

**XBase**

THE SWEDISH NATIONAL  
KNEE LIGAMENT REGISTER

# Swedish ACL Register. Annual Report 2014.

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HEALTH  
CARE

# Contents

Preface .....	3	ACL reconstruction in children under	
Goals and goal fulfillment .....	3	15 years of age .....	14
Future vision for Swedish quality register.....	5	Miscellaneous .....	15
Areas for improvement and action .....	5	Surgery variables .....	16
Feedback.....	7	Graft selection.....	16
Coverage and response rate .....	7	Tibial fixation .....	18
Funding the ACL register.....	7	Femoral fixation .....	18
Remuneration system and ACL operations .....	8	Revisions and operations on	
Organization .....	8	the contralateral side.....	18
IT organization.....	9	Multi-ligament injuries .....	22
Research partnerships.....	9	Late-responder analysis .....	23
Register data.....	9	Patient-reported outcome and	
Number of operations per clinic in 2013-2014.....	9	quality of life (PROM) .....	25
Age at surgery .....	11	Gender aspects .....	29
Gender distribution of ACL operations.....	11	ACL reconstructions in older patients.....	29
Activity in conjunction with injury .....	12	Discussion .....	32
Duration of surgery and number of surgeons .....	13	Conclusions.....	32
Time between injury and surgery.....	13	Own references.....	33
Percentage of day surgery in relation to		External references.....	34
in-patient care .....	14	Presentations.....	35

## 3430 Primary operations and 267 Revisions.

AKADEMISKA SJUKHUSET ALERIS ORTOPEDI ÄNGELHOLM ALINGSÅS LASARETT ART CLINIC BLEKINGES-  
JUKHUSET CAPIO ARTRO CLINIC CAPIO LIDKÖPINGS SJUKHUS LUNDBY NÄRSJUKHUS CAPIO LÄKARGRUPPEN  
I ÖREBRO CENTRALLASARETTET VÄXJÖ CITYAKUTEN PRIVATVÅRD DANDERYDS SJUKHUS DROTTNING SILVIAS  
BARN OCH UNGDOMSSJUKHUS ELISABETH SJUKHUSET FALU LASARETT FRÖLUNDA SPECIALISTSJUKHUS  
GÄLLIVARE SJUKHUS GÄVLE SJUKHUS HALMSTADS SJUKHUS HELSINGBORGS SJUKHUS HUDIKSVALLS SJUK-  
HUS HÄSSLEHOLMS SJUKHUS HÖGLANDSSJUKHUSET KALMAR SJUKHUS KARLSTAD CENTRALSJUKHUS KAROLINSKA  
UNIVERSITETSSJUKHUSET KUNGSBACKA SJUKHUS KUNGÄLVIS SJUKHUS KÄRNSJUKHUSET I SKÖVDE LASARETTET  
I ENKÖPING LINKÖPINGS UNIVERSITETSKLINIK LJUNGBY LASARETT LÄKARHUSET HERMELINEN LÄNSSJUK-  
HUSET RYHOV LÄNSSJUKHUSET SUNDSVALL MEDICIN DIREKT MOVEMENT MEDICAL AB MÄLARSJUKHUSET  
ESKILSTUNA NACKA NÄRSJUKHUS NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ NORRTÄLJE SJUKHUS  
NU-SJUKVÅRDEN NYKÖPINGS LASARETT ODENPLANS LÄKARHUS ORTHOCENTER/IFK-KLINIKEN ORTHOCENTER  
I SKÅNE ORTOPEDISKA HUSET CAREMA OSKARSHAMNS SJUKHUS PERAGO ORTOPEDKLINIK SABBATSBERG  
NÄRSJUKHUSET SAHLGRENSKA SKÅNES UNIVERSITETSSJUKHUS SOLLEFTEÅ SJUKHUS SOPHIAHEMMET  
SPECIALISTCENTER SCANDINAVIA SPORTSMED SPORTS MEDICINE UMEÅ SUNDERBY SJUKHUS SÖDERSJUK-  
HUSET SÖDERTÄLJE SJUKHUS SÖDRA ÄLVSBORGS SJUKHUS VARBERGS SJUKHUS VISBY LASARETT VRINNEVI-  
SJUKHUSET VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN VÄSTERVIKS SJUKHUS VÄSTERÅS CENTRALLASARETTET  
VÄSTERÅS ORTOPEDPRAKTIK ÖREBRO USÖ ÖRNSKÖLDSEVIKS SJUKHUS

## Preface

The incidence of anterior cruciate ligament (ACL) injuries has been reported from a number of studies with a range of between 32-70/100,000 inhabitants/year. Recent Swedish studies based on national data from population-based studies indicate an incidence of around 80/100,000 inhabitants/year. ACL injury is a serious knee injury that often prevents young people from continuing to engage in heavy physical work or physical exercise and sport at recreational or elite level without satisfactory treatment. Regardless of the primary treatment, studies have revealed that about 50% of patients present radiological signs of knee arthrosis within 10-15 years after the initial injury.

Treatment can take the form of only rehabilitation or a combination of surgery (ACL reconstruction) followed by rehabilitation. It is estimated that about half of all cruciate ligament injuries are not the subject of surgery for different reasons. An injury frequency of approximately 80 per 100,000 inhabitants in Sweden would mean that some 5,800 individuals suffer anterior cruciate ligament injuries every year and that some 3,500 undergo surgery. Recent studies reveal that around 20% of the patients undergoing surgery require repeat surgery within the space of a few years as a result of complications, first and foremost meniscal and/or cartilage damage, restricted mobility or the failure of the reconstructed cruciate ligament. The results after secondary surgery are probably poorer than after primary surgery. Good results have been reported in the short term after the primary operation, but there are only a few studies that are randomized or have a long follow-up. The number of operations per surgeon is unevenly distributed and about 40% of all surgeons perform fewer than 10 operations a year. A trend towards an increase in the number of operations per surgeon has, however, been seen since the ACL register began in 2005.

To begin with, the ACL register was a surgical register, but attempts are now being made to register all the patients with this injury, regardless of surgical or non-surgical treatment. The absolute majority of the patients registered so far have undergone surgery and this annual report therefore includes a preliminary analysis of patient-reported data following non-surgical treatment. We are working to involve our physical therapists in this work to a greater degree and are also planning, in connection with the replacement of IT platforms, to improve our website when it comes to follow-ups after surgery and rehabilitation.

## Goals and goal fulfillment

The overall goal of the register is to promote the improved care of individuals with ACL injuries.

### Treatment

The goal when treating an individual who has suffered an ACL injury should be a satisfied patient with optimal knee function, a high level of satisfaction and normalized, health-related quality of life. The result should also be long lasting.

In every case, an ACL injury should be treated with structured, purpose-designed rehabilitation. In at least 50% of cases, surgical stabilization of the injured knee is also needed to meet the patient's knee-function requirements (Frobell et al., 2010 & 2013), but which individuals require which treatment has not been scientifically documented. In all probability, a return to a high activity level, first and foremost in contact sports (such as soccer, handball and floorball), will necessitate an increase in the need for surgical treatment.

The main indication for an ACL reconstruction is, however, lasting symptoms in the form of functional instability. This is frequently described as the "knee giving way" or the patient being unable to rely on his/her knee.

## Register coverage

The target is 100% coverage of the number of registered operation reports. An annual check is made with the Swedish Board of Health and Welfare's patient register at ID number level. At the present time, more than 90% of all operations are registered.

## ACL injuries

In 2005-2010, the register was only a surgical register and, as a result, the coverage for patients who were treated non-surgically was non-existent. On 31 December 2014, the database contained 2,868 patients who had registered an ACL injury prior to a decision to treat. Of these 2,868 patients, 1,574 have since undergone surgery. A follow-up of the patients who did not undergo surgery is presented further on in this report.

## Registration after injury

A partnership with a group from Gothenburg under the leadership of Professor Roland Thomeé has been initiated with a view to increasing the response rate for patients undergoing surgery and to include a follow-up via treating physical therapists.

## ACL reconstruction

At the present time, there are about 80 clinics in Sweden that provide orthopedic care. Of these, 67 have informed the ACL register that they performed ACL surgery in 2014. It is estimated that the ACL register covers more than 90% of all the ACL operations in Sweden.

## Validity of input data

Patient-reported data cannot be validated retrospectively, but they are assumed to be valid, as the patients themselves register them.

The surgical data are fed in by surgeons and the target for the Swedish ACL Register is that at least 95% of all the data that are entered are a direct match with patient notes and surgery reports. In 2014, we performed a validation process on the data that were entered in 2012.

Eleven clinics were selected and, at each of them, 50 consecutive operations from 1 March 2012 were identified. Validation data were entered for all the register variables using data from patient notes in 581 individual cases. These validation data were compared with existing register data and the differences were evaluated.

The coverage level, i.e. the percentage of the 581 studied cases which could also be found in the Swedish ACL Register, was 90%. However, more than half the missing cases were due to administrative errors at one clinic and they were found before the study began.

The agreement between register data and validation data was generally good (most variables above 97%). The cases in which the agreement was less than 97% (18 variables) and some key variables with higher agreement were analyzed in more detail. In most cases, trivial explanations could be found, thereby confirming the relative reliability of the variable in question.

Inherent problems with some variables (such as operation times and injury dates) were, however, noted and this therefore means that the suitability of using these data for research purposes can be questioned. By improving definitions, eliminating obvious error sources, modifying the design of the variable or simplifying the alternatives for entering data, the reliability of the problem variables can probably be improved.

The result of the validation process will be published in scientific journals and the steering committee is going to discuss future changes to the structure of the variables in the register.

## Dissemination of register data and results

The target is that register data should be readily available to all caregivers and that the annual report from the register should reach all the clinics in Sweden running orthopedic programs. We are also hoping that the annual report will be disseminated at international level by translating it and through participation at different international meetings.

The register is open to all the participating clinics when it comes to their own data. The annual report is distributed to all the orthopedic clinics and their clinical directors in Sweden. In 2010, the annual report was translated into English for the first time and it attracted a great deal of international interest. The steering committee is also planning to commission an English translation of the 2014 report.

## Future vision for the Swedish quality register

Every individual who suffers an ACL injury in Sweden is to be included in the Swedish ACL Register and followed up.

An ACL injury has serious consequences for the individual who sustains it. In the short term, the injury causes a reduction in activity levels and, in the longer term, one in every two sufferers develops arthrosis in the injured knee. Treatment can take the form of rehabilitation alone or with the addition of the surgical reconstruction of the damaged ligament. In the short term, many individuals experience a return to satisfactory knee function with the help of the two treatment methods, but we do not know which individuals should avoid surgical treatment and which require it. Nor is there currently any scientific proof that either treatment reduces the risk of future arthrosis.

As a result, an important line of development for the ACL Register is to include all patients with ACL injuries, regardless of how they are treated in the short and long term. In this way, data from the register will be able to spotlight the risk of both short-term and long-term consequences of the injury in relation to the treatment that was given (no treatment, structured rehabilitation alone and surgical reconstruction combined with rehabilitation).

The success and usefulness of a register are dependent on its coverage in terms of both baseline data and follow-up data. We currently have good coverage of the ACL reconstructions that are performed in Sweden (approx. 90% compared with the patient register), but this figure needs to be confirmed in a separate validation process which we shall be presenting during the next year. There is, however, real scope for improvement when it comes to patient-reported follow-up data, as more than half of all patients are lost after five years.

The database is run by the Capio Arthro Clinic on behalf of Karolinska University Hospital in its capacity as register owner. Future collaboration with other orthopedic registers is a future vision which the steering committee favors. A change of IT platforms in 2015 is under consideration, first and foremost for patients, who will be offered a new web platform.

## Areas for improvement and action

### Inclusion of all injured individuals regardless of treatment

The register is still a surgery register, even if the aim for several years has also been to include non-operated individuals with ACL injuries. In 2012, we produced a brochure containing information about the register which was to be given to all patients diagnosed with ACL injuries. In addition to general information for the injured individual, the brochure also encourages patients to report to the register via

our web portal. The website has been updated to include the opportunity to register as a patient with a confirmed diagnosis.

Recently published incidence data reveal that some 40-50% of all individuals with ACL injuries are treated without surgery. Within the framework of this project, we plan to contact specialist rehab units to evaluate the potential for registering patients via physical therapists offering treatment. Our aim is to involve these physical therapists as informants in the same way surgeons have provided information until now. This should increase the amount of information on specific knee function and a possible return to sports, but, first and foremost, it should increase the flow of patients who have recently sustained injuries and have been treated without surgery.

### Preoperative patient-reported data

In the case of patients who undergo surgery, the frequency of patients' self-reported data prior to surgery increased from 70% in 2012 to 75% in 2013, which is really positive. Unfortunately, the preoperative report rate fell to 70% in 2014. There is a large difference between clinics, but the Capio Arthro Clinic still has the highest reporting rate for patient-reported preoperative data (> 95%). The steering committee has access to a coordinator who has been tasked with contacting all the clinics to investigate how we can improve the reporting of data. This work is ongoing and the steering committee is optimistic that the frequency of preoperative data reporting will improve in the future. In 2015, the work of improving reporting for patients has begun.

### Quality of input data

At the present time, the register data are fed in by patients (patient-reported data) and surgeons (surgical data) and we are reliant on the precision of the person responsible for registration when this takes place. The recent validation reveals that the quality of the input data is generally good (the majority with more than 97% agreement compared with patient notes), but it has also identified variables with poorer quality. In 2015, the steering committee is going to examine all the variables and facilitate the registration of some, while removing variables with poor reliability.

### Data loss

The response rate for patient-reported data on all follow-up visits is low, even if the trend is improving. In collaboration with QRC Stockholm, we have initiated a joint project to increase patient response rates. The follow-up data after two and five years, however, still have a low response rate (49% and 39% in 2012 and 2009 respectively). Patient-reported data are still followed up through targeted inquiries to patients' home addresses using the conventional postal service, one, two, five and ten years after surgery. The steering committee is looking into the potential for registering these data via the internet to facilitate the processing of data and reduce the time it takes for patients to fill in their data. Measures, such as the opportunity to use social media or mobile applications to maintain contact with patients, have been discussed.

This is, however, associated with some ethical and technical problems which need to be resolved before implementation can take place. Attempts sharply to reduce the loss of data remain a priority area.

### Improvement seminar

In collaboration with QRC Stockholm, an improvement seminar with selected clinics is planned in 2015. During the autumn, a pilot project will begin; four to five clinics will meet to discuss the scope for improvement based on the data in the ACL Register.

## Feedback

Each surgeon is able to process the de-identified data in the register using statistical functions that are posted on the website and he/she can also perform calculations on different variables. A printed annual

report is sent to clinical directors and health-care units that are expected to be interested in the report. An annual report translated into English was produced for the first time in 2010. Users also receive information via regular newsletters and the steering committee organized one meeting for users in 2013.

## Coverage and response rate

The Swedish National Board of Health and Welfare registered 3,675 ACL operations (both primary and revisions with surgery code NGE41) in 2013. The ACL Register contains 3,746 registered operations for 2013.

Matching at personal ID number level reveals that the ACL Register and the patient register have a total of 4,156 unique ACL operations.

The exact agreement on the number of ACL operations in the two registers was 78.6% in 2013; 9.9% were only found in the ACL Register and 11.6% only in the patient register.

One possible explanation of why a patient can only be found in the ACL Register could be incomplete reporting to the patient register. If the opposite applies (i.e. the patient can only be found in the patient register), the reason could be an incorrect surgery code (NGE41 has been selected for an arthroscopy, for example). It goes without saying that these differences also reflect shortcomings in coverage. In spite of this, it is estimated that the ACL Register covers more than 90% of all the ACL operations in Sweden. Data for 2014 are not yet available and this comparison has therefore been made with 2013.

Response rate at follow-up

	K00S				E05			
	Preop	1 year	2 years	5 years	Preop	1 year	2 years	5 years
2014	70				68			
2013	75	63			72	62		
2012	70	61	49		66	60	48	
2011	70	66	47		65	65	47	
2010	69	61	50		65	59	47	
2009	73	61	52	35	70	59	50	35
2008	65	60	48	39	63	62	46	39
2007	57	55	49	40	57	62	48	39
2006	58	50	49	41	55	56	50	40
2005	57	50	50	38	54	50	52	35

If the results are to be credible and applicable in a research context, the response rate for patient-reported data should be high. Unfortunately, the response rate for the KOOS preoperatively fell slightly in 2014 compared with 2013 and has returned to the 2012 level. The response rate for the EQ5D is slightly lower than that for the KOOS.

## Funding the ACL Register

For 2013 and 2014, the SKL, Sweden's Municipalities and County Councils, allocated SEK 1.2 million to the ACL Register to cover running costs. SEK 1.4 million has been allocated for 2015 and 2016 in the form of a two-year grant. The register is administered in collaboration with the Capio Artro Clinic. The registrar, Magnus Forssblad, is employed on a part-time basis at the Orthopedic Clinic at Karolinska Hospital. Two administrators work part time on the ACL Register.

## Remuneration system and ACL operations

In the majority of cases, remuneration for ACL operations in Sweden is based on the DRG (diagnosis-related group) system. An ACL operation without complications is classified as DRG group H100 as day surgery and H13E as in-patient care. This group contains virtually all knee operations, apart from knee arthroplasty and less complex knee surgery in the form of day surgery (H120). The national weighting list also includes a factor of 2 when comparing day surgery with in-patient care. In the case of DRG H100, this dependence on point pricing results in remuneration for day surgery of between SEK 10,000 and 20,000 compared with between SEK 30,000 and 45,000 for in-patient care. The approximate cost price of an ACL operation is estimated at SEK 25,000. The DRG remuneration is based on cost prices from different hospitals and, with the increase in specialization that has taken place in recent years, there are bound to be large differences between the case mix of operations at different hospitals. In its current form, the system is not steering the remuneration towards increased day surgery.

Nor do many caregivers divulge their cost prices, as a result of the way negotiations are conducted. If they did, the purchaser would have complete insight into the economic situation of the person making the tender and this would then jeopardize the procurement process. In the longer term, a “less flexible” DRG system could also lead caregivers to choose not to perform more difficult operations as a result of inadequate remuneration.

In the Stockholm health-care selection set-up, all types of ACL operation (primary, revisions, multi-injuries) are entitled to the same amount of remuneration, regardless of complexity and cost price. To perform ACL operations within this health-care selection set-up, surgical data and preoperative patient questionnaires must be reported for at least 90% of cases and the surgeons performing these operations must perform at least 25 ACL operations a year.

## Organization

The Swedish ACL Register is administered by Karolinska University Hospital and the principal is the board.

Magnus Forssblad at the Capio Arthro Clinic has been appointed by Karolinska University Hospital and the steering committee as the registrar.

The contact person is Anna Pappas and the administrator is Lovisa Backmark, both of whom are employed by the Sports Trauma Research and Education Center, Karolinska Institutet, and the Capio Arthro Clinic.

In 2014, the steering committee was made up of the following representatives from different regions in Sweden.

- Martin Englund, Associate Professor, Skåne University Hospital
- Karl Eriksson, Associate Professor, Söder Hospital, Stockholm
- Magnus Forssblad, Associate Professor, Capio Arthro Clinic and Sports Trauma Research and Education Center, Karolinska Institutet, Stockholm
- Richard Frobell, Associate Professor, Skåne University Hospital
- Professor Joanna Kvist, Linköping University
- Pär Herbertsson, MD, Orthocenter and Skåne University Hospital
- Professor Jon Karlsson, Sahlgrenska University Hospital, Gothenburg
- Professor Jüri Kartus, NU-sjukvården, Trollhättan/Uddevalla
- Anders Stålman, MD, Sabbatsberg Hospital, Stockholm (since April 2015 Capio Arthro Clinic and Sports Trauma Research and Education Center, Karolinska Institutet, Stockholm)

Henrik Magnusson, a statistician at Linköping University, has been co-opted as a member of the steering committee.

## IT organization

The IT operations relating to the Swedish ACL Register are administered by the Capio Artro Clinic. The system operates in a Progress environment, with both a relationship database as the base and a web-based solution for all users (WebSpeed).

## Research partnerships

The Swedish ACL Register protocol is virtually identical to that of the ACL registers that were set up in Norway in 2004 and Denmark in 2005. The first joint article was published in 2009 (Acta Orthopaedica 2009; 80 (5): The Scandinavian ACL registries 2004-2007: baseline epidemiology Lars-Petter Granan, Martin Lind, Magnus Forssblad and Lars Engebretsen).

Separate formal research agreements have been drawn up for all the projects in which data from the register have been used.

There has been an increase in national and international collaboration. In recent years, researchers in Stockholm, Gothenburg and Linköping have published and will be publishing a number of reports. Collaboration with Norway continues. Every year, the international ACL registers in the USA meet for a brief review. A number of new international initiatives have been taken in the past few years – ESSKA, ISAKOS and the ACL study group.

The steering committee would like to request and encourage all the participating clinics to submit applications for research studies within the framework of the ACL Register.

## Register data

The register reports ACL reconstructions in Sweden from January 2005. This information is individually based and the patient's personal ID number automatically shows his/her age and gender. The diagnosis is based on data that are entered manually. During the period 2005-2014, 30,454 primary ACL reconstructions and 2,046 revisions from a total of 81 clinics were registered.

## Number of operations per clinic in 2013-2014

Clinic	2013				2014			
	Prim	Rev	K00S	Perce- tage	Prim	Rev	K00S	Perce- tage
CAPIO ARTRO CLINIC	577	64	627	98 %	683	72	740	98 %
SKÅNES UNIVERSITETSSJUKHUS	282	28	249	80 %	213	14	160	70 %
SAHLGRENSKA	193	20	198	93 %	140	13	130	85 %
ORTHOCENTER/IFK-KLINIKEN	138	11	127	85 %	131	16	116	79 %
SÖDERSJUKHUSET	127	9	97	71 %	110	11	74	61 %
CAPIO LUNDBY NÄRSJUKHUS	15	0	1	7 %	93	1	27	29 %
ORTOPEDISKA HUSET CAREMA	61	3	32	50 %	92	3	73	77 %
VRINNEVISJUKHUSET	92	3	67	71 %	89	8	58	60 %
KUNGSBACKA SJUKHUS	127	11	80	58 %	78	10	64	73 %
HÄSSLEHOLMS SJUKHUS	72	3	67	89 %	78	0	68	87 %

NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	83	8	45	49 %	78	8	34	40 %
MOVEMENT MEDICAL AB	71	10	59	73 %	77	10	53	61 %
HELSINGBORGS SJUKHUS	82	4	76	88 %	75	3	66	85 %
KARLSTAD CENTRALSJUKHUS	73	7	20	25 %	72	3	11	15 %
CAPIO LÄKARGRUPPEN I ÖREBRO AB	28	1	28	97 %	65	5	69	99 %
SPORTS MEDICINE UMEÅ	57	8	49	75 %	63	8	23	32 %
SABBATSBERG NÄRSJUKHUSET	38	4	13	31 %	60	10	49	70 %
MEDICIN DIREKT	54	2	36	64 %	58	7	49	75 %
KALMAR SJUKHUS	51	5	14	25 %	57	3	10	17 %
CENTRALLASARETTET VÄXJÖ	56	4	57	95 %	57	2	55	93 %
LÄNSSJUKHUSET RYHOV	46	6	21	40 %	54	2	24	43 %
FALU LASARETT	50	3	11	21 %	54	0	12	22 %
LINKÖPINGS UNIVERSITETSKLINIK	71	5	55	72 %	52	1	42	79 %
ELISABETH SJUKHUSET	73	8	35	43 %	51	4	27	49 %
GÄVLE SJUKHUS	46	1	25	53 %	49	2	32	63 %
DANDERYDS SJUKHUS	57	5	36	58 %	48	3	32	63 %
SUNDERBY SJUKHUS	42	2	32	73 %	39	2	30	73 %
NU-SJUKVÅRDEN	87	10	88	91 %	38	8	33	72 %
HÖGLANDSSJUKHUSET	33	3	32	89 %	38	1	22	56 %
FRÖLUNDA SPECIALISTSJUKHUS	35	6	36	88 %	35	8	31	72 %
VÄSTERÅS ORTOPEDEPRAKTIK	21	0	14	67 %	34	0	14	41 %
LASARETTET I ENKÖPING	0	0	0	0 %	32	2	0	0 %
HUDIKSVALLS SJUKHUS	25	4	25	86 %	32	1	30	91 %
ORTHOCENTER STOCKHOLM	11	0	2	18 %	32	2	18	53 %
VÄRNAMO SJUKHUS/ORTOPEDEKLINIKEN	16	1	13	76 %	29	0	26	90 %
AKADEMISKA SJUKHUSET	8	0	0	0 %	29	2	0	0 %
ODENPLANS LÄKARHUS	10	1	1	9 %	27	3	4	13 %
ALINGSÅS LASARETT	17	3	14	70 %	27	3	23	77 %
PERAGO ORTOPEDEKLINIK	22	3	11	44 %	26	6	17	53 %
ORTHOCENTER I SKÅNE	21	2	16	70 %	26	4	23	77 %
SÖDRA ÄLVSBORGS SJUKHUS	23	0	16	70 %	25	0	13	52 %
ÖRNSKÖLDSEVIKS SJUKHUS	14	1	12	80 %	21	1	21	95 %
NORRTÄLJE SJUKHUS	22	1	16	70 %	20	0	15	75 %
SPORTSMED	24	2	11	42 %	20	1	10	48 %
BLEKINGESJUKHUSET	21	0	14	67 %	18	0	9	50 %
ÖREBRO USÖ	37	2	14	36 %	16	2	6	33 %
CITYAKUTEN PRIVATVÅRD	13	0	0	0 %	15	0	1	7 %
NYKÖPINGS LASARETT	7	0	0	0 %	15	0	1	7 %
LJUNGBY LASARETT	17	0	3	18 %	14	0	0	0 %
OSKARSHAMNS SJUKHUS	29	0	28	97 %	13	0	12	92 %
VÄSTERVIKS SJUKHUS	11	0	5	45 %	13	0	4	31 %
ART CLINIC	10	1	9	82 %	12	0	12	100 %
SOPHIAHEMMET	5	0	3	60 %	11	2	4	31 %
VÄSTERÅS CENTRALLASARETTET	42	3	25	56 %	11	0	8	73 %
SÖDERTÄLJE SJUKHUS	32	0	2	6 %	11	0	0	0 %
KAROLINSKA UNIVERSITETSSJUKHUSET	31	1	14	44 %	11	0	6	55 %
VISBY LASARETT	15	0	10	67 %	11	0	10	91 %
LÄKARHUSET HERMELINEN	15	0	6	40 %	10	0	4	40 %
HALMSTADS SJUKHUS	0	0	0		9	0	2	22 %
LÄNSSJUKHUSET SUNDSVALL	6	0	6	100 %	8	0	0	0 %

ALERIS ORTOPEDI ÄNGELHOLM	30	3	21	64 %	8	0	4	50 %
GÄLLIVARE SJUKHUS	3	0	2	67 %	6	0	6	100 %
SOLLEFTEÅ SJUKHUS	13	0	10	77 %	4	0	4	100 %
SPECIALISTCENTER SCANDINAVIA	0	0	0		2	0	2	100 %
KUNGÄLVS SJUKHUS	7	0	6	86 %	2	0	1	50 %
KÄRNSJUKHUSET I SKÖVDE	8	0	0	0 %	2	0	0	0 %
<b>DROTTNING SILVIAS</b>								
BARN OCH UNGDOMSSJUKHUS	0	0	0		1	0	0	0 %
VARBERGS SJUKHUS	0	0	0		0	0	0	
MÄLARSJUKHUSET ESKILSTUNA	19	0	13	68 %	0	0	0	
LIDKÖPINGS SJUKHUS	33	1	15	44 %	0	0	0	
NACKA NÄRSJUKHUS	11	1	2	17 %	0	0	0	
TOTAL	3 466	2 842	672	71 %	3 430	2 672	524	68 %

Prim = Primary ACL surgery, Rev = Revisions, KOOS = Number of patients who responded to the preoperative KOOS questionnaire within 180 days prior to the operation, Percentage = % of the total number of operations that received a response (Primary + Revisions)

In order to follow up patients, the clinics have to ensure that patients undergoing surgery complete their preoperative questionnaires. If they do not, no comparison can ever be made in individual cases. The last column in the above table shows the number of completed KOOS questionnaires within 180 days prior to an ACL operation.

## Age at surgery

The average age of patients undergoing ACL surgery in the whole of Sweden is 28. This can be interpreted as meaning that not only young active sportsmen and sportswomen but also somewhat older individuals with unstable knees undergo surgery. Women generally have surgery at a younger age than men, 27 and 28 respectively in 2014. During the period 2009-2014, women were always several years younger than men when it came to primary ACL surgery. The probable explanation is that women reach senior levels in ball sports earlier than men and therefore expose themselves to greater risk of an ACL injury at a younger age. Men are probably also active as sportsmen for a longer period than women.

The average age at revision surgery is 26 for women and 28 for men.

## Gender distribution in ACL operations

As in a number of previous studies conducted in Sweden, some 40% of the patients who undergo ACL surgery are women and this percentage is the same as in previous years.

Year	Men	Women	Men %	Women %
2009	1 789	1 300	58	42
2010	1 944	1 366	59	41
2011	1 896	1 415	57	43
2012	1 970	1 444	58	42
2013	2 020	1 451	58	42
2014	1 948	1 482	57	43

This may seem surprising, as it is also known that women run a far higher risk of sustaining an ACL injury than men. One explanation could be that there are a number of unknown cases among women who voluntarily reduce their activity level, take part in a non-surgical rehabilitation program and thereby

never undergo surgical treatment for their ACL injury. Another explanation could be that men are more risk prone than women. It is therefore important in the future also carefully to register and follow up patients with ACL injuries who seek medical care for their injuries but receive only rehabilitation. So basically no major change has taken place since 2009 when it comes to the gender distribution for primary ACL reconstruction.

The following table shows the number of revisions in 2009–2014.

Year	Men	Women	Men %	Women %
2009	110	81	58	42
2010	136	88	61	39
2011	122	100	55	45
2012	131	112	54	46
2013	149	132	53	47
2014	150	117	56	44

There is a slight preponderance of men undergoing revision surgery, but the ratio between men and women was previously declining, only to increase slightly in 2014. Based on clinical experience, the reason for this could be that more men than women return to their previous activity level.

The number of revisions in patients with a new ACL injury to the knee that has already undergone surgery or with an unsatisfactory result after the first operation is relatively small compared with the number of primary reconstructions.

## Activity in connection with injury

Among both men and women, football is the most common activity associated with an ACL injury and this situation has not changed compared with previous years. In 2014, football was the cause of ACL injuries in 32% of women and 49% of men.

The second most common activity was downhill skiing for women and floorball among men in 2010, 2011, 2012, 201 and 2014.

As football is the leading cause of ACL injuries, it is interesting that projects including prophylactic training for young people playing football are in progress in Sweden. This training is designed to create improved balance and proprioception in the lower extremities, thereby teaching ball-playing youngsters to avoid situations in which an ACL injury could occur.

2014	Total	Women	%	Men	%
FOOTBALL	1441	482	33,4	959	66,6
ALPINE/TELEMARK	493	316	64,1	177	35,9
FLOORBALL	275	102	37,1	173	62,9
OTHER	215	96	44,7	119	55,3
HANDBALL	160	117	73,1	43	26,9
OTHER SPORT	123	61	49,6	62	50,4
MARTIAL ARTS	94	37	39,4	57	60,6
BASKETBALL	82	50	61,0	32	39,0
TRAFFIC	63	25	39,7	38	60,3
WORK	62	15	24,2	47	75,8
ENDURO/MOTORCROSS	61	3	4,9	58	95,1
OUTDOOR LIFE	49	35	71,4	14	28,6
ICE HOCKEY/BANDY	49	5	10,2	44	89,8
GYMNASTICS	33	27	81,8	6	18,2

AMERICAN FOOTBALL/RUGBY	33	11	33,3	22	66,7
DANCE	28	26	92,9	2	7,1
RACKET SPORTS	27	10	37,0	17	63,0
VOLLEYBALL	22	10	45,5	12	54,5
EXERCISE	22	11	50,0	11	50,0
SNOWBOARDING	19	9	47,4	10	52,6
WRESTLING	15	2	13,3	13	86,7
CYCLING	14	7	50,0	7	50,0
EQUESTRIAN SPORT	13	12	92,3	1	7,7
TRAMPOLINE	12	4	33,3	8	66,7
SKATEBOARD	12	2	16,7	10	83,3
WAKEBOARD	7	2	28,6	5	71,4
TOURING SKIING	4	4	100,0	0	0,0
HORSERIDING	1	1	100,0	0	0,0
OTHER	1	0	0,0	1	100,0
TOTAL	3 430	1 482		1 948	

## Duration of surgery and number of surgeons

In Sweden, as in a number of other countries, including the USA, many surgeons perform only a few ACL operations. Of the Swedish ACL surgeons, 75% perform fewer than 30 operations a year and 41% perform fewer than 10 operations a year. These figures have been much the same since the ACL Register was set up in 2005, but the number of operations per surgeon appears to be increasing with time.

The average duration of surgery for an ACL reconstruction is around 75 minutes for a primary operation and about 95 minutes for a revision.

## Time between injury and surgery

Since 2009, the average time between injury and surgery has been 400 days and there is no marked gender difference. Nor are there any obvious differences between private and public caregivers.

The reason why there is a long period between injury and surgery is not known. One reason could be that many patients are not identified at emergency departments or local medical centers after their injury. In other words, they are not given the correct diagnosis at the acute stage. This would be extremely unfortunate, as it would mean that treatment is not given, resulting in a major risk of new and repeated trauma to the knee (which is unstable). Another reason could be that Sweden has embraced a treatment algorithm which means that most patients first receive non-surgical treatment, thereby extending the time to surgery. This is completely in line with the recent discussion and hypothesis that patients with ACL injuries may not always require surgery but can instead eliminate their problems using rehabilitation and activity modification.

Average number of days between injury and surgery, 2014

	Total	Women	Men
Greater Stockholm	373	398	353
Rest of Svealand + Gotland	442	429	451
Skåne	452	439	461
Halland	297	267	319

Småland + Blekinge	290	266	314
Västra Götaland	321	320	321
Östergötland	402	361	427
Norrland	494	491	497
TOTAL	3 987	395	400

## Percentage of day surgery in relation to in-patient care

The percentage of patients who undergo day surgery is slowly increasing and now appears to be more than 85% of the total number of operations. In 2008, 74% of ACL operations were performed as day surgery. In 2009 and 2010, this figure was almost 80%, whereas it was 82.4% in 2011, 83.1% in 2012, 84.5% in 2013 and, in 2014, 85.2%.

One reason for performing in-patient surgery could be that long distances in the region prevent patients being discharged the same day. This is, however, contradicted by the fact that Norrland in northern Sweden, where the distances are very long, is not characterized by a smaller percentage of day surgery. Halland in southern Sweden, on the other hand, has the lowest percentage of day surgery (51.6%) based on 62 patients.

Needless to say, a low percentage of day surgery could also be due to the remuneration system and a tendency towards in-patient care.

2014	Percentage of day surgery %
Greater Stockholm	85,6
Rest of Svealand + Gotland	80,0
Skåne	92,3
Halland	51,6
Småland + Blekinge	74,5
Västra Götaland	85,9
Östergötland	89,1
Norrland	94,1
TOTAL	85,2

## ACL reconstruction in children under 15 years of age

It appears that substance ruptures in the ACL of children with open growth zones are increasing. The annual incidence has previously been estimated at 0.5/10,000 children under 15 years of age, but this figure may have doubled. The reason has not been identified, but increased awareness of the fact that children can also sustain this injury, improved MRI diagnostics and increasing performance demands in organized sport involving children and young people have been cited as some of the possible reasons. Even the associated meniscal injuries in association with ACL injuries are thought to be growing in number based on an historical comparison. In a Swedish study from 1996 of children under 15 years of age, 21% had meniscal injuries at the time the ACL injury was diagnosed, while this figure rose to 31% at surgery.

In 2014, 95 ACL reconstructions were performed on children under 15 years of age in Sweden compared with 81 in 2013. Only one revision was performed in 2013 (by NU sjukvården), while none was performed in 2014.

	2013	2014
CAPIO ARTRO CLINIC	34	40
SAHLGRENSKA	2	9
SKÅNES UNIVERSITETSSJUKHUS	6	4
ORTHOCENTER/IFK-KLINIKEN	0	3
KALMAR SJUKHUS	3	3
CENTRALLASARETTET VÄXJÖ	1	2
MEDICIN DIREKT	1	2
HELSINGBORGS SJUKHUS	2	2
ELISABETH SJUKHUSET	2	2
LÄNSSJUKHUSET RYHOV	1	2
VÄSTERÅS ORTOPEDPRAKTIK	0	2
ÖREBRO USÖ	0	2
SUNDERBY SJUKHUS	3	2
CAPIO LUNDBY NÄRSJUKHUS	1	2
KARLSTAD CENTRALSJUKHUS	1	2
LINKÖPINGS UNIVERSITETSKLINIK	3	1
SABBATSBERG NÄRSJUKHUSET	0	1
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	0	1
GÄVLE SJUKHUS	1	1
LJUNGBY LASARETT	0	1
KUNGSBACKA SJUKHUS	3	1
VÄSTERVIKS SJUKHUS	0	1
OSKARSHAMNS SJUKHUS	0	1
FALU LASARETT	2	1
DROTTNING SILVIAS BARN OCH UNGDOMSSJUKHUS	0	1
ALINGSÅS LASARETT	0	1
HUDIKSVALLS SJUKHUS	1	1
NU-SJUKVÅRDEN	2	1
SOLLEFTEÅ SJUKHUS	0	1
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	2	1
ORTHOCENTER STOCKHOLM	0	1
LÄKARHUSET HERMELINEN	1	0
CAPIO LÄKARGRUPPEN I ÖREBRO AB	1	0
LIDKÖPINGS SJUKHUS	0	0
PERAGO ORTOPEDKLINIK	1	0
MOVEMENT MEDICAL AB	3	0
VRINNEVISJUKHUSET	1	0
ÖRNSKÖLDSVIKS SJUKHUS	1	0
SPORTS MEDICINE UMEÅ	1	0
HÖGLANDSSJUKHUSET	1	0
TOTAL	81	95

About half of all the patients had meniscal injuries, half of which were resected and half sutured. Girls accounted for 78% of the patients. The cause of accidents is similarly distributed between boys and girls. Football dominated and accounted for 65% of accidents. It was followed by handball (9%) and Alpine/ Telemark skiing (6%).

## Miscellaneous

The use of the double-tunnel technique as a surgical method continues to decline in Sweden. In 2014, only 28 such operations were performed, which corresponds to less than 1% of all the operations performed. The corresponding figure for 2012 was 42 (1.2%) and, for 2013, 36.

Thromboprophylaxis is administered in 31% of all operations. Antibiotic prophylaxis is basically administered in all operations. A research project studying the risk of thrombosis and infection following ACL surgery is currently in progress.

## Surgical variables

### Graft selection

Since the ACL Register was created in 2005, the use of hamstring grafts rose from 80% to 98% in 2012, but, in conjunction with ACL reconstruction, different types of graft can be used. By far the most common graft selection is the hamstring tendon, which can comprise the semitendinosus or the semitendinosus and the gracilis tendon. Surgery involving hamstrings is technically straightforward, but it can result in somewhat weaker flexion in the knee, first and foremost during the first year after surgery. When the use of hamstring tendons began, it was standard procedure to double the gracilis and the semitendinosus, but interest in quadrupling the semitendinosus is currently increasing, as cadaver studies have revealed that this is a stronger option. Retaining the gracilis can reduce the problem of reduced flexion to some degree.

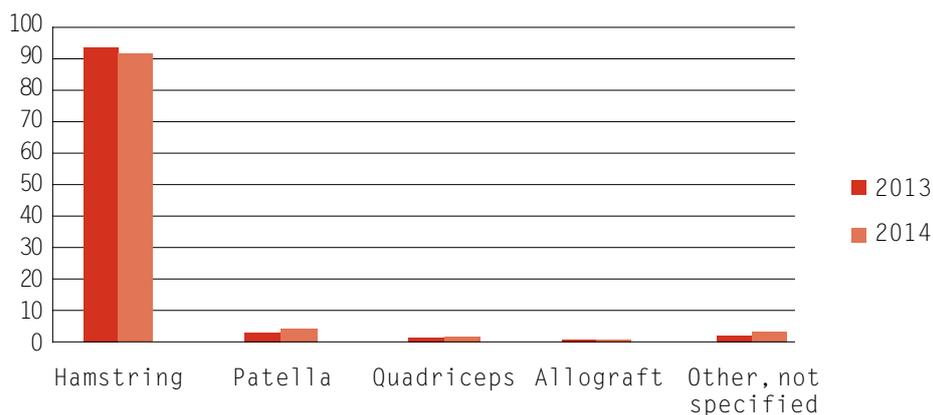
As ACL surgery developed during the 1980s and 1990s, using the patellar tendon was the standard method, but it has declined in popularity, probably because it is somewhat more technically complicated and the length of surgery can increase. More postoperative pain and problems with anterior knee pain, primarily during the first two years, have also been mentioned as disadvantages. One advantage when it comes to the patellar tendon is that a bone plug can be used at both ends, thereby guaranteeing the effective healing of the graft in the canal. During the past few years, register studies have indicated that the risk of graft failure and rupture necessitating a revision is somewhat greater, if a hamstring graft is selected. During the past two years, the percentage of hamstring tendon grafts has declined in favor of the patellar tendon and, to some degree, also the quadriceps, even if the absolute figures are still low. The use of the patellar tendon increased by 39% from 2013 and 2014 (95 in 2013 to 131 in 2014).

Increasing interest has also been shown in the use of quadriceps grafts. The quadriceps tendon can be used as a free transplant or with a bone plug at one end. This can enable a thick graft, which makes it possible to divide the graft, thereby permitting the bone plug to be inserted in the femur, with two attachment points in the tibia. The quadriceps tendon probably results in less anterior knee pain than the patellar tendon. There is speculation about whether the patellar tendon and the quadriceps tendon should be considered more frequently in patient groups in which a greater risk of graft rupture can be anticipated.

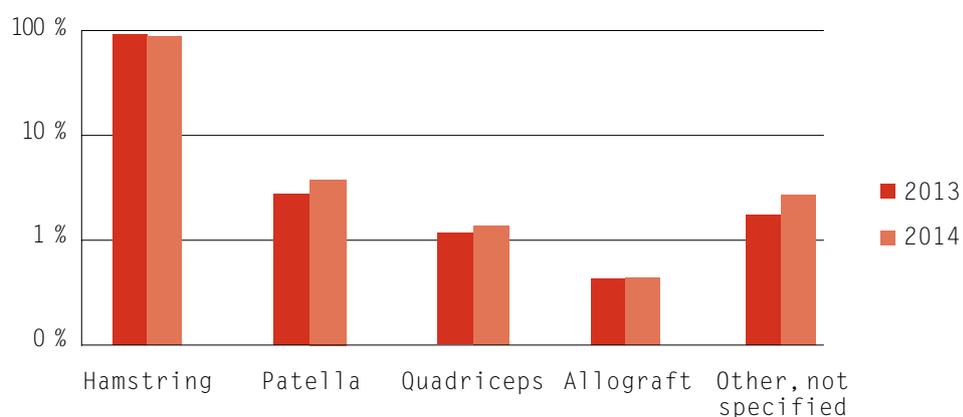
The use of allografts is another alternative. In international terms, it is common for allografts to be used in ACL reconstruction. The advantages possibly include the lack of morbidity at the graft retrieval point and shorter surgery times. The disadvantages may include a probably greater risk of graft failure and, first and foremost, the high cost, as an allograft costs more than SEK 20,000 per graft, which is not always reimbursed via the reimbursement system in Sweden. Access to a freezer with a temperature of minus 70°C is also essential. In 2014, 15 (0.5%) allografts were used in primary surgery and this figure has remained stable in recent years. Allografts are frequently used as a complement in conjunction with multiple-ligament injuries and revisions.

While hamstring grafts have been the dominant graft in primary ACL reconstruction in Sweden for many years, the patellar tendon is being used increasingly in revision surgery (> 50%). Interest in the quadriceps in revisions has almost doubled, from 15 in 2013 to 29 in 2014. Allografts are being used increasingly in revision surgery (6%).

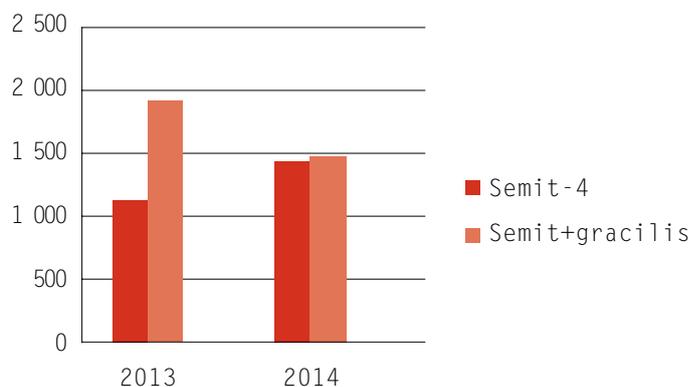
Distribution of graft selection (%) in 2013 and 2014.



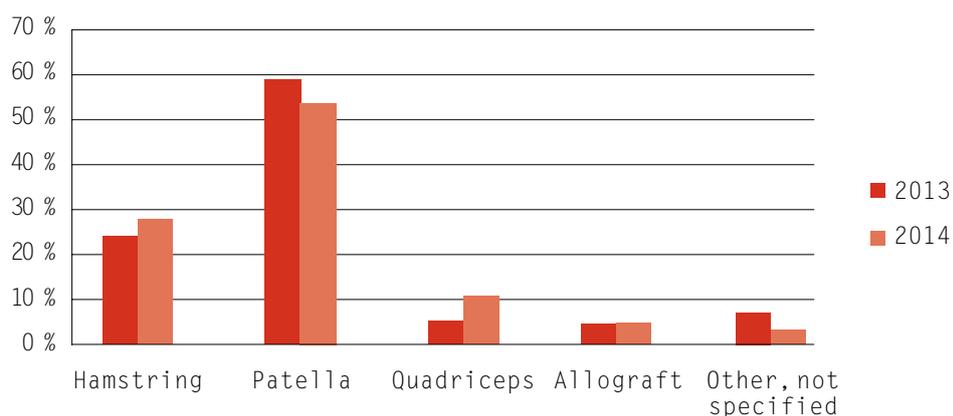
Distribution of graft selection (% , logarithmic scale) in 2013 and 2014.



Quadruple semitendinosus is increasing, while the gracilis is harvested less frequently.



Graft selection in revisions.



## Tibial fixation

Screw fixation alone with interference screws dominates in the tibia and currently accounts for 44%, while resorbable screws are used in 28%. The use of the Tightrope in the tibia has increased sharply to 19% from only 7% in 2013. This method was introduced in 2012. The use of resorbable screws has doubled since 2009. The reason for this is undoubtedly to avoid revisions involving the removal of the screw in the tibia. The use of the AO screw, which is not an interference screw, has been between 10% and 20% since the ACL Register was created and this screw was used in 21% of cases in 2014. The use of a screw and staple sink and the use of intrafix have fallen since 2009.

## Femoral fixation

The most common form of fixation at the present time is the cortical button, which is used in 86% of all femoral fixations. The most common cortical button is still the Endobutton, although the use of the Tightrope has risen sharply in the past few years. When the Tightrope is used, the cruciate ligament transplant can be tightened after it has been inserted in the canal and even after it has been fixed distally. The use of cortical buttons has increased every year, from 37% in 2008 to 86% in 2014. The reason for this increase is that the cortical button is easy to use without any alignment instruments. It can be inserted through the medial portal and, unlike the transtibial method, where it is necessary to drill through the lower part of the leg using alignment instruments, the surgeon is not obliged to use the tibial canal. Cortical buttons are also stable and there is no risk that the transplant will move or slip. Interference screws in the femur were used in some 20% of patients in 2005, when the ACL Register was created, but this figure has fallen slightly in recent years and is currently around 10%.

## Revisions and surgery on the contralateral side

A total of 2,046 revisions were registered in the ACL Register in 2005-2014. If we instead choose to follow the patients who initially underwent surgery within the framework of the ACL Register and then underwent revisions, 1,192 (3.9%) new operations were registered on patients who had previously undergone surgery. In this way, the follow-up period is longest for patients who underwent surgery in 2005, while it was only possible to follow up patients who underwent surgery in 2014 during that same year. In addition, 1,096 (3.6%) underwent a new ACL operation on the contralateral knee. Women underwent revisions on a larger scale than men – 4.2% compared with 3.7% for the same knee and 3.9% compared with 3.3% for the contralateral knee.

Patients receiving hamstring tendon grafts underwent revisions on the same knee in 3.9% of cases compared with 3.4% for patients receiving patellar tendon grafts, but this figure is difficult to assess, as the number of primary patellar tendon operations is only around 2,400 compared with 28,657 hamstring operations. As the number of patellar tendon operations was also higher at the beginning of the study period, this figure is probably also misleading. If the follow-up period is limited to three years, the number of revisions for patellar tendons is 2.6% compared with 2.9% for hamstring tendons. This still indicates a slightly larger number of revisions for hamstring tendons, which matches data presented from Norway and Denmark.

Patients under 20 years of age underwent revisions on a wider scale and this is due to the fact that this patient group is more active and more frequently returns to active sports; 6.8% underwent revisions on the same knee, while the percentage for the contralateral knee was 6.3%.

If the follow-up period is limited to three years and we choose to follow the patients undergoing primary surgery in 2005-2010, 1,123 new operations were performed in 2005-2014. Of these, 591 were revisions on the same knee, corresponding to 2.9% of all primary operations.

For the second year in a row, we have chosen to present revisions on the same knee by clinic. The following table presents the number of revisions in which hamstring grafts were used. The clinics that are presented are those that initially performed the first operation but not necessarily the revision. The steering committee has chosen to present all the clinics without taking account of the number of primary operations.

Primary operations 1.1.2005-31.12.2012

CLINIC	No of ops	No of revs	Percentage
ORTHOCENTER I SKÅNE	22	2	9,1 %
SÖDERTÄLJE SJUKHUS	15	1	6,7 %
SPORTS MEDICINE UMEÅ	167	10	6,0 %
PERAGO ORTOPEDKLINIK	67	4	6,0 %
SABBATSBERG NÄRSJUKHUSET	20	1	5,0 %
CAPIO LÄKARGRUPPEN I ÖREBRO AB	405	19	4,7 %
HALMSTADS SJUKHUS	64	3	4,7 %
ORTHOCENTER/IFK-KLINIKEN	694	28	4,0 %
NU-SJUKVÅRDEN	977	38	3,9 %
HELSINGBORGS SJUKHUS	184	7	3,8 %
LÄNSSJUKHUSET RYHOV	161	6	3,7 %
VISBY LASARETT	27	1	3,7 %
KUNGSBACKA SJUKHUS	387	14	3,6 %
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	30	1	3,3 %
ALINGSÅS LASARETT	236	7	3,0 %
S:T GÖRANS SJUKHUS CAPIO, STOCKHOLM	107	3	2,8 %
ORTOPEDISKA HUSET CAREMA	359	10	2,8 %
KUNGÄLVS SJUKHUS	109	3	2,8 %
ÖREBRO USÖ	221	6	2,7 %
SAHLGRENSKA	1 201	32	2,7 %
ÖSTERSUNDS SJUKHUS	77	2	2,6 %
MOVEMENT MEDICAL AB	847	22	2,6 %
KALMAR SJUKHUS	477	12	2,5 %
HUDIKSVALLS SJUKHUS	199	5	2,5 %
CAPIO ARTRO CLINIC	4 741	117	2,5 %
SKÅNES UNIVERSITETSSJUKHUS	578	13	2,2 %
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN	590	13	2,2 %
SÖDERSJUKHUSET	927	20	2,2 %
LÄNSSJUKHUSET SUNDSVALL	47	1	2,1 %
DANDERYDS SJUKHUS	142	3	2,1 %
NACKA NÄRSJUKHUS	98	2	2,0 %
ORTHOCENTER STOCKHOLM	246	5	2,0 %
LÖWETS SPECIALISTMOTTAGNING	247	5	2,0 %
FRÖLUNDA SPECIALISTSJUKHUS	149	3	2,0 %
LJUNGBY LASARETT	151	3	2,0 %
MALMÖ ALLMÄNNA SJUKHUS	869	17	2,0 %
KARLSTAD CENTRALSJUKHUS	596	11	1,8 %
ODENPLANS LÄKARHUS	169	3	1,8 %
MÄLARSJUKHUSET ESKILSTUNA	345	6	1,7 %
ELISABETH SJUKHUSET	529	9	1,7 %
NORRTÄLJE SJUKHUS	59	1	1,7 %
CENTRALLASARETTET VÄXJÖ	373	6	1,6 %

HÖGLANDSSJUKHUSET	393	6	1,5 %
FALU LASARETT	330	5	1,5 %
LIDKÖPINGS SJUKHUS	200	3	1,5 %
VARBERGS SJUKHUS	283	4	1,4 %
LUNDS UNIVERSITET	433	6	1,4 %
SÖDRA ÄLVSBERGS SJUKHUS	82	1	1,2 %
ÖRNSKÖLDSEVIKS SJUKHUS	85	1	1,2 %
KAROLINSKA UNIVERSITETSSJUKHUSET / ALB	174	2	1,1 %
HÄSSLEHOLMS SJUKHUS	541	6	1,1 %
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	805	8	1,0 %
CAPIO LUNDBY NÄRSJUKHUS	111	1	0,9 %
LINKÖPINGS UNIVERSITETSKLINIK	580	5	0,9 %
ALERIS ORTOPEDI ÄNGELHOLM	581	5	0,9 %
MEDICIN DIREKT	239	2	0,8 %
GÄVLE SJUKHUS	224	1	0,4 %
SAMARITERHEMMETS SJUKHUS	249	1	0,4 %
VRINNEVISJUKHUSET	553	2	0,4 %
SUNDERBY SJUKHUS	346	1	0,3 %
OSKARSHAMNS SJUKHUS	246	0	0,0 %
GÄLLIVARE SJUKHUS	48	0	0,0 %
SKELLEFTEÅ SJUKHUS	30	0	0,0 %
VÄSTERÅS CENTRALLASARETTET	182	0	0,0 %
NYKÖPINGS LASARETT	89	0	0,0 %
KARLSKOGA LASARETT	11	0	0,0 %
PITEÅ ÄLVDAL SJUKHUS	71	0	0,0 %
VÄSTERVIKS SJUKHUS	97	0	0,0 %
SOPHIAHEMMET	22	0	0,0 %
BLEKINGESJUKHUSET	46	0	0,0 %
SOLLEFTEÅ SJUKHUS	31	0	0,0 %
LÄKARHUSET HERMELINEN	30	0	0,0 %
VÄSTERÅS ORTOPEDPRAKTIK	23	0	0,0 %
KÄRNSJUKHUSET I SKÖVDE	6	0	0,0 %
SPORTSMED	2	0	0,0 %
ART CLINIC	1	0	0,0 %

The following table shows the percentage of patients who responded to the KOOS after two years and gave an estimate of < 44 in the category of knee-related quality of life. A low value like this should indicate that, at this time, the ACL was not fully functional. The clinics that are presented are those that initially performed the first operation but not necessarily the revision. There are naturally sources of error in presentations of this kind, such as the clinic not choosing to perform revisions on patients.

CLINIC	No of Ops	QOL < 44	No of KOOS	Percentage
SÖDERTÄLJE SJUKHUS	15	3	4	75 %
KARLSKOGA LASARETT	11	3	5	60 %
SOLLEFTEÅ SJUKHUS	31	7	12	58 %
VISBY LASARETT	27	8	14	57 %
ÖRNSKÖLDSEVIKS SJUKHUS	85	24	47	51 %
VÄSTERÅS CENTRALLASARETTET	182	43	87	49 %
SÖDRA ÄLVSBERGS SJUKHUS	82	18	41	44 %

VÄSTERÅS ORTOPEDPRAKTIK	23	3	7	43 %
LÄNSSJUKHUSET SUNDSVALL	47	8	19	42 %
LIDKÖPINGS SJUKHUS	200	39	97	40 %
GÄVLE SJUKHUS	224	41	103	40 %
ÖREBRO USÖ	221	41	107	38 %
LINKÖPINGS UNIVERSITETSKLINIK	580	99	261	38 %
ALINGSÅS LASARETT	236	42	111	38 %
MALMÖ ALLMÄNNA SJUKHUS	869	136	363	37 %
ÖSTERSUNDS SJUKHUS	77	12	33	36 %
SUNDERBY SJUKHUS	346	58	161	36 %
VRINNEVISJUKHUSET	553	92	259	36 %
LÄNSSJUKHUSET RYHOV	161	28	79	35 %
VÄSTERVIKS SJUKHUS	97	15	43	35 %
CAPIO LUNDBY NÄRSJUKHUS	111	19	55	35 %
KARLSTAD CENTRALSJUKHUS	596	90	261	34 %
CAPIO LÄKARGRUPPEN I ÖREBRO AB	405	65	189	34 %
KUNGÄLVIS SJUKHUS	109	23	67	34 %
SKÅNES UNIVERSITETSSJUKHUS	578	93	272	34 %
SAHLGRENSKA	1 201	181	535	34 %
FALU LASARETT	330	54	160	34 %
MÄLARSJUKHUSET ESKILSTUNA	345	56	167	34 %
ORTHOCENTER I SKÅNE	22	4	12	33 %
SABBATSBERG NÄRSJUKHUSET	20	4	12	33 %
MOVEMENT MEDICAL AB	847	129	393	33 %
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	805	124	389	32 %
NACKA NÄRSJUKHUS	98	13	41	32 %
NYKÖPINGS LASARETT	89	12	38	32 %
SPORTS MEDICINE UMEÅ	167	23	73	32 %
PITEÅ ÄLVDAL SJUKHUS	71	11	35	31 %
LÄKARHUSET HERMELINEN	30	5	16	31 %
SKELLEFTEÅ SJUKHUS	30	4	13	31 %
HÄSSLEHOLMS SJUKHUS	541	71	234	30 %
SAMARITERHEMETS SJUKHUS	249	33	109	30 %
MEDICIN DIREKT	239	36	119	30 %
VARBERGS SJUKHUS	283	45	151	30 %
CENTRALLASARETTET VÄXJÖ	373	49	165	30 %
HELSINGBORGS SJUKHUS	184	27	91	30 %
OSKARSHAMNS SJUKHUS	246	38	129	29 %
BLEKINGESJUKHUSET	46	5	17	29 %
HUDIKSVALLS SJUKHUS	199	23	79	29 %
FRÖLUNDA SPECIALISTSJUKHUS	149	20	69	29 %
SÖDERSJUKHUSET	927	107	373	29 %
NU-SJUKVÅRDEN	977	138	492	28 %
HÖGLANDSSJUKHUSET	393	60	215	28 %
DANDERYDS SJUKHUS	142	17	61	28 %
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	30	3	11	27 %
KUNGSBACKA SJUKHUS	387	51	193	26 %
LUNDS UNIVERSITET	433	55	211	26 %
HALMSTADS SJUKHUS	64	8	31	26 %
GÄLLIVARE SJUKHUS	48	8	31	26 %
ORTHOCENTER/IFK-KLINIKEN	694	84	327	26 %

ALERIS ORTOPEDI ÄNGELHOLM	581	60	235	26 %
KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	590	59	237	25 %
KALMAR SJUKHUS	477	49	198	25 %
ORTHOCENTER STOCKHOLM	246	28	114	25 %
ELISABETH SJUKHUSET	529	46	204	23 %
LJUNGBY LASARETT	151	17	76	22 %
CAPIO ARTRO CLINIC	4 741	497	2 284	22 %
ODENPLANS LÄKARHUS	169	13	63	21 %
ORTOPEDISKA HUSET CAREMA	359	30	153	20 %
NORRTÄLJE SJUKHUS	59	4	22	18 %
LÖWETS SPECIALISTMOTTAGNING	247	24	134	18 %
PERAGO ORTOPEDKLINIK	67	5	32	16 %
SOPHIAHEMMET	22	2	13	15 %
S:T GÖRANS SJUKHUS CAPIO, STOCKHOLM	107	8	54	15 %
KAROLINSKA UNIVERSITETSSJUKHUSET / ALB	174	13	101	13 %
KÄRNSJUKHUSET I SKÖVDE	6	0	5	0 %
SPORTSMED	2	0	1	0 %
ART CLINIC	1	0	1	0 %

## Multiligament injuries

Multiligament and isolated other ligament injuries can and should be registered in the ACL Register. However, we have no idea of the extent to which this is done, but the different combinations that were registered in 2014 are presented below. It is clear that the most common combination is the anterior cruciate ligament (ACL) and the medial cruciate ligament (MCL). The number of posterior cruciate ligament (PCL) operations registered in 2014 totaled 35, of which 13 were isolated. There were 61 medial cruciate ligament injuries and 22 lateral collateral ligament (LCL) injuries, plus 11 posterolateral cruciate (PLC) injuries.

2014	2005-2014
Primary	Primary
ACL --- --- --- 3 249	ACL --- --- --- 29 346
ACL --- MCL --- --- 46	ACL --- MCL --- --- 263
--- PCL --- --- --- 13	--- PCL --- --- --- 135
ACL --- --- LCL --- 8	ACL --- --- LCL --- 78
ACL --- --- LCL PLC 7	ACL PCL --- --- --- 54
--- PCL MCL --- --- 7	ACL --- --- LCL PLC 45
ACL PCL --- --- --- 5	ACL PCL MCL --- --- 39
ACL PCL MCL --- --- 4	--- PCL MCL --- --- 28
ACL PCL --- LCL --- 3	ACL PCL --- LCL PLC 19
--- --- MCL --- --- 2	ACL --- --- --- PLC 13
--- --- --- LCL --- 1	ACL PCL --- LCL --- 11
ACL PCL MCL LCL PLC 1	--- --- MCL --- --- 10
ACL PCL --- --- PLC 1	--- PCL --- LCL --- 7
ACL --- MCL LCL PLC 1	ACL PCL MCL LCL PLC 6
ACL PCL --- LCL PLC 1	ACL PCL --- --- PLC 6
	ACL --- MCL LCL --- 4
	ACL --- MCL LCL PLC 2
	ACL --- MCL --- PLC 1
	ACL PCL MCL --- PLC 1
	--- --- --- LCL --- 1

## Late-responder analysis

In 2013, a data loss analysis was performed on the ACL Register to validate its data, in spite of the large-scale data loss rate after two years. All the patients undergoing surgery in 2010 were included in the analysis. The patients who answered the two-year KOOS (responders) were compared with those that did not (non-responders) in terms of gender, age at surgery, time between injury and surgery, activity at the time of the injury, associated meniscal and/or cartilage damage, graft type, primary or revision surgery and region in which the operation was performed. At the same time, a questionnaire was sent to non-responders asking about their reasons for not responding, whether they had received information about the register at the time of surgery, reminders to complete questionnaires and whether the KOOS questions felt difficult, time consuming, a violation of their integrity, unclear or whether it was difficult to understand the reason for asking them. It was also possible to make comments. A comparison of the KOOS and EQ5D was also made between responders and the people who answered the KOOS and the EQ5D respectively after the reminder questionnaire (late responders).

Of a total of 3,588 patients who had undergone ACL reconstruction in 2010, 1,865 were identified as responders and 1,723 as non-responders. The average age was significantly higher in the responder group (27.8 years) than in the non-responder group (25.9 years) ( $p < 0.0001$ ). The response rate for women was significantly higher among women (62.8%) than among men (44.4%) ( $p < 0.001$ ). On the other hand, there was no significant difference in the time between injury and surgery, associated injuries, graft selection, the region in which the operation was performed or whether a primary operation or a revision was involved. The response rate depending on the activity at the time of the injury varied between 48.7% and 51.7%, with the exception of "Alpine skiing and Telemark", which had a significantly higher response rate, 62.5% ( $p < 0.001$ ).

In all, there were 359 male responders and 145 female responders, from 1,723 (20.8%) patients on the late-responders questionnaire. In this questionnaire, 60% of the patients said they had received information about the register and 81% replied that they had received reminders about the two-year follow-up. None of the statements in the dispatched questionnaire had a percentage agreement of  $> 50\%$ , but the statement with which most respondents agreed was that answering the questions was time consuming. Most of the comments (29/55) were variations on "didn't have time", "was not a priority" and "forgot".

In the late-responders group, 291 patients returned the KOOS questionnaire after a further request and they were compared with the patients who had responded after the first request, two years after the operation, 1,358 patients. Only patients who registered the KOOS both preoperatively and at the two-year follow-up were included and, as a result, the number in this comparison differs from the number in the analysis of the late-responder questionnaire.

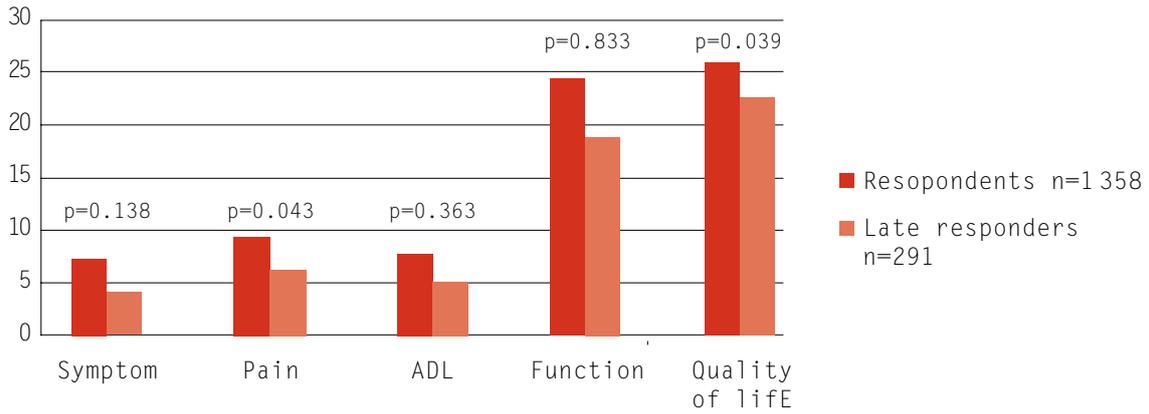
KOOS "Pain" revealed an improvement of 7.3 points in the responder group compared with 4.2 among late responders ( $p = 0.043$ ), while "Quality of life" revealed an improvement of 26.3 points in the responder group compared with 22.6 among late responders ( $p = 0.039$ ). This analysis has been corrected for age.

In order to be clinically relevant, a KOOS difference of eight to 10 points is needed (Roos et al., Health Quality Life Outcomes 2003). The greatest difference in the late-responder analysis was 3.7 points.

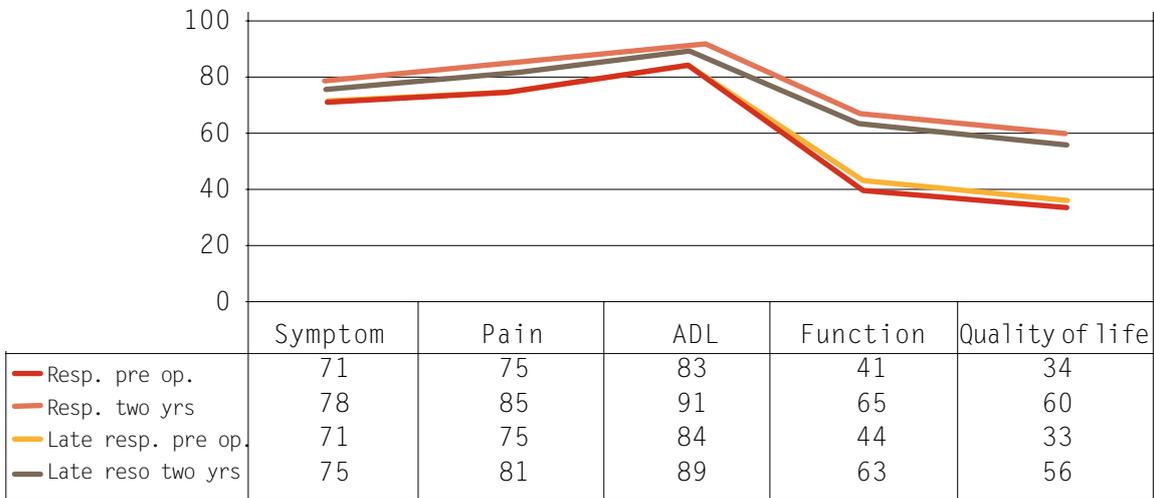
In a comparison of the EQ5D with the same groups, there were no significant differences in either the EQ5D index or the EQ5D-VAS.

The results of the study indicate that the data in the register are valid in relation to the studied data and the steering committee is working actively to improve the response rate using information and new technical solutions.

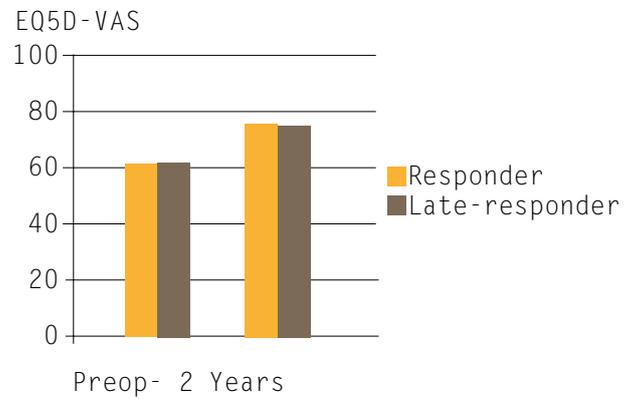
Increase in K00S from preop to two-year follow-up.



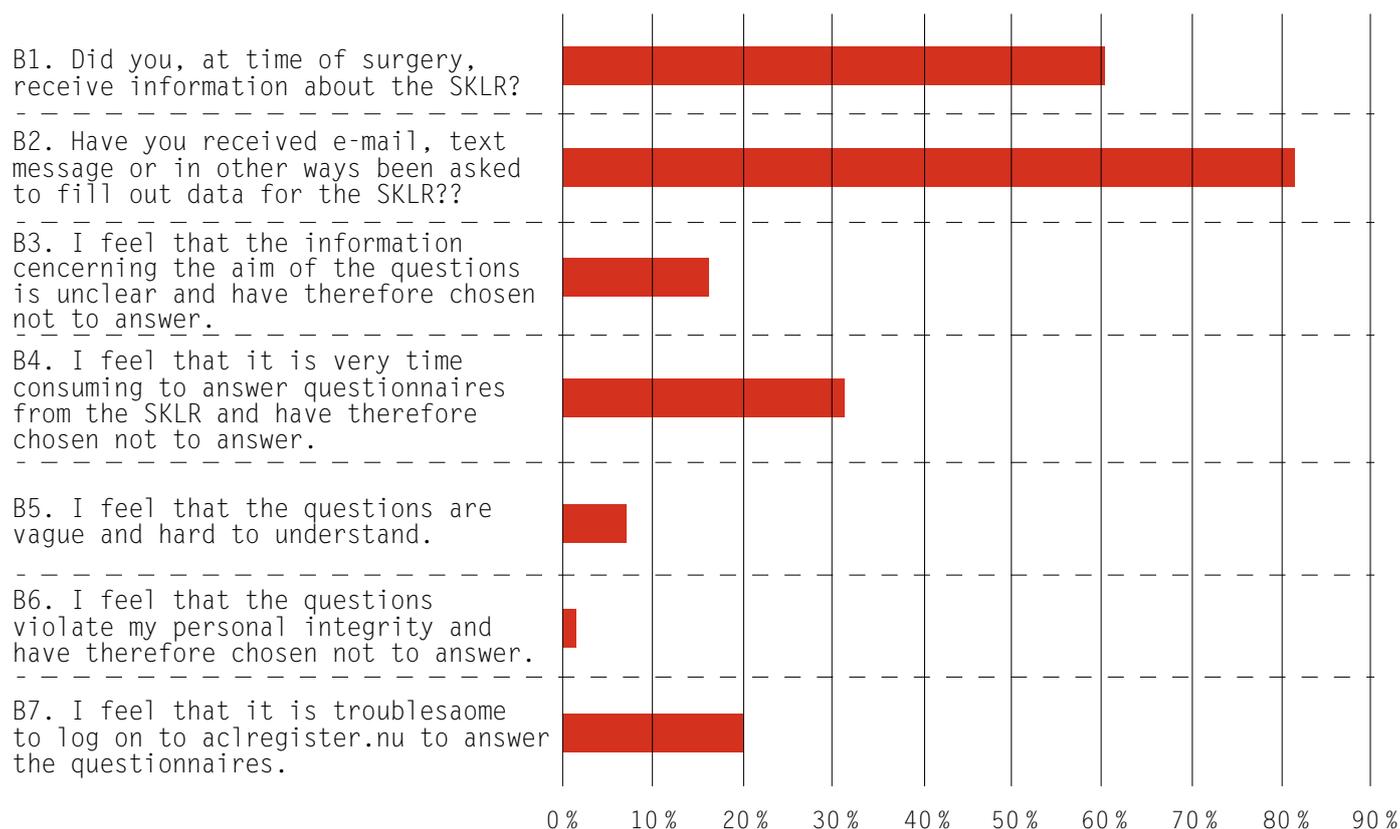
K00S preop and after two years.



EQ5D preop and after two years.



Level of agreement with statements in the late-responder questionnaire.



## Patient-reported function and quality of life (PROM)

All patients are asked to complete two questionnaires, the KOOS and the EQ5D.

The KOOS (Knee injury and Osteoarthritis Outcome Score) is a knee-specific instrument for evaluating the patient's perception of his/her knees and knee-related problems. The instrument evaluates five aspects: pain, other symptoms, such as swelling, joint mobility and mechanical symptoms, functional impairment in connection with daily activities, functional impairment in connection with sport and recreational activities and knee-related quality of life.

The EQ5D is a questionnaire on non-illness-specific health-related quality of life. It comprises five questions with three alternative answers. Each question covers a separate dimension: mobility, hygiene, main activities, pain/problems and fear/depression. The results are presented as an index, a quality of life weighting between 0 (death) and 1 (complete health). A negative index is also possible and then indicates a state of health worse than death. This self-rated health status is also assessed using a thermometer-like scale, the EQ5D-VAS, with the end-points of "worst conceivable health status" (assessed as 0) and "best conceivable health status" (assessed as 100).

Prior to surgery, the patients experience an impairment in their self-rated function. The steering committee sees a clear-cut improvement in self-rated knee function one year after surgery, followed by a successive improvement two and five years after surgery. A comparison with reference data from 118 football players with healthy knees reveals that patients do not achieve normal function one, two or five years after surgery. The greatest differences between patients before and after surgery and the reference group can be seen in the aspects of "functional impairment in connection with sport and recreational activities" and "knee-related quality of life". The results for 2014 do not differ markedly from those in previous years.

The following tables show the data for the KOOS, clinic by clinic, two years postoperatively. We have only included patients aged between 20 and 30 who underwent surgery with hamstring grafts in 2007-2012. The first table presents an average value for the first dimensions of the KOOS, i.e. pain, other symptoms, such as swelling, joint mobility and mechanical symptoms, and functional impairment in connection with daily activities. In a similar way, the second table presents the average value for the last two dimensions of the KOOS, i.e. functional impairment in connection with sport and recreational activities and knee-related quality of life.

We have chosen to present all the clinics with five or more answers.

AVERAGE KOOS SCORES FOR PAIN, SYMPTOMS AND ADL  
FOR PATIENTS UNDERGOING SURGERY IN 2007-2012

CLINIC	No of op	Average age	No of responses	KOOS
LÄKARHUSET HERMELINEN	11	24,6	7	88,4
DANDERYDS SJUKHUS	27	24,8	8	88,3
NACKA NÄRSJUKHUS	28	25,5	11	88,0
PITEÅ ÄLVDAL SJUKHUS	19	24,4	9	87,5
ELISABETH SJUKHUSET	209	24,0	82	87,1
LÖWETS SPECIALISTMOTTAGNING	87	24,2	43	86,9
CAPIO ARTRO CLINIC	1035	25,0	511	86,8
LÄNSSJUKHUSET RYHOV	61	24,2	28	86,8
MEDICIN DIREKT	57	24,8	27	86,2
ORTHOCENTER STOCKHOLM	58	24,1	27	85,9
KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	163	24,9	74	85,6
ORTOPEDISKA HUSET CAREMA	80	24,5	26	85,3
LUNDS UNIVERSITET	98	23,9	51	85,1
MÄLARSJUKHUSET ESKILSTUNA	93	23,8	45	85,1
KALMAR SJUKHUS	148	24,1	65	85,0
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	248	23,8	117	84,9
CAPIO LUNDBY NÄRSJUKHUS	39	25,0	19	84,9
LJUNGBY LASARETT	66	23,0	34	84,7
ORTHOCENTER/IFK-KLINIKEN	186	24,4	89	84,4
ÖSTERSUNDS SJUKHUS	16	24,4	9	84,4
SUNDERBY SJUKHUS	93	24,2	42	84,3
CENTRALLASARETTET VÄXJÖ	101	23,8	40	84,3
SÖDERSJUKHUSET	276	24,7	120	84,3
SPORTS MEDICINE UMEÅ	62	23,9	25	84,1
SAHLGRENSKA	360	24,4	168	84,0
KUNGÄLVS SJUKHUS	27	23,7	14	83,7
OSKARSHAMNS SJUKHUS	71	23,8	36	83,6
HÄSSLEHOLMS SJUKHUS	172	23,8	90	83,5
HÖGLANDSSJUKHUSET	100	24,7	52	83,4
VARBERGS SJUKHUS	54	24,1	27	83,4
MOVEMENT MEDICAL AB	269	24,2	121	83,3
ALERIS ORTOPEDI ÄNGELHOLM	104	23,6	42	83,1
SAMARITERHEMMETS SJUKHUS	42	23,3	17	82,9
ODENPLANS LÄKARHUS	62	24,5	21	82,9
VÄSTERÅS CENTRALLASARETTET	52	23,8	19	82,6

FRÖLUNDA SPECIALISTSJUKHUS	52	25,0	25	82,6
NU-SJUKVÅRDEN	205	24,3	110	82,5
GÄVLE SJUKHUS	72	23,7	38	82,5
MALMÖ ALLMÄNNA SJUKHUS	180	24,6	80	82,3
CAPIO LÄKARGRUPPEN I ÖREBRO AB	111	24,0	58	81,8
NORRTÄLJE SJUKHUS	25	25,1	8	81,8
ORTHOCENTER I SKÅNE	10	24,3	8	81,5
VÄSTERVIKS SJUKHUS	43	23,3	11	81,5
ALINGSÅS LASARETT	60	23,7	28	81,4
LÄNSSJUKHUSET SUNDSVALL	22	23,8	7	81,2
VRINNEVISJUKHUSET	179	23,9	81	81,2
BLEKINGESJUKHUSET	21	23,8	7	81,0
ÖREBRO USÖ	69	24,0	32	80,3
LINKÖPINGS UNIVERSITETSKLINIK	166	23,9	73	80,2
FALU LASARETT	92	24,3	41	80,1
KUNGSBACKA SJUKHUS	138	24,0	71	80,1
KARLSTAD CENTRALSJUKHUS	113	24,2	58	79,5
NYKÖPINGS LASARETT	30	23,5	11	79,5
HUDIKSVALLS SJUKHUS	76	23,2	29	79,0
PERAGO ORTOPEDKLINIK	21	23,9	8	78,4
SKÅNES UNIVERSITETSSJUKHUS	204	24,1	88	78,3
LIDKÖPINGS SJUKHUS	77	24,1	38	77,3
SÖDRA ÄLVSBERGS SJUKHUS	31	23,4	16	76,3
HELSINGBORGS SJUKHUS	54	24,3	22	75,1
SOLLEFTEÅ SJUKHUS	17	24,9	7	70,7
HALMSTADS SJUKHUS	22	24,3	8	69,3
ÖRNSKÖLDSVIKS SJUKHUS	14	24,6	5	69,0

AVERAGE KOOS SCORES FOR FUNCTION AND QUALITY OF LIFE  
FOR PATIENTS UNDERGOING SURGERY IN 2007-2012

CLINIC	No of op	Average age	No of responses	KOOS
NACKA NÄRSJUKHUS	28	25,5	11	72,3
DANDERYDS SJUKHUS	27	24,8	8	68,9
LÖWETS SPECIALISTMOTTAGNING	87	24,2	43	68,1
ORTHOCENTER STOCKHOLM	58	24,1	27	67,2
ELISABETH SJUKHUSET	209	24,0	82	67,0
CAPIO ARTRO CLINIC	1035	25,0	511	66,9
CENTRALLASARETTET VÄXJÖ	101	23,8	40	66,0
SAMARITERHEMMETS SJUKHUS	42	23,3	17	65,7
PITEÅ ÄLVDAL SJUKHUS	19	24,4	9	65,4
ORTHOCENTER/IFK-KLINIKEN	186	24,4	89	65,3
LJUNGBY LASARETT	66	23,0	34	65,2
MEDICIN DIREKT	57	24,8	27	64,6
LÄNSSJUKHUSET RYHOV	61	24,2	28	64,4
KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	163	24,9	74	64,3
SUNDERBY SJUKHUS	93	24,2	42	64,1
LUNDS UNIVERSITET	98	23,9	51	63,9

HÄSSLEHOLMS SJUKHUS	172	23,8	90	63,7
HÖGLANDSSJUKHUSET	100	24,7	52	63,3
SPORTS MEDICINE UMEÅ	62	23,9	25	63,3
LÄKARHUSET HERMELINEN	11	24,6	7	63,3
KALMAR SJUKHUS	148	24,1	65	63,2
MÄLARSJUKHUSET ESKILSTUNA	93	23,8	45	63,1
ORTHOCENTER I SKÅNE	10	24,3	8	62,9
NORRTÄLJE SJUKHUS	25	25,1	8	62,7
SÖDERSJUKHUSET	276	24,7	120	62,5
ODENPLANS LÄKARHUS	62	24,5	21	62,5
ORTOPEDISKA HUSET CAREMA	80	24,5	26	62,0
CAPIO LUNDBY NÄRSJUKHUS	39	25,0	19	61,8
MOVEMENT MEDICAL AB	269	24,2	121	60,8
SAHLGRENSKA	360	24,4	168	60,7
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	248	23,8	117	60,6
CAPIO LÄKARGRUPPEN I ÖREBRO AB	111	24,0	58	60,3
OSKARSHAMNS SJUKHUS	71	23,8	36	60,1
FRÖLUNDA SPECIALISTSJUKHUS	52	25,0	25	60,0
KUNGÄLVS SJUKHUS	27	23,7	14	59,9
GÄVLE SJUKHUS	72	23,7	38	59,8
VÄSTERÅS CENTRALLASARETTET	52	23,8	19	59,6
NU-SJUKVÅRDEN	205	24,3	110	59,4
ÖSTERSUNDS SJUKHUS	16	24,4	9	58,7
ALERIS ORTOPEDI ÄNGELHOLM	104	23,6	42	58,7
VARBERGS SJUKHUS	54	24,1	27	58,6
VÄSTERVIKS SJUKHUS	43	23,3	11	58,2
LÄNSSJUKHUSET SUNDSVALL	22	23,8	7	58,0
NYKÖPINGS LASARETT	30	23,5	11	57,8
ÖREBRO USÖ	69	24,0	32	57,7
MALMÖ ALLMÄNNA SJUKHUS	180	24,6	80	57,5
VRINNEVISJUKHUSET	179	23,9	81	57,2
PERAGO ORTOPEDKLINIK	21	23,9	8	57,2
HUDIKSVALLS SJUKHUS	76	23,2	29	57,0
HELSINGBORGS SJUKHUS	54	24,3	22	56,5
KARLSTAD CENTRALSJUKHUS	113	24,2	58	56,4
KUNGSBACKA SJUKHUS	138	24,0	71	55,9
BLEKINGESJUKHUSET	21	23,8	7	55,8
FALU LASARETT	92	24,3	41	54,3
SKÅNES UNIVERSITETSSJUKHUS	204	24,1	88	54,3
LINKÖPINGS UNIVERSITETSKLINIK	166	23,9	73	53,8
ALINGSÅS LASARETT	60	23,7	28	52,6
LIDKÖPINGS SJUKHUS	77	24,1	38	52,1
SÖDRA ÄLVSBORGS SJUKHUS	31	23,4	16	49,5
SOLLEFTEÅ SJUKHUS	17	24,9	7	45,9
HALMSTADS SJUKHUS	22	24,3	8	35,3
ÖRNSKÖLDSVIKS SJUKHUS	14	24,6	5	35,1

## Gender aspects

### Age

Some 40% of the primary ACL reconstructions that were performed in 2014 involved women and the 60/40 relationship between the genders has been relatively constant since the start in 2005. The same thing basically applies to revision surgery, but an increasing trend for women can be seen in this context. The average age for patients undergoing primary reconstruction is 28, but there are no relevant differences between the genders (27 for women and 28 years for men). There is, however, a difference in the age at revision surgery, where the average age of women is 26 compared with 28 for men. It is worth noting that the average age of women in conjunction with revision surgery is lower than the average age in connection with primary surgery.

### Activity in conjunction with injury

Reconstruction after injuries suffered during equestrianism and gymnastics is more common among women than among men, but this probably reflects the differences in the gender of people taking part in these activities. The differences in gender ratios (women/men as a percentage) in activities such as handball (73/27), Alpine skiing (64/36) and basketball (61/49) are surprising, as the number of male participants can be expected to be as high as or higher than the percentage of females.

### Time between injury and operation

In average terms, there was no difference between the genders when it came to the time between injury and operation in 2014.

## Anterior cruciate ligament reconstruction in older patients

Some 80% of all ACL reconstructions since 2005 have been performed on patients under 40 years of age. Of the remaining 20%, only 3% are 50 or older. A considerable number of reconstructions are therefore performed on patients aged between 40 and 50 (17%). It appears that these patients still wish to maintain a high activity level to a greater degree than before. This high activity level means that a larger number of patients, perhaps more than ever before, are faced with the question of whether or not they should undergo surgery.

The most common question facing an orthopedist is whether ACL reconstruction in an older patient could lead to poorer results compared with younger patients as a result of possible established cartilage and/or meniscal damage. What results can be expected and what can we recommend to our patients?

A recently published study containing data from the Swedish ACL Register reports comparable results for patient-related result measurements (KOOS) for patients from different age categories. This study was based on data from 2005 up to and including 2012. The total patient cohort was stratified into the age groups of 0-19, 20-29, 30-39 and  $\geq 40$  years. The median age was 24, where 60.3% were men with a median age of 26 and 39.7% were women with a median age of 21. In all, 13.3% of the patients were  $\geq 40$  (Table 1).

In the younger age groups, sports such as football, handball and floorball dominate as the etiology for ACL injuries. In the oldest age group, Alpine skiing was the most common activity at the time of injury, while football was the second most common. A clear reduction in football as the primary cause of ACL injury and an increase in Alpine skiing can be seen in each age category.

Older patients had more cartilage and/or meniscal damage and a longer time to operation compared with the younger age groups. The second of these factors perhaps illustrates that surgeons apply stricter indication criteria when deciding on ACL reconstructions among older patients, but also that patients are more likely to adopt a wait-and-see attitude to possible surgical intervention. In spite of this, the data

from the study reveal that the result did not differ between age categories, indicating that a longer period of time between injury and surgery in itself does not influence the analyzed results.

The preoperative KOOS was significantly lower in the older age groups for all the sub-groups in the KOOS. One explanation could be that older patients have lower KOOS scores in overall terms related to impaired knee function secondary to simultaneous cartilage or meniscal damage.

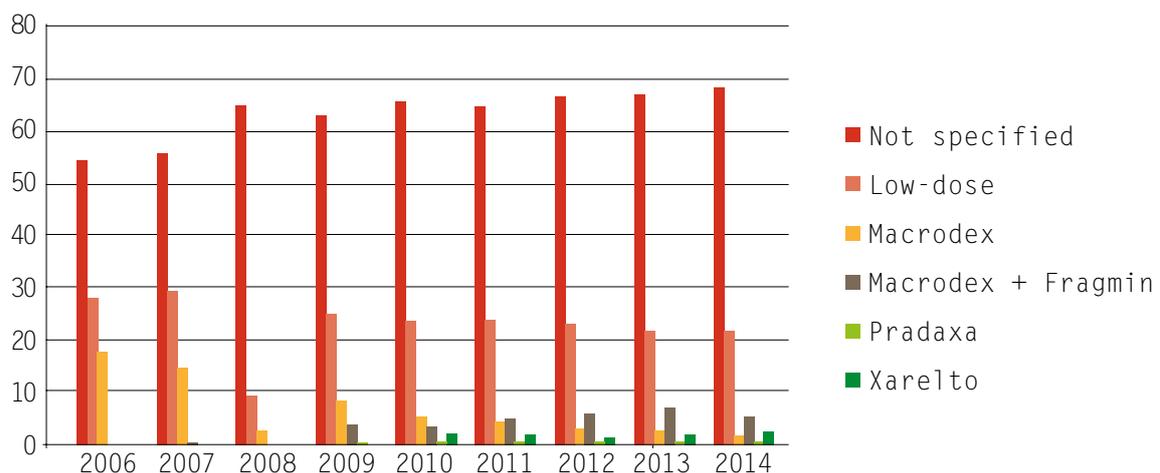
Interestingly, a significant improvement in all the KOOS sub-scales was found with increasing age. The greatest improvement was seen in the oldest group ( $\geq 40$  years) at the one-, two- and five-year follow-up. One possible explanation could be that younger patients perceive lasting knee instability and a deterioration in knee function as more of a handicap to a greater degree than older patients would, possibly as a result of more physically demanding occupations and/or hobbies. This could then impact and perhaps also explain the shorter period between injury and surgery in the younger patient category. The relatively high postoperative KOOS scores in older patients could perhaps be explained by the fact that they are still actively involved in sports but generally have lower total demands when it comes to knee function compared with younger patients. Older patients may have higher total rehabilitation motivation and determination and lower expectations in terms of the results of surgery and are therefore more satisfied with the result of surgery. This is reflected in higher KOOS scores postoperatively.

## Thromboprophylaxis in the ACL Register

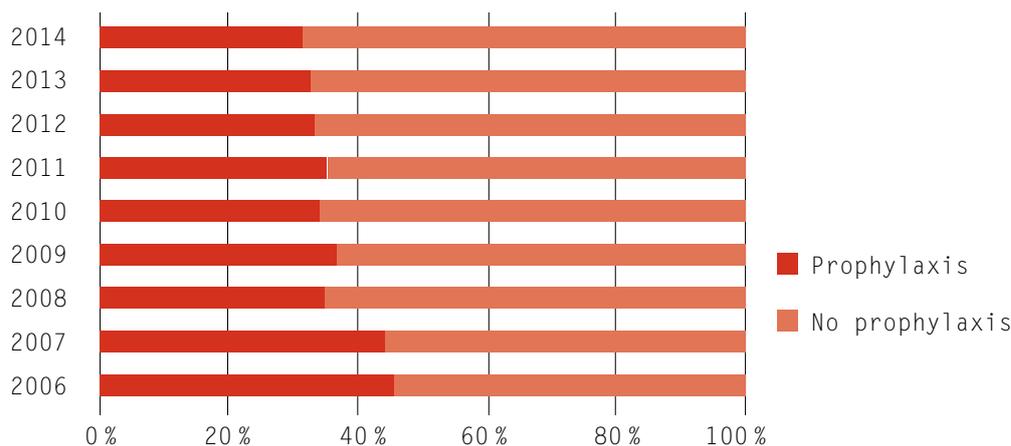
There are no general guidelines and recommendations when it comes to the use of thromboprophylaxis in conjunction with ACL surgery. The risk of symptomatic thrombosis is probably low and is specified in large studies as being around 0.3% (Jameson 2012). A higher risk among women, especially in connection with hormone-based contraception, and the elderly has been discussed. In the ACL Register, it is possible to register any administered thromboprophylaxis.

It appears that the tendency to administer thromboprophylaxis has declined from 45% in 2006 to 31% in 2014. So-called low-dose antithrombotic medication, such as fragmin and klexane, is most frequently prescribed. Macrodex was common in 2006, but it has now virtually disappeared as an antithrombotic in connection with ACL surgery, probably as a result of changes in anesthesia routines. In recent years, perorally administered antithrombotics, pradaxa and xarelto, have been introduced and they are easier for patients to administer, but they have a different side-effect profile and have only been evaluated as prophylaxis in conjunction with elective hip- and knee-prosthetic surgery. Pradaxa and xarelto appear to have replaced low-dose antithrombotics at some clinics. The declining tendency to administer thromboprophylaxis can probably be largely explained by the replacement of macrodex, which was previously routinely administered, by another form of prophylaxis. The dose or the period of time for which antithrombotics have been recommended are not stated in the register.

Percentage of patients receiving thromboprophylaxis distributed by medication and not specified (%).



Percentage of patients (%) for whom, according to the register, some form of thromboprophylaxis was recommended.



## ACL injuries not treated surgically

Patients with an ACL injury which is not reconstructed have been able to answer the KOOS and EQ5D questionnaires. In 2014, a group of researchers (C Ardern, S Tagesson, M Forssblad and J Kvist) collated the data registered by these patients and categorized them in time intervals: three months after the injury and one, two and five years after the injury. Depending on when the injury occurred, follow-up questionnaires have been sent to these patients in an attempt to obtain answers on a number of follow-up occasions. To enable comparisons with patients who have undergone a reconstruction, four groups of patients of the same gender and corresponding ages and the same activity in conjunction with the injury, who answered prior to the reconstruction (some three months after the injury and no more than three months prior to the reconstruction) and one, two and five years after the reconstruction, have been identified.

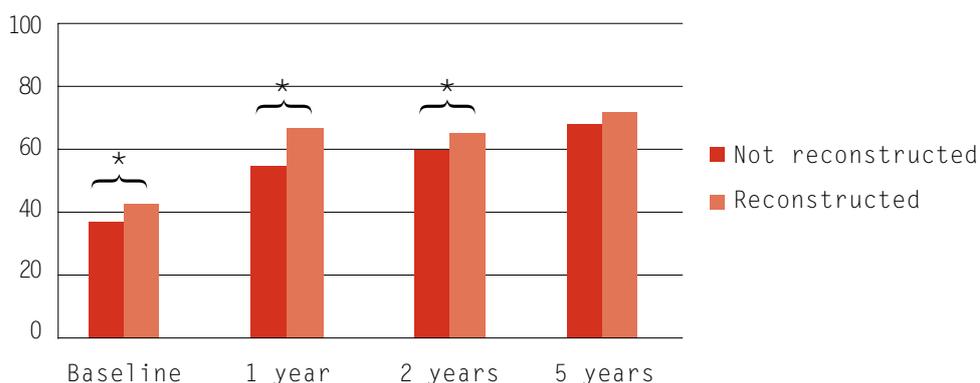
Number of people who answered the questionnaires

	Baseline	1 yr	2 yrs	5 yrs
Not reconstructed	298	351	358	112
Reconstructed	305	359	392	126

The results from the KOOS scale for sports reveal that patients who do not undergo reconstruction give lower ratings for KOOS sport three months, one year and two years after injury compared with those that undergo an ACL reconstruction. Five years after injury, there are no significant differences between patients who have undergone a reconstruction and those that have not.

These results should be interpreted with care, as only a few patients with non-reconstructed ACL injuries answered the questionnaires and it is unclear whether the results can be generalized to suit all the patients who are treated without reconstruction.

KOOS sport.



## Discussion

The Swedish ACL Register was started in 2005 and it is estimated that it now covers more than 90% of all the ACL operations performed in Sweden. ACL reconstruction improves both function and knee-related quality of life compared with the situation prior to surgery, but there are still limitations after ACL surgery. Patients with an ACL injury who undergo stabilization surgery do not achieve the same function as an uninjured, age-matched population. Self-reported, patient-perceived quality indicators reveal that these patients experience a deterioration in quality of life one, two, five and 10 years after surgery and that it is primarily related to restricted knee-related quality of life.

The steering committee is discussing a number of improvement projects. This is necessary in order to improve the applicability of the register. The project with the highest priority aims to transform the ACL Register from a surgery register to a diagnosis register. It is already possible to register untreated patients with an ACL injury, but a real effort needs to be made to improve reporting.

The response rate to questionnaires has improved in recent years. The steering committee believes that national collaboration with web portals and the improved registration of e-mail addresses, for example, would further facilitate this process and would also contribute to increased reporting and reduced costs.

The steering committee also feels that there is a need for continuous training for ACL surgeons in Sweden, especially those that perform fewer than 10 operations a year.

## Conclusions

One important conclusion from the analyses conducted in previous years is that smoking has a negative effect on the result of an ACL reconstruction. The steering committee therefore recommends that patients should be informed of the negative impact of smoking prior to possible surgery.

The national ACL Register is collaborating with other orthopedic registers and with a number of other quality registers. The aim is to help in the development of simplified methods for the collection and feedback of data. The ACL Register's steering committee would like to express its gratitude for excellent collaboration during the past year. It is clear that collaboration relating to the follow-up of patient-perceived health is becoming increasingly interactive, which is leading to constructive in-depth studies. The steering committee welcomes comments and views on this annual report and looks forward to continued good collaboration.

The register would like to thank all the participating clinics and users. Without your contributions, this kind of register cannot survive.

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