroplasties in Younger Patients with Osteoarthritis.
Clin Orthop 2004 Apr; 1 (421): 162-168.

Dunbar M J, Robertsson O, Ryd L.
What's all that noise? The effect of co-morbidity on health outcome questionnaire results after knee arthroplasty.
Acta Orthop Scand 2004 Apr; 75 (2): 119-26.

Robertsson O, Ranstam J.
No bias of ignored bilaterality when analysing the revision risk of knee prostheses: analysis of a population based sample of 44,590 patients with 55,298 knee prostheses from the national Swedish Knee Arthroplasty Register.
BMC Musculoskelet Disord 2003 Feb 05; 4 (1): 1.

Lidgren L.
Arthroplasty and its complications.
In: Rheumatology, 3rd edition (Ed. Hochberg M C, Silman A J, Smolen J S, Weinblatt M E, Weissman M H). Mosby 2003; 1055-1065.

Lidgren L, Knutson K, Stéfansdóttir A.
Infection of prosthetic joints.
Best Pract Res Clin Rheumatol 2003; 17 (2): 209-218.

Lidgren L.
Arthroplasty and its complications.
In: Osteoarthritis, 2nd ed. (Eds. Brandt K D, Doherty M, Lohmander L S). Oxford Univerity Press, 2003; 9.19: 361-70.

Robertsson O, Knutson K.
Knee arthroplasty registers.
Prothéses totales du genou. Ed. by Roger Lemaire and Jacques Witvoet.
Éditions scientifiques et médicales Elsevier SAS, 2002.

Dunbar M J, Robertsson O, Ryd L, Lidgren L.
Appropriate Questionnaires for Knee Arthroplasty.
J Bone Joint Surg [Br] 2001; 83-B: 339-44.

Knutson K.
Arthroplasty and its complications.
In: Osteoarthritis 2nd ed (Eds. Brandt K D, Doherty M, Lomander LS).
Oxford University Press 2001;

Lindstrand A, Robertsson O, Lewold S, Toksvig-Larsen S.
The patella in total knee arthroplasty: resurfacing or non-resurfacing of patella.
Knee Surg Sports Traumatol Arthrosc 2001; 9 Suppl 1: S21-3.

Robertsson O, Knutson K, Lewold S, Lidgren L.
The Swedish Knee Arthroplasty Register 1975-1997: an update with special emphasis on 41,223 knees operated on in 1988-1997.
Acta Orthop Scand 2001; Oct;72 (5): 503-13.

Robertsson O, Knutson K, Lewold S, Lidgren L.
The routine of surgical management reduces failure after unicompartmental knee arthroplasty.
J Bone Joint Surg [Br] 2001; 83-B: 45-9.

Robertsson O, Dunbar M J.
Patient satisfaction compared with general health and disease-specific questionnaires in knee arthroplasty patients.
J Arthroplasty 2001 Jun;16 (4): 476-82.

Dunbar M J, Robertsson O, Ryd L, Lidgren L.
Translation and validation of the Oxford-12 item knee score for use in Sweden.
Acta Orthop Scand 2000 Jun; 71 (3): 268-74.

Robertsson O, Scott G and Freeman MAR.
Ten-year survival of the cemented Freeman-Samuelson primary knee arthroplasty. Data from the Swedish Knee Arthroplasty Register and the Royal London Hospital.
J Bone Joint Surg [Br] 2000 May;82(4):506-7.

Robertsson O, Lewold S, Knutson K, Lidgren L.
The Swedish Knee Arthroplasty Project.
Acta Orthop Scand 2000 Jun; 71 (1): 7-18.

Robertsson O, Dunbar M J, Knutson K, Lidgren L.
Past incidence and future need for knee arthroplasty in Sweden. A report from the Swedish Knee Arthroplasty Register regarding the affect of past and future population changes on the number of arthroplasties performed.
Acta Orthop Scand 2000; 71 (4): 376-80.

Robertsson O, Dunbar MJ, Knutson K, Lidgren L.
Patient satisfaction after knee arthroplasty: a report on 27,372 knees operated on between 1981 and 1995 in Sweden.
Acta Orthop Scand 2000 Jun; 71 (3): 262-7

Robertsson O.
Unicompartmental arthroplasty. Results in Sweden 1986-1995.
Orthopäde 2000 Jun;29 Suppl 1:S6-8

Sandmark H, Hogstedt C, Vingard E.
Primary osteoarthrosis of the knee in men and women as a result of lifelong physical load from work.
Scand J Work Environ Health. 2000 Feb;26(1):20-5.

Lidgren L, Lohmander L S.
Knäartros [Arthrosis of the knee].
Socialstyrelsens faktadatabas, : 1999.

Robertsson O, Borgquist L, Knutson K, Lewold S, Lidgren L.
Use of unicompartmental instead of tricompartmental prostheses for unicompartmental arthrosis in the knee is a cost-effective alternative. 15,437 primary tricompartmental prostheses were compared with 10,624 primary medial or lateral unicompartmental prostheses.
Acta Orthop Scand 1999; 70 (2): 170-5.

Robertsson O, Dunbar M J, Knutson K, Lewold S, Lidgren L.
Validation of the Swedish Knee Arthroplasty Register: a postal survey regarding 30,376 knees operated on between 1975 and 1995.
Acta Orthop Scand 1999; 70 (5): 467-72.

Robertsson O, Dunbar M J, Knutson K, Lewold S, Lidgren L.
The Swedish Knee Arthroplasty Register: 25 Years Experience.
Bulletin Hospital for Joint Diseases 1999; 58 (3): 133-8.

Sandmark H, Högstedt C, Lewold S, Vingard E.
Osteoarthrosis of the knee in men and women in association with overweight, smoking, and hormone therapy.
Ann Rheum Dis 1999; 58 (3): 151-5.

Sandmark H, Vingard E .
Sports and risk for severe osteoarthrosis of the knee.
Scand J Med Sci Sports 1999; Oct;9 (5): 279-84.

Knutson K.
Arthroplasty and its complications.
In: Osteoarthritis 1st ed (Eds. Brandt K D, Doherty M, Lomander LS).
Oxford University Press 1998; 9.17: 388-402.

Lewold S, Robertsson O, Knutson K, Lidgren L.
Revision of unicompartmental knee arthroplasty: outcome in 1,135 cases from the Swedish Knee Arthroplasty study.
Acta Orthop Scand 1998; 69 (5): 469-74.

Blunn G W, Joshi A B, Minns R J, Lidgren L, Lilley P, Ryd L, Engelbrecht E, Walker P S.
Wear in retrieved condylar knee arthroplasties. A comparison of wear in different designs of 280 retrieved condylar knee prostheses.
J Arthroplasty 1997; 12 (3): 281-90.

Knutson K, Lewold S, Lidgren L, Robertsson O.
Knie-TEP Revisionseingriffe. Lösungsmöglichkeiten bei Beschwerden nach Implantation einer Knieendoprothese
Georg Thieme verlag 1997; ISBN 3-13-104711-9: 107-12

Robertsson O, Knutson K, Lewold S, Goodman S, Lidgren L.
Knee arthroplasty in rheumatoid arthritis. A report from the Swedish Knee Arthroplasty Register on 4,381 primary operations 1985-1995.
Acta Orthop Scand 1997; 68 (6): 545-53.

Robertsson O, Knutson K, Lewold S, Goodman S, Lidgren L.
Selected Scientific Exhibits - Knee arthroplasty in rheumatoid arthritis.
Archives of the American Academy of Orthopaedic Surgeons 1997; 1 (1): 44-50.

Stenström S, Lindstrand A, Lewold S.
Unicompartmental knee arthroplasty with special reference to the Swedish Knee Arthroplasty Register.
Cahiers d´enseignement de la SOFCOT 1997 ; 159-62.

Lewold S, Olsson H, Gustafson P, Rydholm A, Lidgren L.
Overall cancer incidence not increased after prosthetic knee replacement: 14,551 patients followed for 66,622 person-years.
Int J Cancer 1996; 68 (1): 30-3.

Toksvig-Larsen S, Ryd L, Stentström A, Dansgard F, Jonsson K, Robertsson O, Lindstrand A.
The Porous-Coated Anatomic total knee experience. Special emphasis on complications and wear.
J Arthroplasty 1996; 11 (1): 11-7.

Lewold S, Goodman S, Knutson K, Robertsson O, Lidgren L.
Oxford meniscal bearing knee versus the Marmor knee in unicompartmental arthroplasty for arthrosis. A Swedish multicenter survival study.
J Arthroplasty 1995; 10 (6): 722-31.

Knutson K, Lewold S, Robertsson O, Lidgren L.
The Swedish knee arthroplasty register. A nation-wide study of 30,003 knees 1976-1992.
Acta Orthop Scand 1994; 65 (4): 375-86.

Lidgren L.
Low virulent bacteria in joint implant infection.
Zentralblatt für Bakteriologie 1994; Suppl 27: 363-7.

Lewold S, Knutson K, Lidgren L.
Reduced failure rate in knee prosthetic surgery with improved implantation technique.
Clin Orthop 1993; (287): 94-7.

Blunn G W, Joshi A B, Lilley P A, Engelbrecht E, Ryd L, Lidgren L, Hardinge K, Nieder E, Walker P S.
Polyethylene wear in unicondylar knee prostheses. 106 retrieved Marmor, PCA, and St Georg tibial components compared.
Acta Orthop Scand 1992; 63 (3): 247-55.

Goodman S, Lidgren L.
Polyethylene wear in knee arthroplasty. A review.
Acta Orthop Scand 1992; 63 (3): 358-64.

Lindstrand A, Stenstrom A, Lewold S.
Multicenter study of unicompartmental knee revision. PCA, Marmor, and St Georg compared in 3,777 cases of arthrosis.
Acta Orthop Scand 1992; 63 (3): 256-9.

Bengtson S, Knutson K.
The infected knee arthroplasty. A 6-year follow-up of 357 cases.
Acta Orthop Scand 1991; 62 (4): 301-11.

Odenbring S, Egund N, Knutson K, Lindstrand A, Toksvig-Larsen S.
Revision after osteotomy for gonarthrosis. A 10-19-year follow-up of 314 cases.
Acta Orthop Scand 1990; 61 (2): 128-30.

Bengtson S, Knutson K, Lidgren L.
Treatment of infected knee arthroplasty.
Clin Orthop 1989; (245): 173-8.

Bengtson S, Carlsson A, Relander M, Knutsson K, Lidgren L.
Prothèse du genou exposèe - traitement. [An exposed knee prosthesis--treatment].
Rev Chir Orthop Reparatrice Appar Mot 1988; 74 (Suppl 2): 322-3.

Bengtson S, Borgquist L, Lidgren L.
Cost analysis of prophylaxis with antibiotics to prevent infected knee arthroplasty.
British Medical Journal 1989; 299 (6701): 719-20.

Bengtson S, Carlsson A, Relander M, Knutson K, Lidgren L.
Treatment of the exposed knee prosthesis.
Acta Orthop Scand 1987; 58 (6): 662-5.

Bengtson S, Blomgren G, Knutson K, Wigren A, Lidgren L.
Hematogenous infection after knee arthroplasty.
Acta Orthop Scand 1987; 58 (5): 529-34.

Rööser B, Boegard T, Knutson K, Rydholm U, Lidgren L.
Revision knee arthroplasty in rheumatoid arthritis.
Clin Orthop 1987; (219): 169-73.

Bengtson S, Knutson K, Lidgren L.
Revision of infected knee arthroplasty.
Acta Orthop Scand 1986; 57 (6): 489-94.

Knutson K, Lindstrand A, Lidgren L.
Survival of knee arthroplasties. A nation-wide multicentre investigation of 8000 cases.
J Bone Joint Surg (Br) 1986 ; 68 (5): 795-803.

Rosenqvist R, Bylander B, Knutson K, Rydholm U, Rooser B, Egund N, Lidgren L.
Loosening of the porous coating of bicompartmental prostheses in patients with rheumatoid arthritis.
J Bone Joint Surg (Am) 1986; 68 (4): 538-42.

Knutson K, Lindstrand A, Lidgren L.
Arthrodesis for failed knee arthroplasty. A report of 20 cases.
J Bone Joint Surg (Br) 1985; 67 (1): 47-52.

Knutson K, Tjörnstrand B, Lidgren L.
Survival of knee arthroplasties for rheumatoid arthritis.
Acta Orthop Scand 1985; 56 (5): 422-5.

Rydholm U, Boegard T, Lidgren L.
Total knee replacement in juvenile chronic arthritis.
Scand J Rheumatol 1985; 14 (4): 329-35.

Tjörnstrand B, Lidgren L.
Fracture of the knee endoprosthesis. Report of three cases of tibial component failure.
Acta Orthop Scand 1985; 56 (2): 124-6.

Boegard T, Brattström H, Lidgren L.
Seventy-four Attenborough knee replacements for rheumatoid arthritis. A clinical and radiographic study.
Acta Orthop Scand, 55(2): 166-71, 1984.

Knutson K, Bodelind B, Lidgren L.
Stability of external fixators used for knee arthrodesis after failed knee arthroplasty.
Clin Orthop 1984; (186): 90-5.

Knutson K, Hovelius L, Lindstrand A, Lidgren L.
Arthrodesis after failed knee arthroplasty. A nationwide multicenter investigation of 91 cases.
Clin Orthop 1984; (191): 202-11.

Knutson K, Leden I, Sturfelt G, Rosen I, Lidgren L.
Nerve palsy after knee arthroplasty in patients with rheumatoid arthritis.
Scand J Rheumatol 1983; 12 (3): 201-5.

Knutson K, Lidgren L.
Arthrodesis after infected knee arthroplasty using an intramedullary nail. Reports of four cases.
Arch Orthop Trauma Surg 1982; 100 (1): 49-53.

Blader S, Knutson K, Surin V.
[Swedish experience with total endoprostheses of the knee (author's transl)].
Acta Chir Orthop Traumatol Cech 1981; 48 (3): 234-41.

Knutson K, Jonsson G, Langer Andersen J, Lárusdottir H, Lidgren L.
Deformation and loosening of the tibial component in knee arthroplasty with unicompartmental endoprostheses.
Acta Orthop Scand 1981; 52 (6): 667-73.

Jonsson G, Knutson K, Lidgren L, Lindstrand A.
Knäartrodes [Knee joint arthrodesis].
Läkartidningen 1980; 77 (22): 2115-7.

The Swedish Knee Arthroplasty Register

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