Akademiska sjukhuset
Alingsås
Arvika
Bollnäs - Söderhamn
Borås
Carlanderska
Danderyd
Eksjö-Nässjö
Elisabethsjukhuset
Enköping
Eskilstuna
Falköping
Falun
Frölunda Spec. Sjh.
Gothenburg Med. Center
Gällivare
Gävle
Halmstad
Helsingborg
Huddinge
Hudiksvall
Hässleholm/Kristianstad
Jönköping
Kalix
Kalmar
Karlshamn
Karlskoga
Karlskrona
Karlstad
Karolinska
Kullbergska
Kungsbacka
Kungälv
Köping
Landskrona
Lidköping
Lindesberg
Linköping
Ljungby
Lund
Lycksele
Löwenströmska
Malmö
Mora
Motala
Movement Halmstad
Mölndal
Nacka / Proxima
Norrköping
Norrtälje
Nyköping
Ortop.Huset, Sthlm
Oskarshamn
Piteå
S:t Göran
Sabbatsberg
Sahlgrenska
Sergelkliniken Gbg
Simrishamn
Skellefteå
Skene
Skövde
Sollefteå
Sophiahemmet
Sunderby
Sundsvall
Södersjukhuset
Södertälje
Torsby
Trelleborg
Uddevalla
Umeå
Varberg
Visby
Värnamo
Västervik
Västerås
Växjö
Ystad
Ängelholm
Örebro
Örnsköldsvik
Östersund
Östra sjukhuset

30 year anniversary

Annual Report 2005

The Swedish Knee Arthroplasty Register

Dept. of Orthopedics, Lund University Hospital

The Swedish Knee Arthroplasty Register for 30 years

This 2005 annual report concerns data reported during 2004 and is based on the content of the register as of October 1st 2005.

In 1975, at the annual meeting of the Swedish Orthopedic Association in Uppsala, about 20 surgeons gathered and decided to start a voluntary multicenter registration of knee arthroplasties being inserted. Thus, this year we celebrate our 30 year anniversary.

In the beginning, knee-joint replacement was an unusual type of surgery, mainly being reserved for the minority of patients with severe joint destruction leading to a high degree of deformity and invalidity. For this new type of surgery it was initially decided to collect a large amount of information including pre- and postoperative evaluation of x-ray pictures as well as clinical parameters. However, the immense improvement in life-quality by the operation quickly became a success and led to a rapid dispersion of the surgical technique to numerous hospitals and surgeons. Thus, the ambitious collection of data quickly became impractical which resulted in a change of routines in which the number of registered parameters was reduced to a minimum. For primary arthroplasties the information was to be provided on an one-page form but for revisions the form had to be accompanied by a copy of the operation report and discharge letter in order to make it possible to classify the reason(s) for failure. However, as the focus of interest has turned on patient-benefit in recent years, the register has tried to supplement it's basic information with health data gathered through postal surveys.

During the first year 24 hospitals reported to the register. In 1980 the number was 47, 1985 51, 1990 66 and in 1996 there were 82 reporting hospitals. In the late nineties the number of reporting units reduced somewhat due to merging of hospitals but in the last couple of years 83 hospitals have reported to the register. All Swedish units routinely performing knee arthroplasty operations participate in the project. In 2004, 9,170 primary arthroplasties were reported which was a 10% increase as compared to 2003 while the number of reported revisions increased by 3% to 603.

The procedures for reporting, data handling and analyses have changed considerably during the years. In the beginning the data was stored on a university mainframe computer in the late eighties the material was transferred to a PC at the orthopedic department and software developed allowing for handling and processing of data. Initially the information was registered centrally but later the Registry opted for decentralized registration for again turning to central registration because of cost-, efficacy- and security issues. A SQL database is now up and running that allows for individual encrypted access. This implies that the different units now can use the WWW to access their own material for analysis and reporting.

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 2004 as well as analyses covering the 10-year period 1994-2003. The third part is specific for each reporting unit and contains lists with information regarding all the operations reported by the unit in 2004. The first and second part are available for downloading from our web site: www.ort.lu.se/knee/.

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 feel that it is important that information about the report is passed on at hospital meetings so that the content can be discussed and analyzed. According to an agreement made at an earlier Arlanda meeting (with contact surgeons), we now for the first time openly render account for the risk ratios of individual units. The results reflect the risk of revision for cemented TKA inserted 1994-2003 in patients with osteoarthritis.

By close cooperation with statisticians from the start, the Knee Register has always exerted a great effort in providing sound data analyses. Information from the register has regularly being published in leading scientific journals and during the last 5-year period the register has been presented on 6 continents around the world.

We find it again appropriate to remind you that the Swedish Knee Arthroplasty Register is a prospective project and that revisions reported to the register are only accepted if the primary operation previously was reported according to prevalent routines. Thus, if a primary operation is discovered as it becomes a 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 when all primaries performed during a time period are reported collectively.

In Sweden and internationally there is an increased focusing on how surgical experience may affect outcome. The Swedish health authorities have initiated an investigation to determine if there is evidence for applying volume-limits for certain types of orthopedic surgery.

Although the risk of infection has lessened over the years, the problem is still substantial. During 1994-2003 the 10-year cumulative risk of becoming revised for infection was 1.0% for patients with osteoarthritis and 1.6% for patients with rheumatoid arthritis. It seems to be a clear need for an increased centralization regarding treatment of infected knee arthroplasties as this complication all to often ends in amputation or arthrodesis.

We at the knee register center in Lund want to thank you for your cooperation during the last year and ask you to analyze and circulate the presented information.

Lund, November 1st, 2005
On behalf of the Swedish Knee Arthroplasty Register.

Lars Lidgren Kaj Knutson Otto Robertsson

CONTENTS

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 (incl. 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.

All the Scandinavian registers do not use this stringent definition. For example the Finnish National Implant Register defines any reoperation as being a revision. However, in their reports, the additional operations account for only about 3 percent of the revision surgery.

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.

Patellar 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 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 superstabilized 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 the above mentioned camshaft construction.

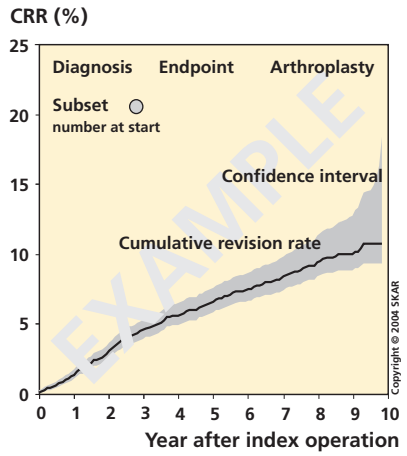
Filling in the Knee Register form

The Knee Register uses a form that it recommends to be filled in during the operation, (by a nurse or other attending staff). The implant stickers (containing the Part No's and Lot No's) for all used implants are to be affixed to the form. Besides the ID of the patient, the date of operation, diagnosis, side operated, brand of cement and cementing of components has to be filled in. Information whether a mini-arthrotomy was used must be specified. Information regarding the operating surgeon is voluntary. Forms are sent to Lund (once a month is recommended) where the data is computerized. In our opinion, this procedure has considerable advantages such as a minimal workload for the participating units and the most correct information with the least risk of wrong coding. Furthermore, it allows the staff of the registry to check unknown Part No's during input.

How the Knee 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.

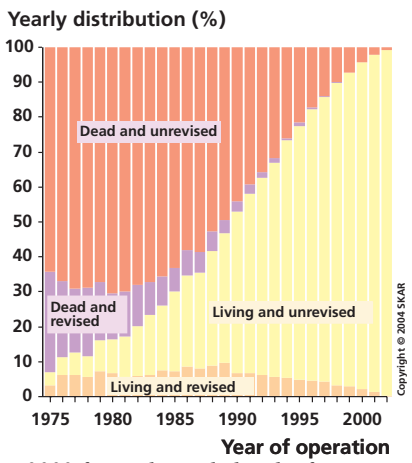
With increasing observation time the fraction of deceased patients increases (see figure below). These patients are not disregarded because they were at risk of becoming revised during their lifetime and are thus allowed to deliver data for the period they lived. The probability for each revision is 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.



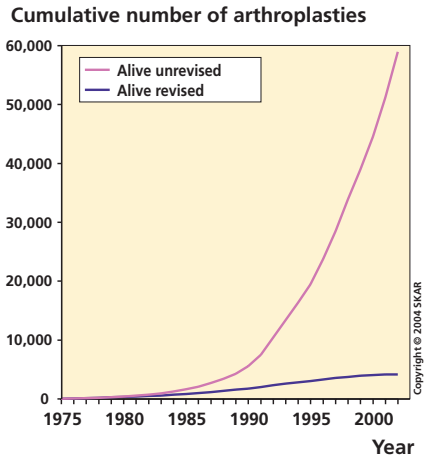
CRR curve example.

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.

It is important to note that as the individual patient also is at risk of dying, the real percentage of revision is lower than CRR. As the figure left below shows, half of the patients alive that were operated in 1975 have been revised but only one third of the patients that were operated at the time.



The status in 2003 for each yearly batch of patients operated since 1975.

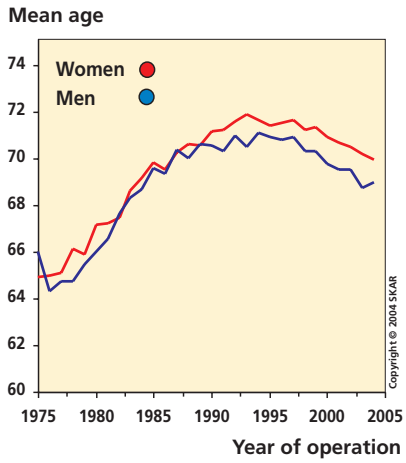


The cumulative number of revised and unrevised patients alive in 2003.

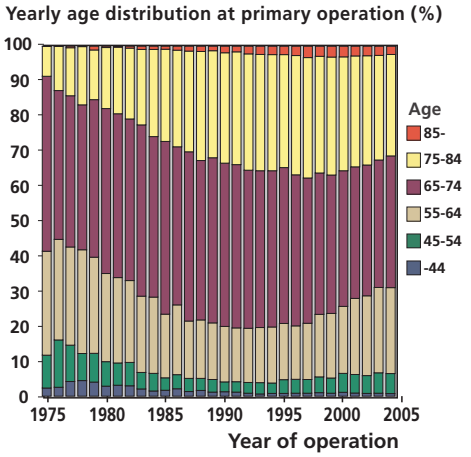
Age distribution and prevalence

Between 1975 and 1995 the mean age at primary operation increased from 66 years to almost 72 years. The main reason was the relative large increase in number of operations for the older age groups. Probable explanations are improvements in anesthetic techniques, which have increased the safety for older patients as well as a changed age distribution of the population. Since 1994 the proportion of younger patients having arthroplasty has increased again, why the mean age again has started to decrease. This can be explained by an increased confidence in the operation technique.

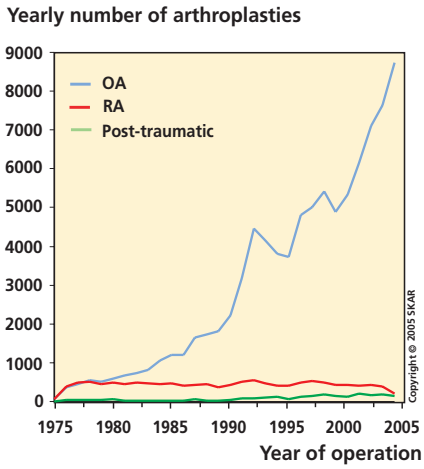
As the picture to the right shows, the real rise in number of operations started in the beginning of the eighties. This was mainly caused by a large increase in the number of operations for osteoarthritis. Operations for rheumatoid arthritis have become marginally fewer while operations for post traumatic conditions have only increased slightly.



The mean age of patients increased until 1994 when it started to decrease again. Therefore, when comparing the rate of revision in series of patients operated during different time periods, Cox regression or separate analyses for different age groups have to be performed.



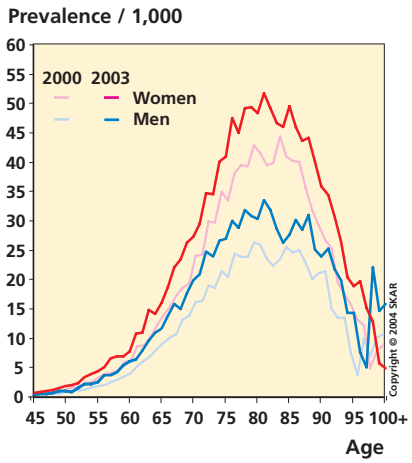
The relative percentage of older age groups increased until the mid-nineties after which the relative proportion of younger increased again.



The yearly number of arthroplasties for different diagnoses

The large increase in number of operations causes a rise in the number of patients walking around with knee implants in the society. The picture below shows the prevalence in 2003 i.e. the number of patients per 1,000 inhabitants in different age groups that had a knee implant. The prevalence for both men and women peaks around 80 years of age. The decrease after 85 years of age is probably sign of that this group is provided below its actual needs (assuming that patients having arthroplasty don't have an increased mortality rate).

Compared to the prevalence in 2002 the influx seems to be insignificant after 87 years of age. The increase in prevalence for the oldest age groups between 2000 and 2003 is caused by ageing of previously operated patients by three years. Thus, it seems that within few years there will be a steady state among the elderly in which at least one in twenty women has a knee implant. Further increase is still possible through widening of indications.

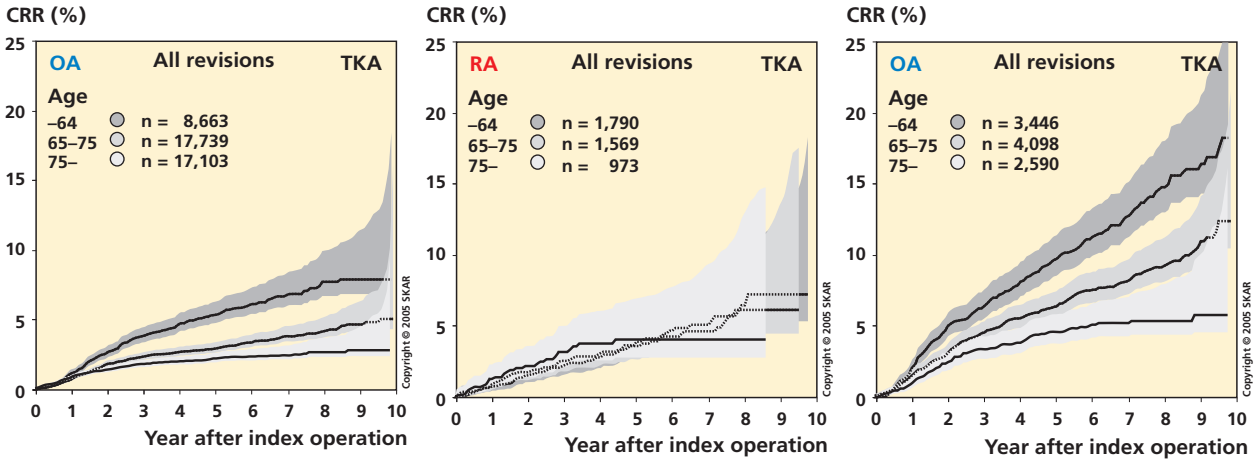


The prevalence of knee arthroplasty in 2000 and 2003. Accordingly, every twentieth woman has a knee arthroplasty

Factors that influence the revision rate

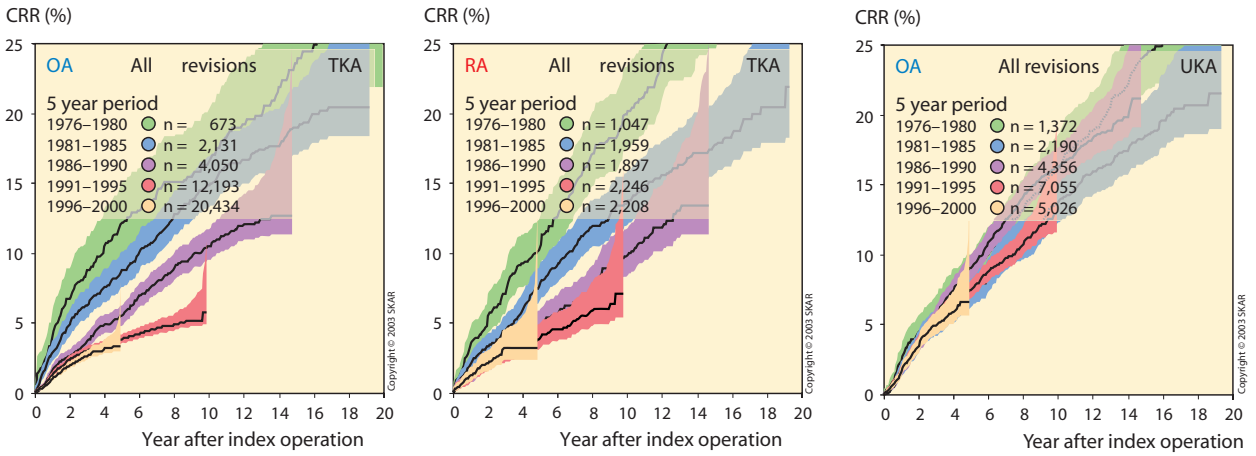
Primary disease – Early it became evident that patients with different primary disease, e.g. rheumatoid arthritis (RA) and osteoarthritis (OA) followed a different postoperative course with differences in the revision rate. Therefore the registry has always produced separate curves for these diagnoses. The differences in CRR between OA and RA treated with unicompartmental arthroplasty (UKA) demonstrate the importance of this.

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 have a higher level of activity, higher demand regarding 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 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.

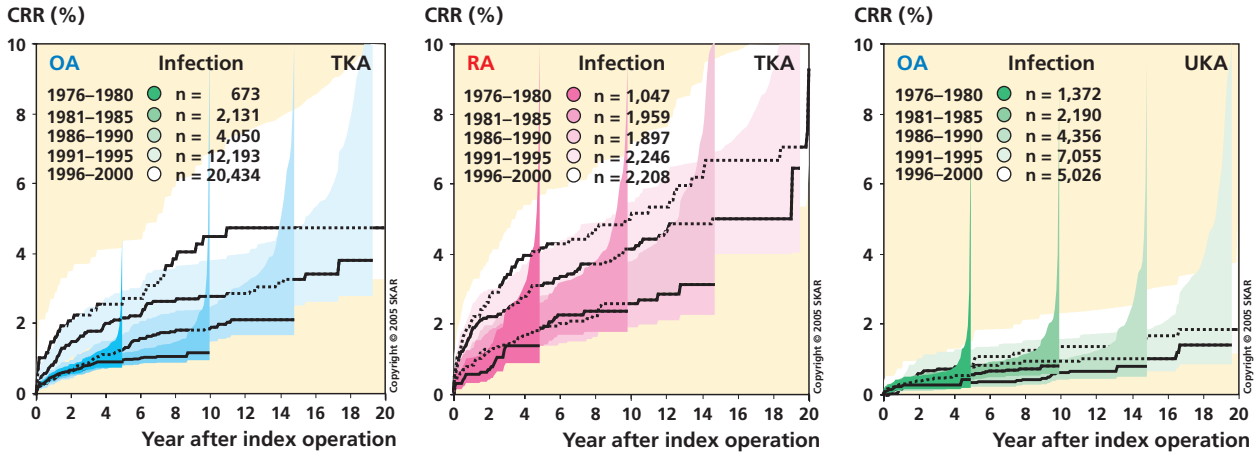


The differences in CRR (1994–2003) between the 3 age groups <65, 65–75, >75 were significant for OA operated on with TKA and UKA but nor for RA operated on with TKA.

Year of operation – Over the years the risk of revision has lessened for TKA. The reduction can't only be explained by an increase in operations of the elderly. 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 which has caused us to 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



Reduction in the revision rate with time was seen for TKA but not UKA when the time periods 1976–1980 (green), 1981–1985 (Blue), 1986–1990 (violet), 1991–1995 (red) and 1996–2000 (orange) were compared.



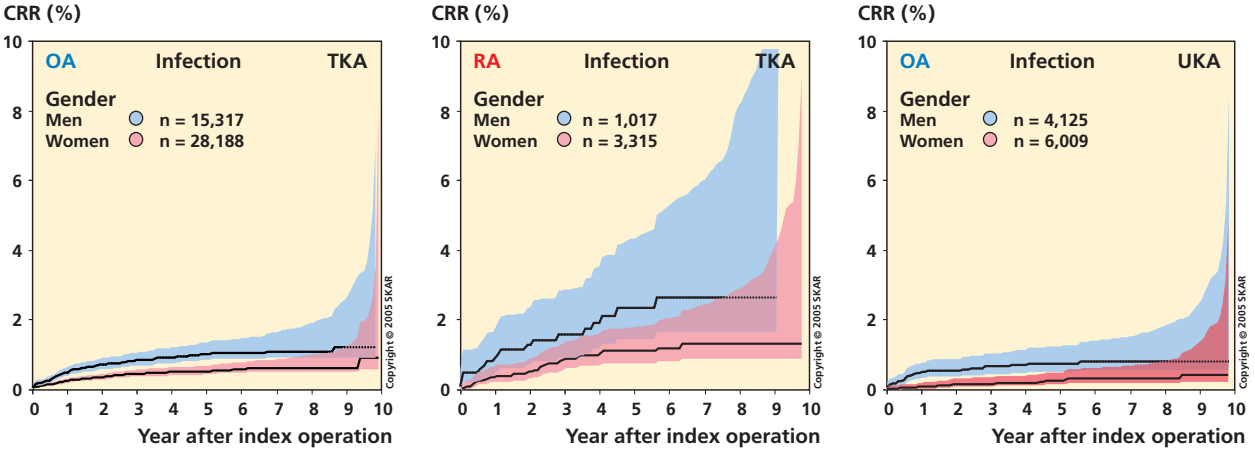
When the different time periods 1976–1980, 1981–1985, 1986–1990, 1991–1995 and 1996–2000 were compared with respect to CRR, using only revision for infection as end-point, we found improvement with time for both TKA and UKA.

is caused by some newer models that have shown inferior results. Furthermore, the number of UKA operations has decreased which may have reduced the surgical routine which has been found to be of importance. Further, changes in implants, instruments, surgical technique and approach may have resulted in a new or prolonged learning curve.

When the Knee Register accounts for the risk of revision for infection, this means the risk of any revision after the primary operation being performed for infection. With 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.

Gender – Analyzing OA in the period 1994-2003 (Cox regression), no significant difference in CRR was found between the sexes, whether it was for TKA or UKA. Overall there is neither any significant difference between the sexes for RA (TKA) although we found a sex difference regarding revision for infection. It is well known that RA patients have a greater risk of infection which is ascribed to the effect of corticosteroid and immunosuppressive medications. However, it is not as obvious why men more often are having their knee arthroplasties revised for infection than women.

Either men are more prone to infections or they more often than women are being offered revision surgery for their infected knee implants. The latter is contradicted by the fact that in other context men also have been found more susceptible to infections than women.

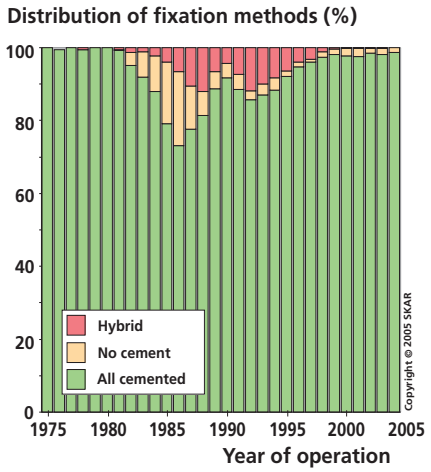


Using the end-point revision for infection, the CRR (1994–2003) shows in TKA for OA and RA that men are more affected than women (RR 2.0 and 2.1). UKA with its smaller implant size does better than the larger TKA but even in UKA men have 2.7 times the risk of women of becoming revised for infection. In TKA, patients with RA are more affected than those with OA (RR 2.0).

Type of implant – Hinges, linked and stabilized implants are mainly used for revisions or especially difficult primary cases. In uncomplicated primary cases a TKA is used and if the disease is unicompartmental an UKA may do. Although UKA has been found to have a substantially higher CRR than TKA (see figures on page 4), the number of serious complications such as infection/arthrodesis/amputation is much less. If a primary UKA is revised to a TKA at a later time, 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. As the UKA implants are less expensive than the TKA, the increased number of revisions due to their use has not resulted in additional cost. When asked, patients with TKA and UKA seem equally satisfied with their knees. In summary we conclude that it cannot be considered wrong to use UKA implants in OA patients with unicompartmental disease.

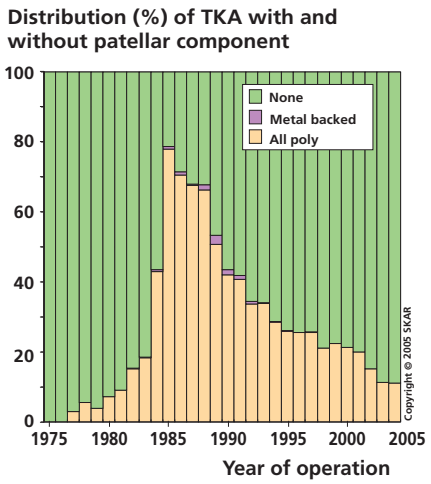
Implant model (brand) – The model is the factor that generates most interest and most often is related to the result after knee arthroplasty. As can be suspected from what has been said, the results are not only affected by the model or design of the prosthesis. In Sweden the most commonly used implants have also been those with the lowest CRR. This can be due to a good design but also due to the surgical routine as the same implant is often used. Models that have had considerably inferior results most often have been withdrawn from the Swedish market. An exception is the Oxford implant that initially had inferior results but that with modification and increased surgical routine improved results and recovered.

Use of bone-cement – As can be seen from the figure on the right, bone-cement has been used in the majority of arthroplasties that have been performed in recent years. We have previously found that cement free insertion of the tibial component is associated with an increased risk of revision. This is in agreement with the results of the Finnish implant register that also found substantially increased risk of revision for uncemented implants. In recent years the number of uncemented implants has become so low that there no longer is possible to do meaningful statistical comparisons.



The figure shows the yearly distribution for cemented, uncemented and hybrid fixation of components.

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 the 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 2004 a button was only used in good 10% of TKA cases. At the same time the curves have turned to the advantage of the patellar button (see page 9)



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

Type of operation and implants in 2004

9,170 primary arthroplasties reported in 2004, by type and region

TYP	Stockholm Gotland	Uppsala Örebro	Southeast	South	West	North
Hinges	–	–	–	–	–	–
Linked	2	17	2	3	4	2
TKA	1,568	1,835	985	1,606	1,276	964
UKA medial	170	218	70	138	236	43
UKA lateral	8	–	2	–	5	–
Patella	4	1	1	6	4	–
Total:	1,752	2,071	1,060	1,753	1,525	1,009

Implants for primary TKA in 2004

	Number	Percent
PFC Sigma	2,871	34.9
NexGen	1,588	19.3
AGC	1,533	18.6
Duracon	987	12.0
F/S MIII	793	9.6
Profix	120	1.5
Kinemax	99	1.2
Natural II	73	0.9
LCS	37	0.4
PFC Rot platf	43	0.5
Scan	16	0.2
Other	74	0.8
Total :	8,234	100

Implants for primary UKA in 2004

	Number	Percent
Link Uni	410	46.1
MillerGalante Uni	245	27.5
Oxford Uni	176	19.8
Genesis	33	3.7
Preservation	17	1.9
Other	9	1.0
Total :	890	100

All active units reported to the registry during 2004 and although some additional reports may occur later, these are only expected to cause minor changes in the number of operations. As compared to 2003 the number of reported primary arthroplasties increased from 8,327 to 9,170 or by 10%. The increase for TKA was 13% while there was 9% reduction in UKA.

During 2003, 603 revisions were performed of which 115 were secondary revisions. In 369 of the revisions the primary procedure had been a TKA and in 218 cases an UKA. Thus the crude revision rate for TKA becomes 5% and for UKA 22%. One has to take into consideration that the use of primary UKA has been reduced by half in the last 10 years while the use of TKA has more than doubled.

The 3 most common implants for primary TKA in each region in 2004

	Model 1	n	Model 2	n	Model 3	n	Other
Stockholm / Gotland	PFC S	986	F/S MIII	166	Duracon	148	268
Uppsala / Örebro	NexGen	459	AGC	409	PFC S	396	571
Southeast	PFC S	353	NexGen	326	AGC	303	3
South	PFC S	698	Duracon	505	AGC	329	74
West	AGC	371	NexGen	252	PFC S	251	402
North	NexGen	416	PFC S	187	AGC	121	240

The 3 most common implants for primary UKA in each region in 2004

	Model 1	n	Model 2	n	Model 3	n	Other
Stockholm / Gotland	MillerGalante	112	Link	44	Oxford	13	9
Uppsala / Örebro	Link	170	MillerGalante	25	Genesis	15	8
Southeast	Link	32	MillerGalante	21	Genesis	17	2
South	Link	95	Oxford	26	MillerGalante	9	8
West	Oxford	137	MillerGalante	76	Link	28	–
North	Link	41	MillerGalante	2	–	–	–

Bone cement and minimally invasive surgery in 2004

Use of cement in primary surgery during 2004

	Primary TKA		Primary UKA	
No components inserted without cement	8,111		889	
Only the patellar button without cement	11			
The femur- and tibial components without cement	101			
Only the femoral component without cement	4			
Only the tibial component without cement	2			
The femur- and patellar components without cement	1			
The femur-. tibial and patellar components without cement	1			
Information missing	3		1	
Total	8,234		890	
	Number	Percent	Number	Percent
Palacos/Gentamicin	4,395	54.0	565	63.5
Refobacin-Palacos R	3,693	45.4	321	36.1
Palacos	17	0.2	2	0.2
CMW SmartSet GHV	14	0.2	1	0.1
Copal	5	0.1		
Combinations	5	0.1	1	0.1
Information missing	6	0.1		
Total	9	100	890	100
All implanted components without cement	99		0	
Grand Total	8,234		890	

NB Handwriting the type of cement on the reprot 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. During 2004, approximately 1.2% of all TKA were completely without cement (1.8% in 2003) and cement was used in all UKA. The cement type Refobacin-Palacos and the recent Refobacin Bone Cement are packaged by Biomet but are supposed to be identical to the Palacos/Gentamicin brand. Combined these cements were used in 99% of the cemented cases during 2004. As only 1.2% of the TKA were inserted without cement the variation is minimal and statistical comparisons are not meaningful.

We want to remind the surgical units to report the type of bone cement used using the stickers that normally are to be found in the cement packages.

Minimally invasive surgery in UKA

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

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 be less traumatic surgery, quicker rehabilitation and shorter hospital stay.

The popularity of minimally invasive surgery (MIS) for UKA seems to have decreased somewhat. MIS was used in 51% of the UKA cases in 2004 as compared to 58% in 2003. 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.

The type of incision for 890 pimary UKA in 2004

	Standard incision	Mini-incision	Missing
Link Uni	264	142	4
MillerGalante Uni	72	172	1
Oxford Uni	37	136	3
Genesis	33	0	0
EIUS	5	2	0
Preservation Uni	10	5	2
Allegretto	1	0	1
Total	422	457	11

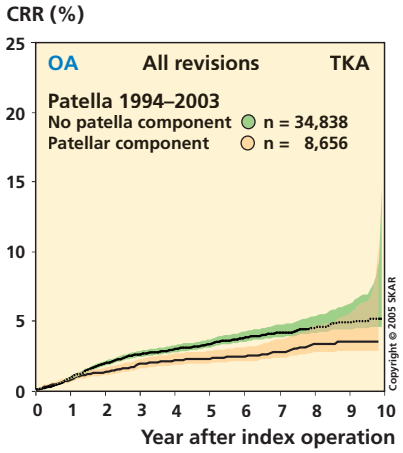
The use of patellar button for TKA during 2004

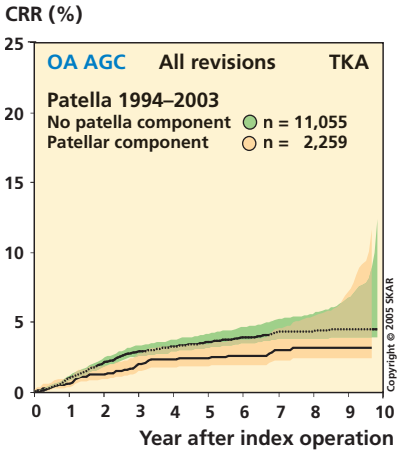
The use of patellar button is heavily dependent on the implant model used. Thus, in primary arthroplasty, surgeons using the Freeman-Samuelson and Kinemax implants commonly resurface the patella while those using the NexGen, LCS (New Jersey) and PFC infrequently do so.

In previous analyses (1988–1997) we found no difference in CRR dependent on the use of patellar button. However, as mentioned in recent reports, this has changed to the advantage of patellar resurfacing. For the analyzed period (1994-2003) we found that the CRR was 1.4 (1.2-1.7) times higher for TKA without a patellar button and if only AGC implants were analyzed, the risk for revision without a patellar button was 1.5 (1.1-2.0) times higher. In RA we found no significant difference (p=0.4 / 0.6) but the material was considerably smaller. The increased frequency of revisions is caused by the need for secondary patellar resurfacing. This in combination with our previous finding that patients that 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.

Use of patellar button with different implants in 2004

	No patellar button	%	Patellar button	%
PFC Sigma	2,709	95.3	133	4.7
NexGen	1,544	97.2	44	2.8
AGC	1,395	91.0	138	9.0
Duracon	887	89.9	100	10.1
Free-Sam MIII	392	49.4	401	50.6
Profix	105	87.5	15	12.5
Natural	58	79.5	15	20.5
Kinemax Plus	53	53.5	46	46.5
PFC rot. platform	43	100.0	0	0.0
LCS	37	100.0	0	0.0
Other	101	86.3	16	13.7
Total	7,324	89.0	908	11.0





The figures show the 10-year CRR for TKA with and without patellar button. On the left all the TKA were analyzed while on the right only the AGC implants. The higher rate of revision for TKA without patellar button is caused by the need for secondary resurfacing with a patellar button.

Implants and revisions during 1994–2003

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

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

Implants for primary TKA in 1994–2003

	Number	Percent
AGC	15,026	30.0
PFC Sigma	8,647	17.3
PFC	2,298	4.6
PFC rot. platform	35	0.1
Free-Sam MIII	6,176	12.4
F/S unspec.	71	0.1
Duracon	5,361	10.7
NexGen	3,612	7.2
Kinemax Plus	2,945	5.9
Scan	2,420	4.8
MillerGalante2	987	2.0
MillerGalante unspec.	57	0.1
AMK	634	1.3
LCS	490	1.0
Profix	395	0.8
Axiom Knee	139	0.3
Natural	70	0.1
Rotaglide	63	0.1
Nuffield	37	0.1
Synatomic	34	0.1
Osteonics	34	0.1
Genesis	28	0.1
PCA-Mod	17	0.0
Other	432	0.9
Total :	50,008	100

Implants for primary UKA in 1994–2003

	Number	Percent
Link-Uni	4,570	43.4
MillerGalante-Uni	2,058	19.5
Marmor	721	6.8
Oxford-Uni	619	5.9
PFC-Uni+S	582	5.5
Duracon-Uni	535	5.1
Brigham	519	4.9
Genesis	416	3.9
Allegretto	266	2.5
Repicci (AARS)	187	1.8
EIUS Uni	37	0.4
Other	27	0.3
Total	10,537	100

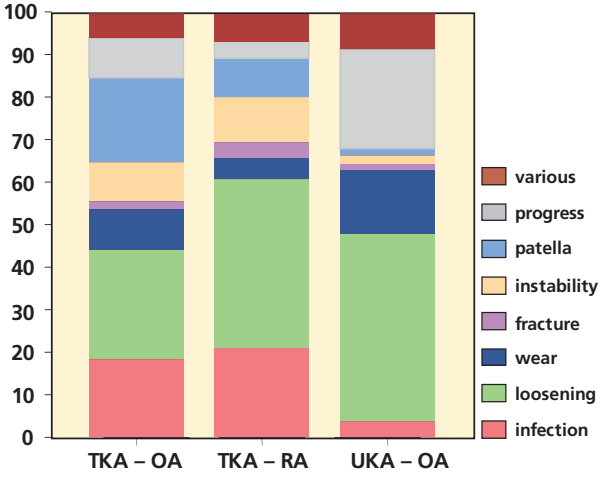
Linked implants (primary) år 1994–2003

	Number	Percent
Rotalink	148	75.9
Kotz	34	17.4
Kinemax Plus rotating hinge	4	2.3
NexGen rotating hinge	3	1.5
Noiles rotating hinge	3	1.5
Other	3	1.5
Total	195	100

Revisions during1994–2003

1,537 revisions of TKA´s for OA, 384 of TKA´s for RA and 1,605 revisions of UKA´s for OA were performed during the 10-year period. The indications for the revisions are shown in the diagram. 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 reasons for revision does not have to reflect the risk of these complications which preferably are evaluated by CRR.

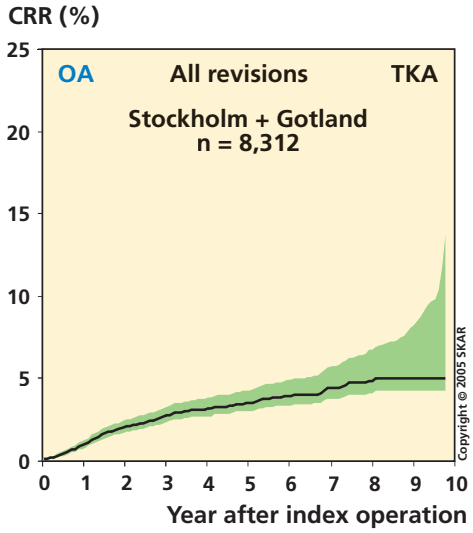
Distribution of indications for revision (%) 1994–2003



Primary TKA implants for OA in the regions during 1994–2003

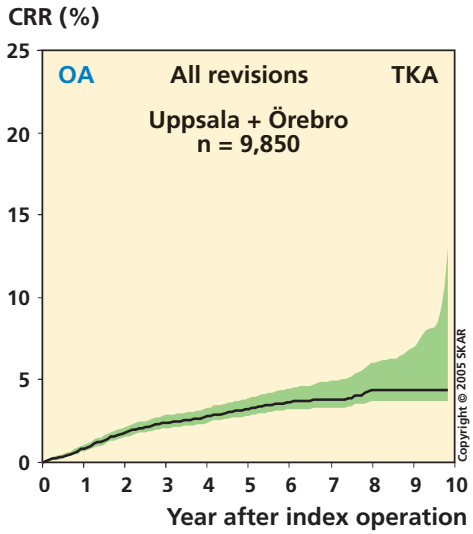
Stockholm + Gotland
Implants for primary TKA in OA 1994–2003

	Number	Percent
PFC Sigma	3,512	42.3
AGC	1,702	20.5
Duracon	1,001	12.0
Kinemax Plus	660	7.9
NexGen	453	5.4
Free-Sam MIII	425	5.1
PFC	395	4.8
AMK	62	0.7
Natural	25	0.5
PFC Rot platf	20	0.3
Genesis	14	0.2
Rotaglide	10	0.2
LCS	10	0.1
Other	23	0.1
Total	8,312	100



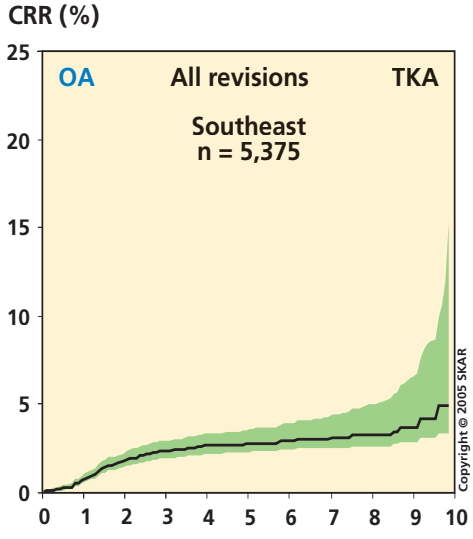
Uppsala-Örebro
Implants for primary TKA in OA 1994–2003

	Number	Percent
AGC	2,735	27.8
Free-Sam MIII	2,689	27.3
Kinemax Plus	1,904	19.3
NexGen	1,020	10.4
PFC Sigma	374	3.8
MillerGalante2	338	3.4
AMK	305	3.1
Scan	239	2.4
PFC	77	0.8
Natural	39	0.4
Duracon	27	0.3
MillerGalante unspec.	24	0.2
Other	79	0.8
Total	9,850	100



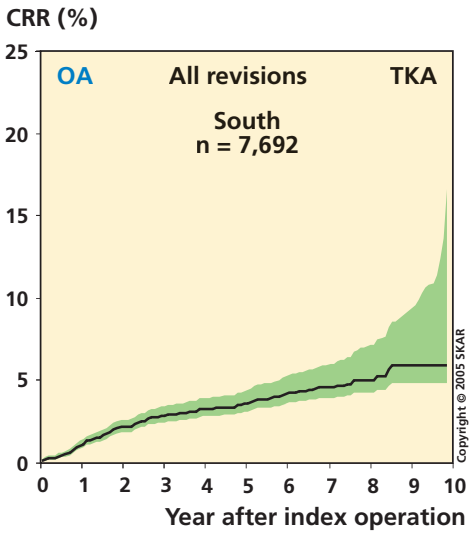
Southeast
Implants for primary TKA in OA 1994–2003

	Number	Percent
AGC	2,078	38.7
NexGen	1,212	22.5
PFC Sigma	973	18.1
MillerGalante2	369	6.9
PFC	356	6.6
Duracon	277	5.2
Scan	12	0.2
PCA-Mod	10	0.2
Other	88	1.6
Total	5,375	100



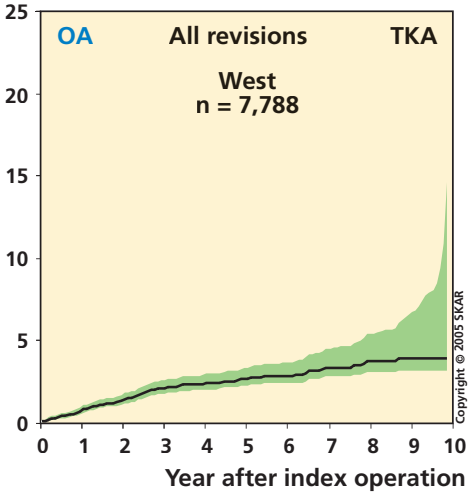
South
Implants for primary TKA in OA 1994–2003

	Number	Percent
Duracon	2,190	28.5
AGC	1,727	22.5
PFC Sigma	1,672	21.7
Scan	1,062	13.8
PFC	639	8.3
Axiom Knee	62	0.8
Free-Sam MIII	60	0.8
Rotaglide	47	0.6
LCS	47	0.6
Nuffield	37	0.5
Osteonics	34	0.4
Synatomic	19	0.2
AMK	13	0.2
Other	83	0.2
Total	7,692	100



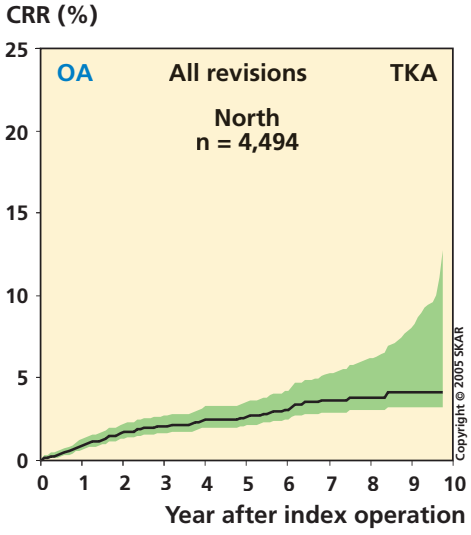
West
Implants for primary TKA in OA 1994–2003

	Number	Percent
AGC	3,309	42.5
Free-Sam MIII	2,004	25.7
Duracon	780	10.0
PFC Sigma	558	7.2
Scan	414	5.3
NexGen	393	5.0
AMK	113	1.5
Axiom Knee	72	0.9
F/S	39	0.5
PFC	33	0.4
MillerGalante2	22	0.3
MillerGalante unspec.	18	0.2
Other	33	0.4
Total	7,788	100



North
Implants for primary TKA in OA 1994–2003

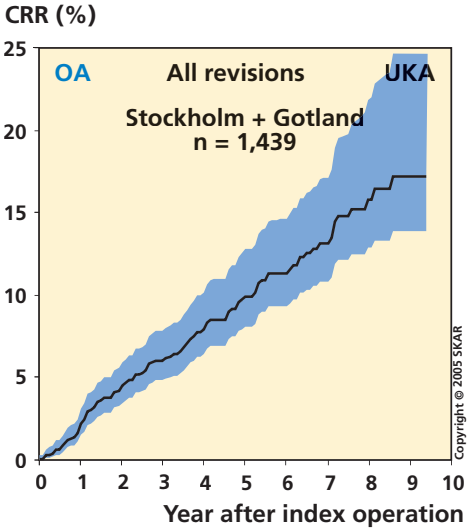
	Number	Percent
AGC	1,766	39.3
PFC Sigma	588	13.1
Duracon	547	12.2
PFC	386	8.6
LCS	359	8.0
Profix	285	6.3
NexGen	185	4.1
Scan	116	2.6
MillerGalante2	86	1.9
Free-Sam MIII	86	1.9
AMK	42	0.9
Other	48	1.1
Total	4,494	100



Implants for primary UKA for OA in the regions during 1994–2003

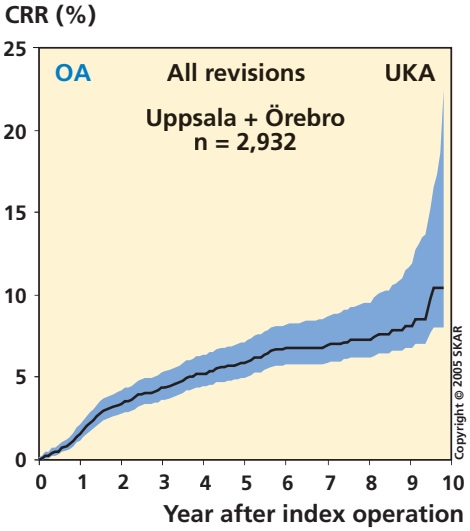
Stockholm + Gotland
Implants for primary UKA in OA 1994–2003

	Number	Percent
MillerGalante-Uni	824	57.3
Brigham	297	20.6
Link-Uni	104	7.2
Oxford-Uni	77	5.4
Genesis	57	4.0
Allegretto	35	2.4
Repicci (AARS)	20	1.4
Other	25	1.7
Total	1,439	100



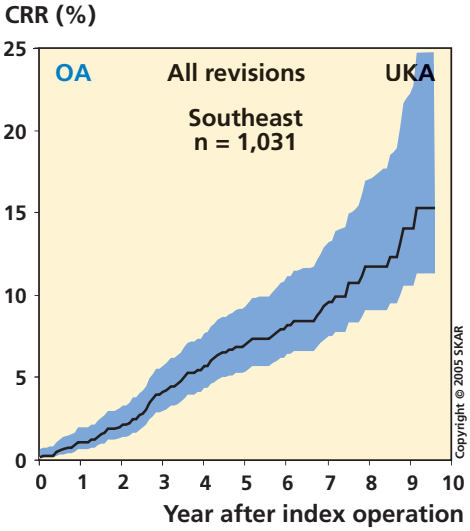
Uppsala-Örebro
Implants for primary UKA in OA 1994–2003

	Number	Percent
Link-Uni	1,821	62.1
Marmor	330	11.3
PFC-Uni+S	272	9.3
St.Georg	157	5.4
Genesis	136	4.6
Duracon-Uni	81	2.8
MillerGalante-Uni	59	2.0
Brigham	27	0.9
Allegretto	24	0.8
Oxford-Uni	14	0.5
Other	11	0.4
Total	2,932	100



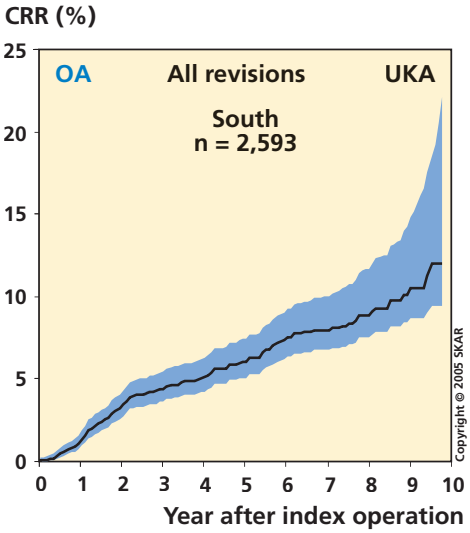
Southeast
Implants for primary UKA in OA 1994–2003

	Number	Percent
Link-Uni	262	25.4
Marmor	160	15.5
Genesis	154	14.9
Duracon-Uni	128	12.4
Brigham	101	9.8
MillerGalante-Uni	80	7.8
Allegretto	64	6.2
PFC-Uni+S	63	6.1
Oxford-Uni	15	1.5
Other	4	0.4
Total	1,031	100



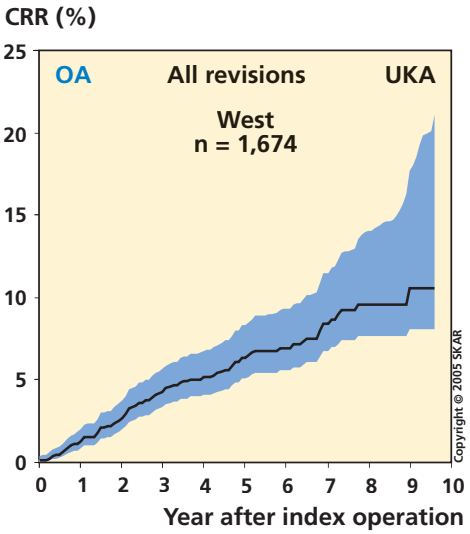
South
Implants for primary UKA in OA 1994–2003

	Number	Percent
Link-Uni	1,370	52.8
Marmor	196	7.6
PFC-Uni+S	185	7.1
Duracon-Uni	183	7.1
MillerGalante-Uni	167	6.4
Oxford-Uni	119	4.6
Allegretto	118	4.6
Repicci (AARS)	90	3.5
Brigham	73	2.8
Genesis	56	2.2
EIUS Uni	31	1.2
Other	5	0.2
Total	2,593	100



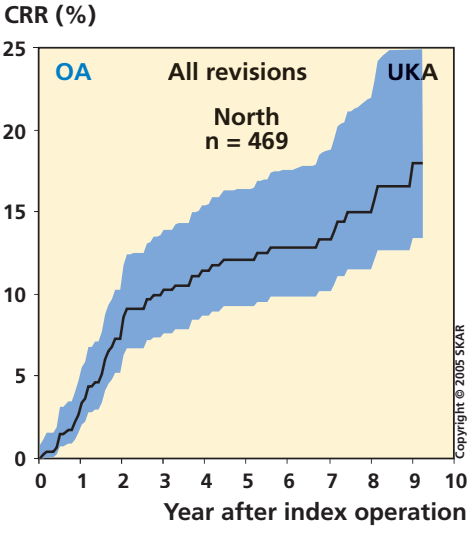
West
Implants for primary UKA in OA 1994–2003

	Number	Percent
MillerGalante-Uni	783	46.8
Oxford-Uni	351	21.0
Link-Uni	342	20.4
Duracon-Uni	93	5.6
Repicci (AARS)	71	4.2
Allegretto	17	1.0
St.Georg	12	0.7
Other	5	0.3
Total	1,694	100



North
Implants for primary UKA in OA 1994–2003

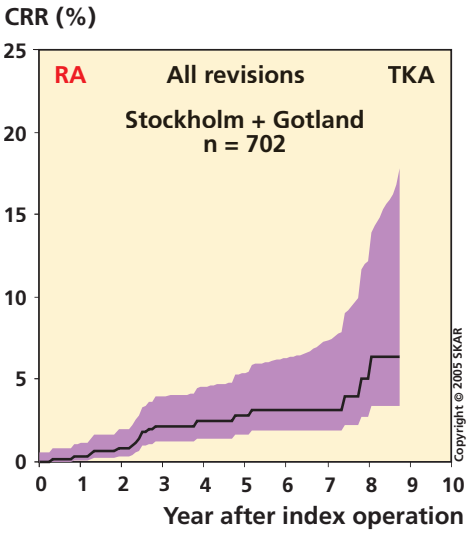
	Number	Percent
Link-Uni	325	69.3
MillerGalante-Uni	66	14.1
St.Georg	23	4.9
PFC-Uni+S	20	4.3
Oxford-Uni	15	3.2
Duracon-Uni	13	2.8
Other	7	1.5
Total	469	100



Primary TKA implants for RA in the regions during 1994–2003

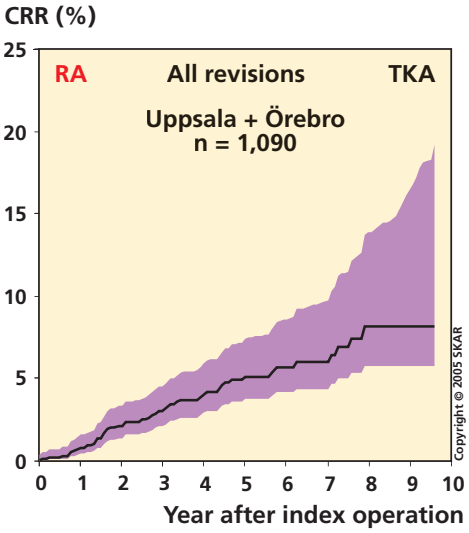
Stockholm + Gotland
Implants for primary TKA in RA 1994–2003

	Number	Percent
PFC Sigma	240	34.2
AGC	213	30.3
Duracon	113	16.1
Kinemax Plus	47	6.7
PFC	42	6.0
Free-Sam MIII	14	2.0
Other	33	4.7
Total	702	100



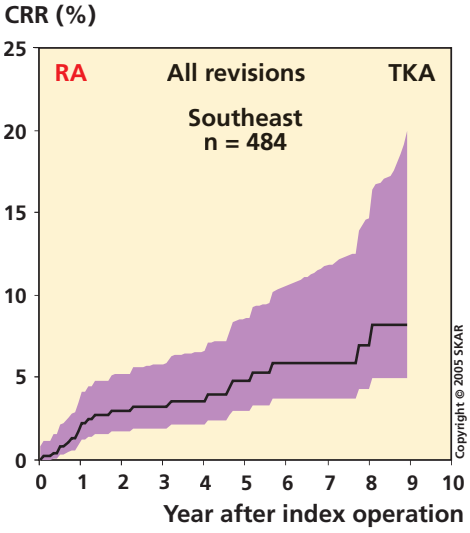
Uppsala-Örebro
Implants for primary TKA in RA 1994–2003

	Number	Percent
Free-Sam MIII	336	30.8
AGC	262	24.0
Kinemax Plus	214	19.6
Scan	96	8.8
NexGen	62	5.7
MillerGalante2	52	4.8
PFC Sigma	15	1.4
AMK	15	1.4
PFC	13	1.2
Other	25	2.3
Total	1,090	100



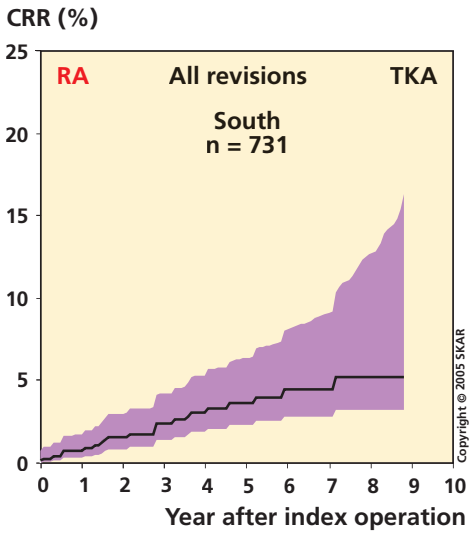
Southeast
Implants for primary TKA in RA 1994–2003

	Number	Percent
AGC	175	36.2
NexGen	116	24.0
PFC Sigma	60	12.4
PFC	57	11.8
MillerGalante2	33	6.8
Duracon	29	6.0
Other	14	2.9
Total	484	100



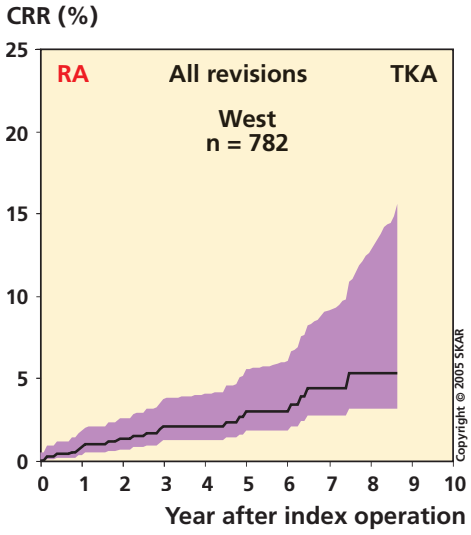
South
Implants for primary TKA in RA 1994–2003

	Number	Percent
Scan	266	36.4
AGC	120	16.4
PFC	107	14.6
PFC Sigma	103	14.1
Duracon	96	13.1
Synatomic	15	2.1
Other	24	3.3
Total	731	100



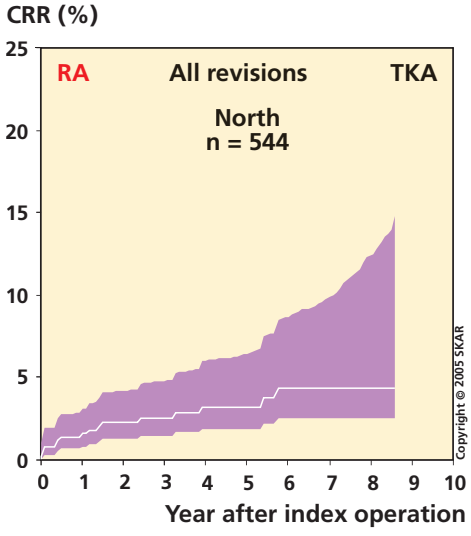
West
Implants for primary TKA in RA 1994–2003

	Number	Percent
AGC	292	37.3
Free-Sam MIII	268	34.3
Scan	86	11.0
Duracon	45	5.8
PFC Sigma	36	4.6
AMK	21	2.7
NexGen	12	1.5
Other	22	2.8
Total	782	100



North
Implants for primary TKA in RA 1994–2003

	Number	Percent
AGC	143	26.3
Duracon	96	17.6
PFC	74	13.6
PFC Sigma	73	13.4
Profix	45	8.3
MillerGalante2	29	5.3
LCS	27	5.0
NexGen	15	2.8
Scan	10	1.8
Other	32	5.9
Total	544	100



The relative risc for implants used in primary arthroplasty during 1994–2003

The registry typically uses the latest 10-year period available for analysis when presenting the results of relatively modern implant types with a reasonable long-term follow-up.

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.

If the use of patellar button is primarly deliberately avoided with a preparedness for a secondary resurfacing of the patella if needed, this will increase the risk of revision. Therefore, we have decided to also account for OA/TKA separately when used with and without a patellar button (see next page).

On the following pages are CRR curves for TKA and UKA implants used for OA. As the table below shows, there were no significant differences for the various models when used in RA why we produced no curves.

For TKA it can be noted that those implants having significantly higher risk of revision than the reference implant AGC have not been used in 2004. The same is true for the UKA except for MillerGalante which now for the first time has a higher risk than the reference implant Link. We have tried to analyze the effect of mini invasive surgery on the UKA short-time results and found that it seems that MIS causes a renewed learning phase which may be shortened if the surgeons are trained before they start using the method. However, it must be emphasized that the effects of MIS on the long-term results are still unclear.

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

OA / TKA	n	p-value	RR	95% CI
AGC	13,317		ref.	
PFC–Sigma	7,693	0.92	0.99	0.79–1.24
PFC	1,885	0.00	1.41	1.12–1.77
F/S MIII	5,265	0.00	0.66	0.53–0.84
Duracon	4,807	0.34	0.90	0.72–1.12
NexGen	3,267	0.00	0.39	0.24–0.61
Kinemax	2,579	0.44	1.10	0.86–1.40
Scan	1,844	0.13	1.22	0.94–1.58
MillerGalante II	816	0.06	1.37	0.99–1.90
AMK	542	0.03	1.53	1.04–2.25
LCS	418	0.86	0.95	0.53–1.69
Profix	292	0.07	0.28	0.07–1.11
Axiom	138	0.06	1.87	0.97–3.63
Other	642	0.81	0.94	0.58–1.53
Gender (male is ref.)		0.14	0.91	0.80–1.03
Age (per year)		0.00	0.96	0.95–0.96
Year of op. (per year)		0.12	0.98	0.95–1.01

RA / TKA	n	p–value	RR	95% CI
AGC	1,205		ref.	
PFC–Sigma	546	0.15	0.54	0.24–1.24
PFC	293	0.72	1.11	0.63–1.97
F/S MIII	622	0.41	0.80	0.47–1.35
Duracon	380	0.70	0.88	0.47–1.67
NexGen	216	0.24	0.43	0.10–1.78
Kinemax	261	0.16	1.49	0.85–2.59
Scan	459	0.36	0.76	0.43–1.37
MillerGalante II	115	0.56	1.27	0.57–2.83
AMK	46	0.95	0.00	
LCS	30	0.97	0.00	
Profix	46	0.97	0.00	
Other	113	0.35	0.51	0.12–2.10
Gender (male is ref.)		0.26	0.81	0.56–1.17
Age (per year)		0.41	1.01	0.99–1.02
Year of op. (per year)		0.71	1.02	0.93–1.10

OA / UKA	n	p–value	RR	95% CI
Link–Uni	4,414		ref.	
MillerGalante	1,977	0.01	1.36	1.07–1.71
Marmor/Richards	698	0.01	1.47	1.12–1.93
Oxford	591	0.96	0.99	0.64–1.52
PFC	549	0.00	1.89	1.43–2.50
Duracon	507	0.01	1.48	1.08–2.04
Brigham	498	0.04	1.40	1.02–1.94
Genesis	403	0.45	1.20	0.75–1.90
Allegretto	258	0.13	1.37	0.91–2.08
Repicci (AARS)	181	0.00	2.21	1.49–3.29
Other	58	0.94	1.08	0.15–7.72
Gender (male is ref.)		0.45	1.06	0.91–1.24
Age (per year)		0.00	0.95	0.95–0.96
Year of op. (per year)		0.62	0.99	0.95–1.03

The Miller-Galante unspec and the St. Georg have disappeared as compared to last years report.

No new implants have been introduced in such numbers that they can be analyzed.

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

The risk of revision (RR) with 95% confidence intervals (TKA/OA), without and with patellar component respectively. The table below uses F/S MIII as reference but that implant is most commonly used with a patellar button.

Without patellar button OA / TKA	n	p–value	RR	95% CI
AGC	11,055		ref.	
PFC–Sigma	7,010	0.96	0.99	0.79–1.26
PFC	1,695	0.04	1.30	1.02–1.65
F/S MIII	1,074	0.57	0.87	0.55–1.39
Duracon	4,457	0.15	0.84	0.67–1.06
NexGen	3,197	0.00	0.38	0.24–0.60
Kinemax	2,049	0.58	1.08	0.83–1.40
Scan	1,766	0.50	1.10	0.84–1.44
MillerGalante II	768	0.13	1.30	0.93–1.82
AMK	478	0.26	1.28	0.83–1.98
LCS	418	0.67	0.88	0.50–1.57
Profix	248	0.06	0.15	0.02–1.10
Axiom	129	0.07	1.86	0.96–3.62
Other	494	0.36	0.76	0.41–1.38
Gender (male is ref.)		0.28	0.93	0.81–1.06
Age (per year)		0.00	0.95	0.95–0.96
Year of op. (per year)		0.08	0.97	0.94–1.00

With patellar button OA / TKA	n	p–value	RR	95% CI
AGC	2,259		ref.	
PFC–Sigma	683	0.55	0.79	0.36–1.71
PFC	190	0.03	2.13	1.08–4.20
F/S MIII	4,191	0.32	0.83	0.58–1.20
Duracon	345	0.48	1.31	0.62–2.77
NexGen	70	0.95	0.00	0.00–6 861
Kinemax	529	0.50	1.22	0.68–2.21
Scan	78	0.02	2.86	1.23–6.67
MillerGalante II	48	0.70	1.32	0.32–5.44
AMK	63	0.00	3.65	1.57–8.50
LCS	0			
Profix	44	0.79	1.30	0.18–9.49
Axiom	9	0.98		
Other	147	0.16	1.84	0.79–4.28
Gender (male is ref.)		0.30	0.85	0.63–1.16
Age (per year)		0.00	0.97	0.96–0.99
Year of op. (per year)		0.65	0.98	0.92–1.05

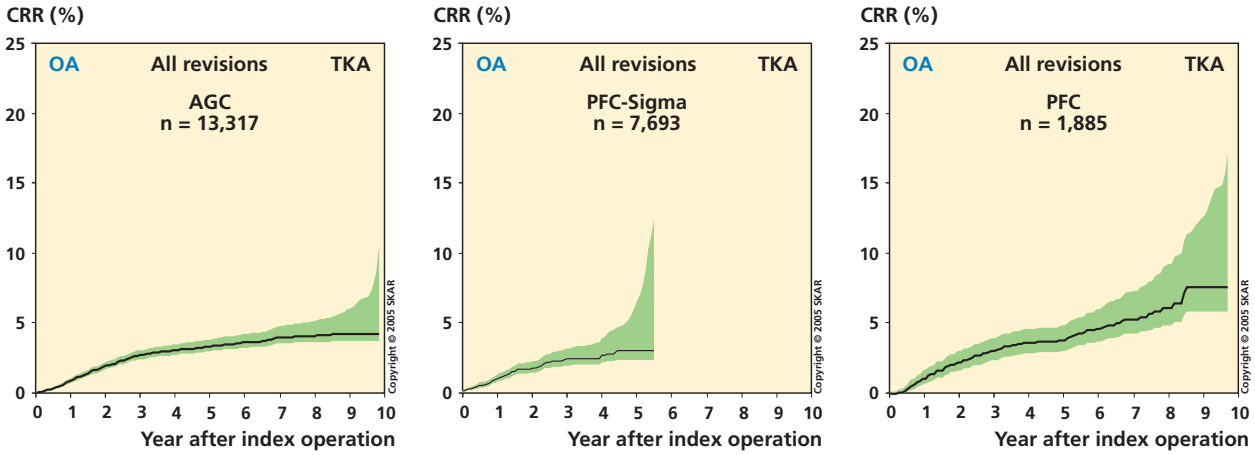
The Miller-Galante unspec and the St. Georg have disappeared as compared to last years report.

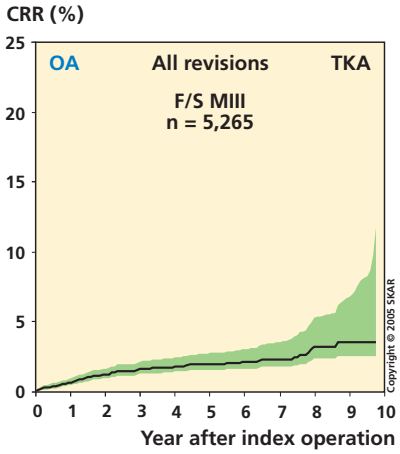
No new implants have been introduced in such numbers that they can be analyzed.

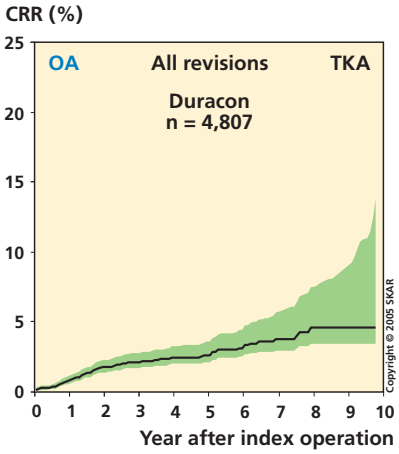
Significant difference with higher risk ratio
Significant difference with lower risk ratio

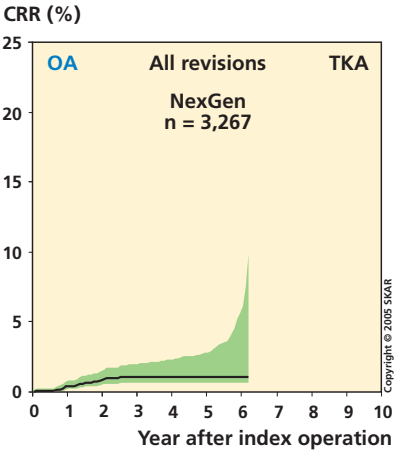
With patellar button (F/S MIII is the ref.) OA / TKA	n	p–value	RR	95% CI
F/S MIII	4,191		ref.	
AGC	2,259	0.32	1.20	0.84–1.73
PFC–Sigma	683	0.89	0.95	0.45–2.00
PFC	190	0.01	2.56	1.32–4.99
Duracon	345	0.22	1.58	0.76–3.28
NexGen	70	0.96		
Kinemax	529	0.19	1.47	0.83–2.62
Scan	78	0.00	3.44	1.48–8.00
MillerGalante II	48	0.53	1.58	0.38–6.55
AMK	63	0.00	4.38	1.89–10.15
LCS	0			
Profix	44	0.66	1.57	0.22–11.34
Axiom	9	0.98	0.00	#VALUE!
Other	147	0.06	2.21	0.96–5.12
Gender (male is ref.)		0.30	0.85	0.63–1.16
Age (per year)		0.00	0.97	0.96–0.99
Year of op. (per year)		0.65	0.98	0.92–1.05

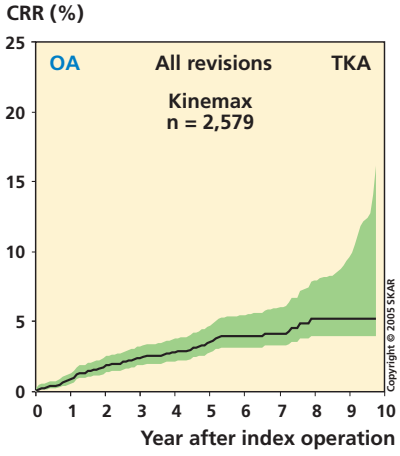
CRR for commonly used TKA implants in OA during 1994–2003

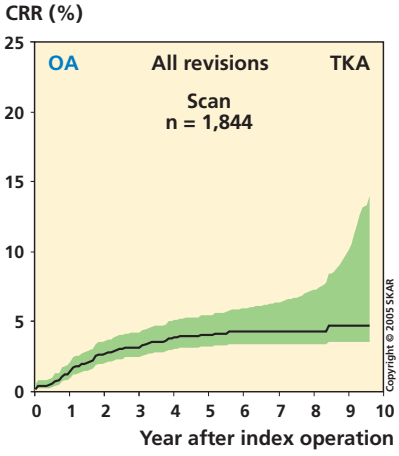


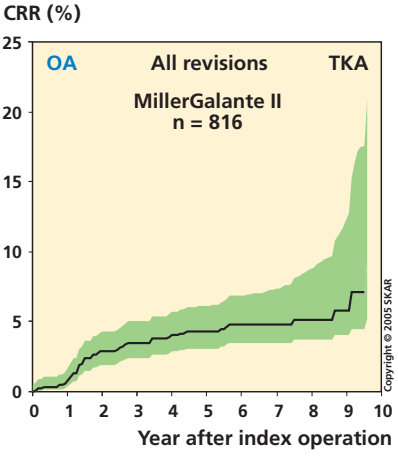


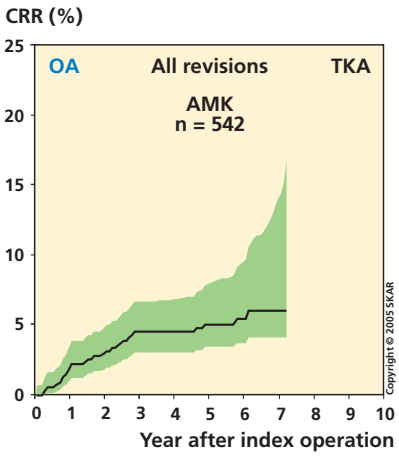


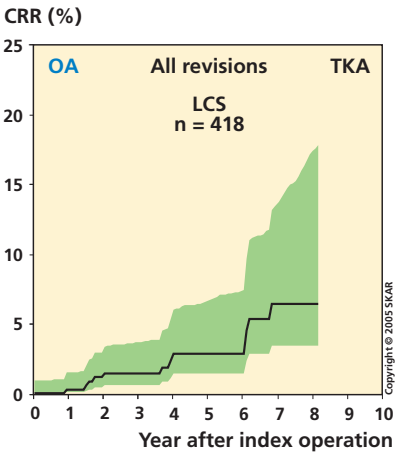


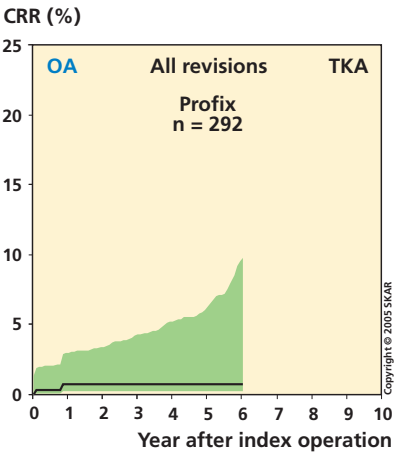


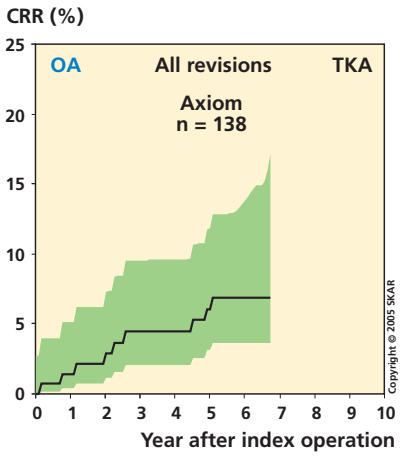


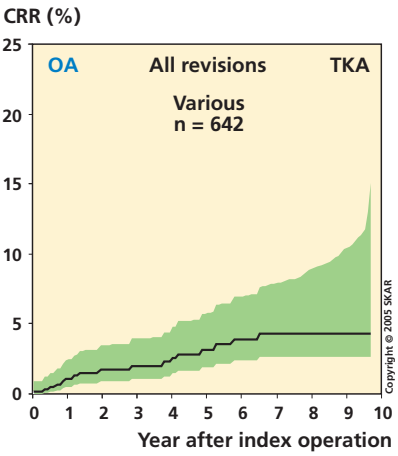



CRR (%)
OA
All revisions
TKA
AMK
n = 542
Year after index operation
Copyright © 2005 SKAR

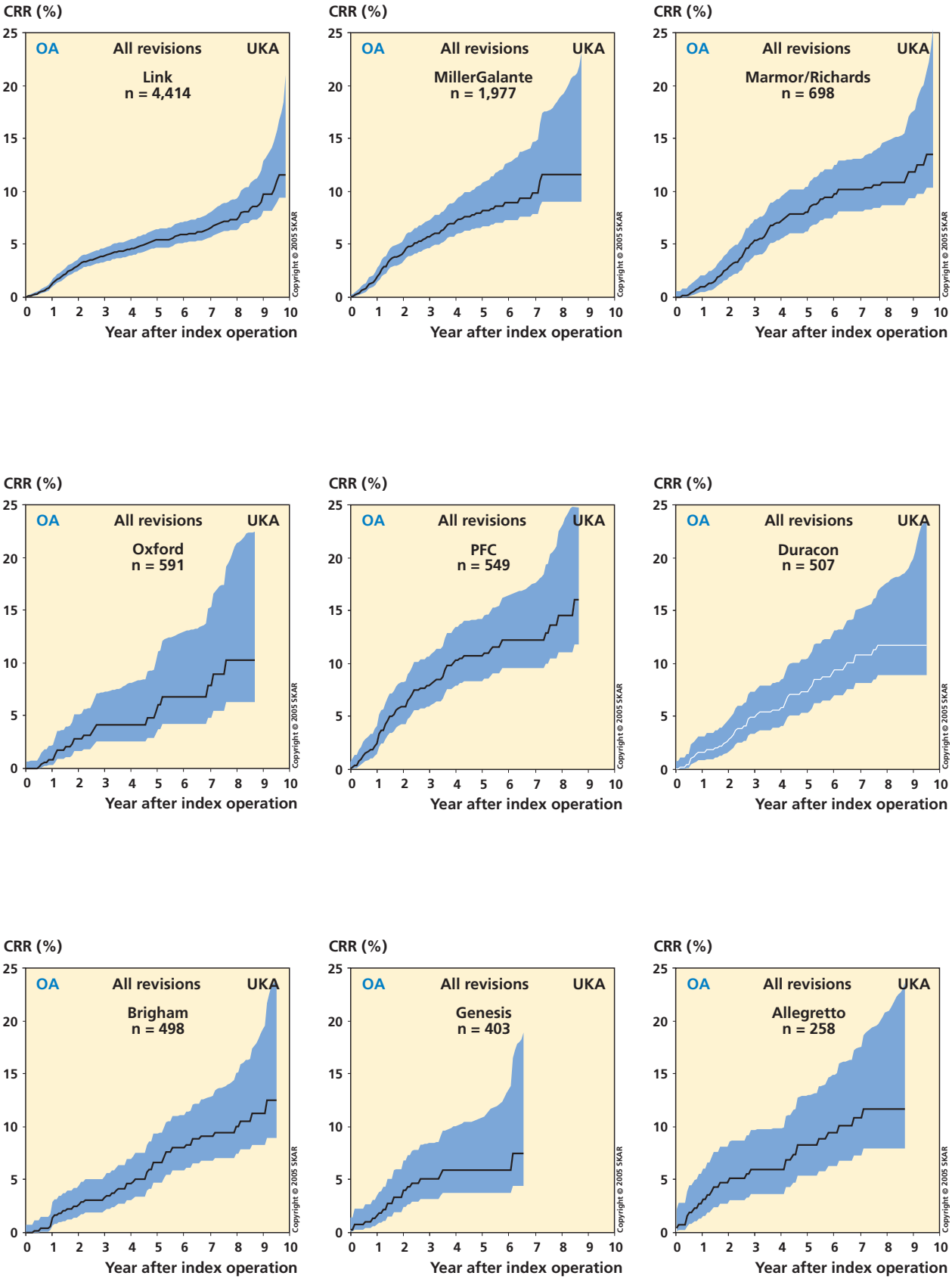

CRR (%)
OA
All revisions
TKA
LCS
n = 418
Year after index operation
Copyright © 2005 SKAR

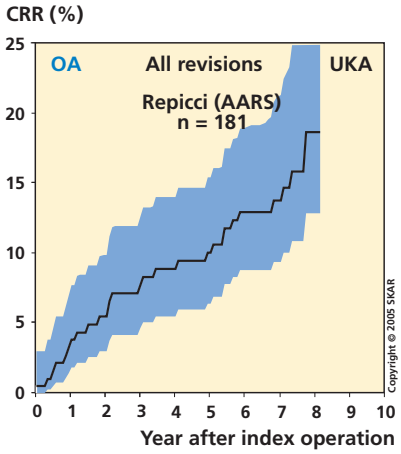

CRR (%)
OA
All revisions
TKA
Profix
n = 292
Year after index operation
Copyright © 2005 SKAR


CRR (%)
OA
All revisions
TKA
Axiom
n = 138
Year after index operation
Copyright © 2005 SKAR


CRR (%)
OA
All revisions
TKA
Various
n = 642
Year after index operation
Copyright © 2005 SKAR

CRR for commonly used UKA implants in OA during 1994–2003

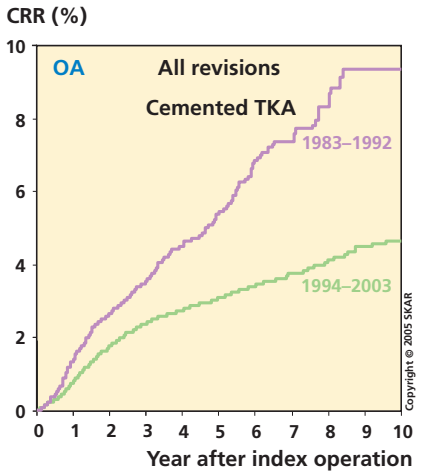




For more information regarding publications, doctoral theses and prior annual reports, please see our web page: www.ort.lu.se/knee/

Relative risk of revision over time (cemented TKA)

The clinicspecific risk of revision – The register has been requested to account for hospital specific results. In order to do a reasonable comparison with respect to risk for revision we decided to analyze only cemented TKA inserted for OA. The 10-year risk of revision was calculated by the shared gamma frailty model which is a specific type of survival analysis. The method 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 in proportion to the amount of information they are based on. Further, the results are adjusted for difference in sex and gender as well as for differences with respect to if a patellar button had been used or not.



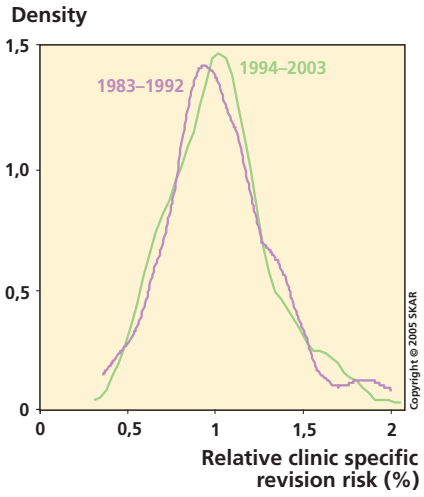
Total CRR for cemented TKA in OA during the 2 periods 1983–1992 and 1994–2003 shows half the risk during the latter period.

Compared to the period 1983-1992, the total risk of revision had decreased by 50% in 1993-2004 (figure upper, left). At the same time the distribution in the absolute risk of revision among the units had considerably reduced (figure below, right).

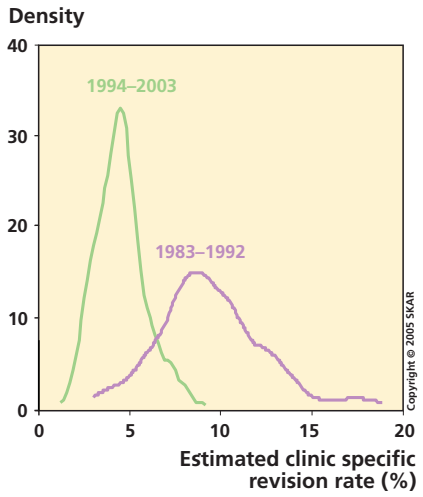
The clinicspecific risk of revision during each period can be compared to the mean risk of that period. When this relative risk of revision was compared in the periods we found that the overall distribution among the hospitals had not changed (figure lower, left). However, the relative risk for the hospitals was not static. We found that while 29% of the units were better than average and 24% were worse than average during both periods, 20% had improved from being worse to becoming better and 17% had become worse.

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.

A complete list with the relative risk for each hospital, as compared to the national mean in 1994-2003, is shown on the next page.



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 1983–1992 and 1994–2003 (x-axis = relative risk).



Plotting the estimated absolute clinicspecific risk of revision shows that the absolute distribution has diminished between 1983-1992 and 1994-2003 (x-axis = absolute risk of revision).

Relative risk of revision for hospitals during 1994–2003 (cemented TKA)

Code	Hospital	n	RR	95% CI
62011	Örnsköldsvik	510	0.36	(0.17–0.76)
53013	Skövde	593	0.45	(0.24–0.85)
13010	Eskilstuna	399	0.52	(0.27–1.01)
64010	Skellefteå	448	0.52	(0.28–0.98)
55012	Lindesberg	466	0.55	(0.29–1.03)
53010	Falköping	411	0.55	(0.29–1.07)
22012	Värnamo	586	0.56	(0.31–1.03)
10484	Sabbatsbergs närsjh	590	0.60	(0.31–1.17)
23010	Växjö	383	0.62	(0.33–1.16)
56012	Köping	560	0.63	(0.36–1.12)
54014	Torsby	460	0.64	(0.35–1.16)
13012	Kullbergska sjukhuset	463	0.65	(0.35–1.23)
52012	Alingsås	355	0.68	(0.35–1.31)
56010	Västerås	392	0.69	(0.39–1.21)
54013	Säffle	416	0.70	(0.37–1.32)
52011	Borås	643	0.71	(0.42–1.19)
50010	Östra sjukhuset	701	0.71	(0.44–1.15)
24010	Västervik	557	0.72	(0.42–1.22)
21001	Linköping	681	0.72	(0.44–1.16)
22010	Jönköping	649	0.72	(0.44–1.18)
65014	Kalix	132	0.73	(0.32–1.64)
13011	Nyköping	332	0.76	(0.42–1.37)
57012	Ludvika	46	0.80	(0.35–1.79)
52013	Skene	465	0.80	(0.47–1.36)
42011	Varberg	848	0.81	(0.53–1.23)
55010	Örebro	454	0.81	(0.48–1.37)
27011	Karlshamn	538	0.81	(0.47–1.41)
10010	Sabbatsberg	31	0.83	(0.37–1.87)
65016	Sunderby sjukhus	185	0.83	(0.41–1.68)
11002	Huddinge	538	0.86	(0.54–1.36)
64001	Umeå	322	0.86	(0.49–1.52)
41001	Lund	243	0.88	(0.50–1.56)
61011	Bollnäs/Söderhamn	401	0.89	(0.51–1.54)
54010	Karlstad	613	0.90	(0.54–1.48)
25010	Kalmar	785	0.90	(0.59–1.36)
41010	Landskrona	524	0.90	(0.54–1.50)
28011	Ängelholm	612	0.91	(0.58–1.44)
21014	Motala	415	0.92	(0.55–1.53)
50071	Frölunda Spec.Sjukhus	136	0.92	(0.44–1.95)
28013	Simrishamn	361	0.92	(0.49–1.72)
41012	Helsingborg	477	0.93	(0.58–1.51)
65012	Gällivare	358	0.96	(0.59–1.57)
61012	Hudiksvall	441	0.97	(0.59–1.59)
11010	Danderyd	970	0.97	(0.65–1.45)
11001	Karolinska	587	0.98	(0.61–1.58)
54012	Arvika	187	0.99	(0.53–1.85)
21480	Linköping medical cent	1	0.99	(0.44–2.24)
65011	Luleå	1	1.00	(0.44–2.24)
42015	Movement Halmstad	7	1.00	(0.44–2.25)
50020	Gothenburg Med Center	8	1.00	(0.44–2.25)
50001	Sahlgrenska	381	1.00	(0.60–1.67)
63010	Östersund	500	1.02	(0.63–1.65)
10013	Södersjukhuset	937	1.04	(0.74–1.46)
11011	Södertälje	445	1.04	(0.63–1.70)
28012	Hässleholm	1,353	1.04	(0.75–1.45)
64011	Lycksele	250	1.05	(0.60–1.81)
27010	Karlskrona	376	1.05	(0.67–1.65)
42010	Halmstad	700	1.05	(0.67–1.66)
12010	Enköping	432	1.06	(0.61–1.84)
50080	Sergelkliniken Gbg	90	1.06	(0.50–2.25)
53011	Lidköping	432	1.06	(0.65–1.75)
28010	Kristianstad	41	1.07	(0.53–2.15)
10015	Sophiahemmet	395	1.07	(0.64–1.78)
51010	Uddevalla	612	1.09	(0.71–1.66)
26010	Visby	392	1.09	(0.66–1.80)
65010	Boden	255	1.09	(0.67–1.79)
10016	Ortopediska huset	371	1.10	(0.62–1.94)
11014	Nacka/Södersjukhuset	104	1.10	(0.59–2.06)
12481	Elisabethsjukhuset	42	1.11	(0.52–2.34)
65013	Piteå	246	1.13	(0.64–2.00)
62010	Sundsvall	743	1.14	(0.78–1.65)
21013	Norrköping	759	1.16	(0.81–1.66)
55011	Karlskoga	389	1.17	(0.72–1.88)
56011	Sala	22	1.18	(0.59–2.38)
11012	Norrtälje	399	1.20	(0.74–1.95)
52016	Vänersborg-NÄL	196	1.22	(0.75–2.00)
25011	Oskarshamn	429	1.23	(0.79–1.92)
57011	Mora	702	1.29	(0.90–1.84)
61014	Söderhamn	49	1.30	(0.70–2.43)
22011	Eksjö-Nässjö	506	1.31	(0.88–1.94)
51012	Kungälv	571	1.32	(0.89–1.96)
23011	Ljungby	449	1.33	(0.89–1.99)
30001	Malmö	317	1.34	(0.85–2.10)
61013	Sandviken	22	1.35	(0.70–2.60)
11013	Löwenströmska	446	1.40	(0.93–2.10)
12001	Akademiska sjukhuset	768	1.44	(1.05–1.98)
10011	S:t Göran	2,009	1.51	(1.20–1.90)
57010	Falun	1,208	1.51	(1.16–1.97)
54011	Kristinehamn	158	1.53	(0.93–2.50)
41013	Ystad	287	1.62	(1.04–2.51)
41011	Trelleborg	811	1.69	(1.22–2.35)
62013	Sollefteå	311	1.69	(1.08–2.66)
51011	Mölndal	400	1.72	(1.17–2.51)
61010	Gävle	369	1.95	(1.34–2.83)

The risk of revision has been calculated using ”the shared gamma frailty model” that estimates how the risk of revision is affected by the operating hospital. In the table, the risk is shown as compared to the national mean (RR=relative risk of revision).
The method 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 in proportion 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.

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.

The Swedish Knee Arthroplasty Register

www.ort.lu.se/knee

Dept of Orthopedics, Lund University Hospital
221 85 Lund, Sweden.
Phone : +46-(0)46-171345,
Fax : +46-(0)46-177167
e-mail: knee@ort.lu.se

Register holder

Prof. Lars Lidgren, Dept of Orthopedics, Lund University Hospital
Phone +46-(0)46-171500, Fax +46-(0)46-130732, e-mail: Lars.Lidgren@ort.lu.se

Board

Researchers

Project Secretary