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THE SWEDISH NATIONAL  
KNEE LIGAMENT REGISTER

# Swedish ACL Register. Annual Report 2015.

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## 3,567 primary operations and 284 revisions.

AKADEMISKA SJUKHUSET ALERIS ORTOPEDI ÄNGELHOLM ALINGSÅS LASARETT ART CLINIC  
ART CLINIC GÖTEBORG BLEKINGESJUKHUSET BOLLNÄS SJUKHUS CAPIO ARTRO CLINIC CAPIO LUNDBY  
NÄRSJUKHUS CAPIO LÄKARGRUPPEN I ÖREBRO AB CARLANDERSKA ORTOPEDI CENTRALLASARETTET VÄXJÖ  
CITYAKUTEN PRIVATVÅRD DANDERYDS SJUKHUS DROTTNING SILVIAS BARN OCH UNGDOMSSJUKHUS  
ELISABETH SJUKHUSET FALU LASARETT FRÖLUNDA ORTOPEDEN AB FRÖLUNDA SPECIALISTSJUKHUS  
GÄLLIVARE SJUKHUS GÄVLE SJUKHUS HALMSTADS SJUKHUS HELSINGBORGS SJUKHUS HUDIKSVALLS  
SJUKHUS HÄSSLEHOLMS SJUKHUS HÖGLANDSSJUKHUSET KALMAR SJUKHUS KARLSTAD CENTRALSJUKHUS  
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN KUNGSBACKA SJUKHUS KUNGÄLVIS SJUKHUS  
KÄRNSJUKHUSET I SKÖVDE LASARETTET I ENKÖPING LINKÖPINGS UNIVERSITETSKLINIK LJUNGBY  
LASARETT LÄKARHUSET HERMELINEN LÄNSSJUKHUSET RYHOV MEDICIN DIREKT MOVEMENT MEDICAL AB  
MÄLARSJUKHUSET ESKILSTUNA NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ NORRTÄLJE SJUKHUS  
NU-SJUKVÅRDEN NYKÖPINGS LASARETT ODENPLANS LÄKARHUS ORTHOCENTER I SKÅNE ORTHOCENTER  
STOCKHOLM ORTHOCENTER/IFK-KLINIKEN ORTOPEDISKA HUSET CAREMA OSKARSHAMNS SJUKHUS  
PERAGO ORTOPEDKLINIK SABBATSBERG NÄRSJUKHUSET SAHLGRENSKA UNIVERSITETSSJUKHUSET SKÅNES  
UNIVERSITETSSJUKHUS SOLLEFTEÅ SJUKHUS SOPHIAHEMMET SPORTS MEDICINE UMEÅ SPORTSMED  
SUNDERBY SJUKHUS SÖDERMALMS ORTOPEDI SÖDERSJUKHUSET SÖDERTÄLJE SJUKHUS SÖDRA ÄLVSBORGS  
SJUKHUS VISBY LASARETT VRINNEVISJUKHUSET 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 helps to prevent 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 during this period. On 31 December 2015, the database contained 3,398 patients who had registered an ACL injury prior to a decision to treat. Of these 3,398 patients, 730 have since undergone surgery. In 2015, 730 patients who did not initially undergo surgery were registered. 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 in progress for a number of years with a view to increasing the response rate for patients undergoing surgery and to include a follow-up via treating physical therapists. A large number of questionnaires are being collected via this research group and this has increased the response rate.

## ACL reconstruction

At the present time, there are about 80 clinics in Sweden that provide orthopedic care. Of these, 70 (67 in 2014) have informed the ACL register that they performed ACL surgery in 2015. It is estimated that the ACL register covers more than 90% of all the ACL operations in Sweden following the pooling of the data in the ACL register and the Swedish Board of Health and Welfare's patient register.

## 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 an administrative error 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, straightforward 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 2015 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 Capho Artro 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 will take place in 2016 when patients and physical therapists will also 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 is slightly more than 70%. There is a large difference between clinics, but the Capiro Artro 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. Preoperatively, all clinics should approach 100%, as this is the "last" opportunity to collect all preoperative data. The ACL Register's steering committee is hoping to encourage all county councils and insurance companies not only to participate in the ACL Register but also to guarantee up to 100% preoperative registration (minimum requirement 90%). The Stockholm County Council introduced this in the requirements for orthopedic health-care selection in 2014, but it has subsequently been removed in 2016.

### 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 examined all the variables to facilitate registration and to remove variables with poor reliability. This will be realized in conjunction with the change of platform in the fall of 2016.

### 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 (approx. 50% and 40%). It is pleasing to report that the 10-year follow-up for 2005 produced a response rate of around 40%. An additional reminder will be sent in 2016 for the 10-year follow-up. 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 2016/2017. During the fall, 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.

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.

## Coverage and response rate

The Swedish National Board of Health and Welfare registered 3,835 ACL operations (both primary operations and revisions with surgery code NGE41) in 2014. The ACL Register contains 3,709 registered operations for 2014.

Matching at personal ID number level reveals that the ACL Register and the patient register have a total of 4,250 unique ACL operations.

The exact agreement on the number of ACL operations in the two registers was 77.2% in 2014; 9.8% were only found in the ACL Register and 13.1% only in the patient register, which largely agrees with the figures for previous years.

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 2015 are not yet available and this comparison has therefore been made with 2014.

Response rate at follow-up

	KOOS				EQ5				
	Preop	1 year	2 years	5/10 years	Preop	1 year	2 years	5/10 years	10 years
2015	72				70				
2014	71	53			68	52			
2013	75	65	41		72	64	40		
2012	70	61	51		66	60	50		
2011	71	66	52		65	65	51		
2010	70	61	54	28	65	60	53	28	
2009	73	61	51	35	70	60	50	35	
2008	65	60	48	39	63	62	46	39	
2007	57	55	49	39	57	62	48	39	
2006	58	51	49	39	55	56	50	40	
2005	57	50	50	38/39	39	54	50	52	35/38

If the results are to be credible and applicable in a research context, the response rate for patient-reported data should be high. The response rate for the EQ5D is slightly lower than that for the KOOS.

## Funding the ACL Register

For 2015 and 2016, SEK 2.6 million has been allocated to the ACL Register 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. Anna Pappas works as a part-time administrator of 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, for example.

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, the surgeons performing these operations must perform at least 25 ACL operations a year, but no follow-up appears to be made.

The differences between county councils when it comes to remuneration pose a large problem and are creating inequality in terms of health care. Each clinic is tied to the same remuneration obtained from its individual county council. In spite of discussions with the SKL, Sweden’s Municipalities and County Councils, among others, no initiatives have been taken to change the remuneration for the free health-care selection set-up and foreign patients. A nationwide pricelist would be the obvious alternative.

## 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 and administrator is Anna Pappas at the Sports Trauma Research and Education Center, Karolinska Institutet, and the Capio Arthro Clinic.

In 2015, 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



- Christina Mikkelsen, MD, Capio Arthro Clinic and Sports Trauma Research and Education Center, Karolinska Institutet, Stockholm
- Kristian Samuelsson, Associate Professor, Sahlgrenska University Hospital, Gothenburg
- Anders Stålmán, MD, 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 Arthro 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). IT will be transferred to a new environment in 2016.

## 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 Forsblad 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, research groups 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 meet in conjunction with orthopedic meetings (once or twice a year). 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 2005-2015, 34,035 primary ACL reconstructions and 2,230 revisions from a total of 86 clinics were registered.

## Number of operations per clinic in 2014-2015

Clinic	2014					2015				
	Prim	Rev	Tot	Koos	Pct	Prim	Rev	Tot	Koos	Pct
CAPIO ARTHRO CLINIC	683	72	755	740	98 %	732	69	801	771	96 %
SKÅNES UNIVERSITETSSJUKHUS	213	14	227	179	79 %	223	17	240	176	73 %
ORTHOCENTER/IFK-KLINIKEN	131	16	147	118	80 %	149	23	172	152	88 %
SÖDERSJUKHUSET	112	12	124	74	60 %	128	13	141	105	74 %
ORTOPEDISKA HUSET CAREMA	92	3	95	73	77 %	123	13	136	115	85 %

CAPIO LUNDBY NÄRSJUKHUS	93	1	94	30	32%	96	4	100	64	64%
HELSINGBORGS SJUKHUS	75	3	78	66	85%	93	5	98	82	84%
KUNGSBACKA SJUKHUS	78	10	88	64	73%	89	8	97	54	56%
SAHLGRENSKA UNIVERSITETSSJUKHUSET	140	13	153	132	86%	85	7	92	68	74%
HÄSSLEHOLMS SJUKHUS	79	0	79	68	86%	84	1	85	75	88%
VRINNEVISJUKHUSET	89	8	97	58	60%	83	3	86	52	60%
ELISABETH SJUKHUSET	51	4	55	27	49%	81	7	88	31	35%
SPORTS MEDICINE UMEÅ	63	8	71	23	32%	80	6	86	60	70%
KARLSTAD CENTRALSJUKHUS	72	3	75	11	15%	72	5	77	17	22%
NU-SJUKVÅRDEN	38	7	45	32	71%	70	10	80	65	81%
MOVEMENT MEDICAL AB	77	10	87	53	61%	68	10	78	48	62%
FALU LASARETT	54	0	54	12	22%	66	4	70	11	16%
CAPIO LÄKARGRUPPEN I ÖREBRO AB	65	5	70	69	99%	59	6	65	65	100%
NORRLANDS UNIVERSITETS- SJUKHUS, UMEÅ	78	8	86	34	40%	59	7	66	21	32%
ORTHOCENTER STOCKHOLM	33	2	35	18	51%	56	4	60	59	98%
MEDICIN DIREKT	58	7	65	49	75%	54	8	62	52	84%
DANDERYDS SJUKHUS	48	3	51	34	67%	53	2	55	40	73%
AKADEMISKA SJUKHUSET	29	2	31	0	0%	53	1	54	3	6%
SUNDERBY SJUKHUS	39	2	41	30	73%	52	2	54	21	39%
CENTRALLASARETTET VÄXJÖ	57	2	59	55	93%	45	3	48	45	94%
LINKÖPINGS UNIVERSITETSKLINIK	52	1	53	42	79%	42	8	50	34	68%
KALMAR SJUKHUS	57	3	60	10	17%	39	5	44	3	7%
FRÖLUNDA SPECIALISTSJUKHUS	35	8	43	31	72%	37	1	38	33	87%
LÄNSSJUKHUSET RYHOV	54	2	56	24	43%	35	3	38	19	50%
GÄVLE SJUKHUS	49	2	51	32	63%	31	0	31	27	87%
KAROLINSKA UNIVERSITETS- SJUKHUSET / ORTOPEDKLINIKEN	11	0	11	6	55%	31	1	32	8	25%
SÖDRA ÄLVSBORGS SJUKHUS	25	0	25	13	52%	30	0	30	18	60%
SABBATSBERG NÄRSJUKHUSET	60	10	70	49	70%	29	0	29	24	83%
ALINGSÅS LASARETT	27	3	30	23	77%	27	4	31	30	97%
VÄSTERÅS ORTOPEDPRAKTIK	34	0	34	14	41%	27	4	31	17	55%
ORTHOCENTER I SKÅNE	26	4	30	23	77%	27	3	30	26	87%
HUDIKSVALLS SJUKHUS	32	1	33	30	91%	27	1	28	24	86%
CITYAKUTEN PRIVATVÅRD	15	0	15	1	7%	25	0	25	0	0%
HÖGLANDSSJUKHUSET	38	1	39	22	56%	24	3	27	15	56%
KÄRNSJUKHUSET I SKÖVDE	9	0	9	0	0%	24	0	24	10	42%
ÖREBRO USÖ	16	2	18	6	33%	23	3	26	6	23%
VISBY LASARETT	11	0	11	10	91%	22	1	23	18	78%
NORRTÄLJE SJUKHUS	20	0	20	15	75%	22	1	23	10	43%
DROTTNING SILVIAS BARN OCH UNGDOMSSJUKHUS	1	0	1	0	0%	21	0	21	2	10%
SPORTSMED	20	1	21	10	48%	20	1	21	4	19%
LASARETTET I ENKÖPING	32	2	34	0	0%	18	0	18	2	11%
VÄSTERVIKS SJUKHUS	13	0	13	4	31%	18	0	18	7	39%
OSKARSHAMNS SJUKHUS	13	0	13	12	92%	17	0	17	16	94%
CARLANDERSKA ORTOPEDI	0	0	0	0	0%	16	0	16	3	19%
LJUNGBY LASARETT	14	0	14	0	0%	15	1	16	0	0%
BLEKINGESJUKHUSET	18	0	18	9	50%	15	0	15	8	53%

ALERIS ORTOPEDI ÄNGELHOLM	8	0	8	4	50 %	15	1	16	7	44 %
PERAGO ORTOPEDKLINIK	26	6	32	19	59 %	14	1	15	3	20 %
ÖRNSKÖLDSVIKS SJUKHUS	21	1	22	21	95 %	14	2	16	14	88 %
NYKÖPINGS LASARETT	15	0	15	1	7 %	11	0	11	1	9 %
ART CLINIC GÖTEBORG	0	0	0	0	0 %	11	0	11	7	64 %
VÄSTERÅS CENTRALLASARETTET	11	0	11	8	73 %	10	1	11	3	27 %
KUNGÄLVS SJUKHUS	2	0	2	1	50 %	10	0	10	5	50 %
SOPHIAHEMMET	11	2	13	4	31 %	9	0	9	6	67 %
ART CLINIC	12	0	12	12	100 %	9	0	9	7	78 %
LÄKARHUSET HERMELINEN	10	0	10	4	40 %	9	0	9	4	44 %
MÄLARSJUKHUSET ESKILSTUNA	0	0	0	0	0 %	7	1	8	2	25 %
SÖDERMALMS ORTOPEDI	0	0	0	0	0 %	7	0	7	6	86 %
SÖDERTÄLJE SJUKHUS	11	0	11	0	0 %	7	0	7	0	0 %
GÄLLIVARE SJUKHUS	6	0	6	6	100 %	6	0	6	3	50 %
ODENPLANS LÄKARHUS	28	3	31	4	13 %	5	0	5	1	20 %
FRÖLUNDA ORTOPEDEN AB	0	0	0	0	0 %	3	0	3	0	0 %
SOLLEFTEÅ SJUKHUS	4	0	4	4	100 %	2	0	2	1	50 %
BOLLNÄS SJUKHUS	0	0	0	0	0 %	2	0	2	2	100 %
HALMSTADS SJUKHUS	9	0	9	2	22 %	1	0	1	0	0 %
LÄNSSJUKHUSET SUNDSVALL	8	0	8	0	0 %	0	0	0	0	0 %
SPECIALISTCENTER SCANDINAVIA	2	0	2	2	100 %	0	0	0	0	0 %
VÄRNAMO SJUKHUS/ ORTOPEDKLINIKEN	29	0	29	26	90 %	0	0	0	0	0 %
TOTAL	3411	267	3678	2553	69 %	3567	284	3851	2688	70 %

Prim = Primary ACL surgery, Rev = Revisions (Reoperations), Total (Prim +Rev) KOOS = Number of patients who responded to the preoperative KOOS questionnaire within 180 days prior to the operation, Pct = 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 2015. During the period 2009-2015, 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 24 for women and 29 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	1,954	1,488	57	43
2015	2,053	1,514	58	42

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 2009-2015.

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
2015	154	130	54	46

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 still the most common activity associated with an ACL injury and this situation does not change from year to year. In 2015, football was the cause of ACL injuries in 34% of women and 47% of men.

The second most common activity was downhill skiing for women and floorball among men and this has not changed in the past few years.

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.

2015	Total	Women	%	Men	%
FOOTBALL	1,441	482	33.4	959	66.6
ALPINE/TELEMARK	493	316	64.1	177	35.9
FLOORBALL	275	102	37.1	173	62.9

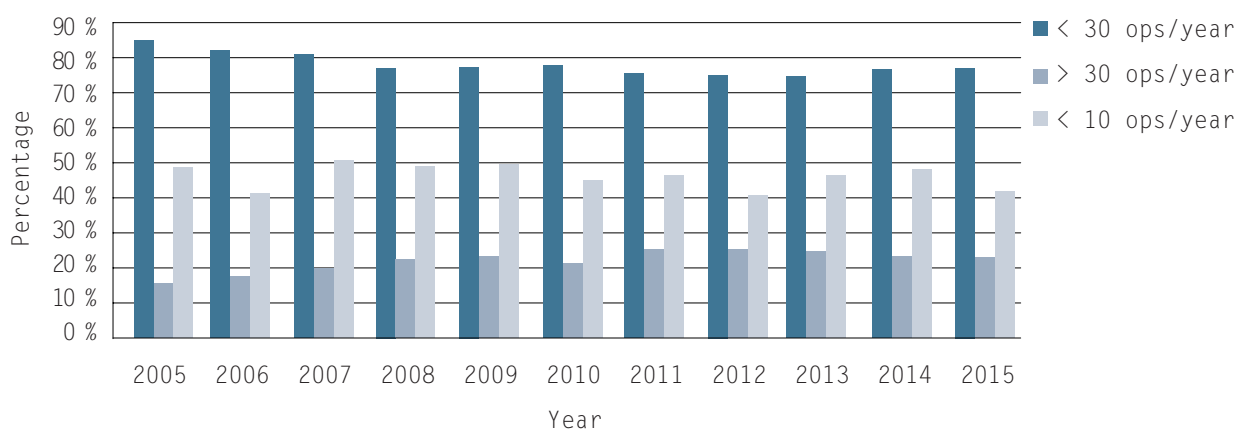
OTHER	215	96	44.7	119	55.3
HANDBALL	160	117	73.1	43	26.9
OTHER SPORT					
RECREATION	123	61	49.6	62	50.4
MARTIAL ARTS	94	37	39.4	57	60.6
BASKETBALL	82	50	61.0	32	39.0
TRAFFIC	63	25	39.7	38	60.3
WORK	62	15	24.2	47	75.8
ENDURO/MOTORCROSS	61	3	4.9	58	95.1
OUTDOOR LIFE	49	35	71.4	14	28.6
ICE HOCKEY/BANDY	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
DANCING	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, 77% perform fewer than 30 operations a year and 42% 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 73 minutes for a primary operation and about 93 minutes for a revision.

Number of ACL operations per surgeon



## 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, 2015

2015	Total	Women	Men
Greater Stockholm	330	329	331
Rest of Svealand + Gotland	410	367	440
Skåne	437	410	455
Halland	386	203	472
Småland + Blekinge	350	259	409
Västra Götaland	414	439	395
Östergötland	395	371	411
Norrland	426	404	446
Total	396	384	405

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

The percentage of patients who undergo day surgery is slowly increasing and is now 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, 85.2% in 2014 and, in 2015, 86.3%.

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, 73.3%, but this figure has increased sharply from 2014 (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.

2015	Percentage of day surgery %
Greater Stockholm	89.4
Rest of Svealand + Gotland	81.1
Skåne	93.3
Halland	73.3
Småland + Blekinge	75.2
Västra Götaland	85.4
Östergötland	86.6
Norrland	87.4
Total	86.3

## 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.

Number of primary operations in children under 15 years of age

	2014	2015
CAPIO ARTRO CLINIC	40	50
DROTTNING SILVIAS BARN OCH UNGDOMSSJUKHUS	1	13
ORTHOCENTER/IFK-KLINIKEN	3	5
SUNDERBY SJUKHUS	2	4
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	1	3
HELSINGBORGS SJUKHUS	2	3
KARLSTAD CENTRALSJUKHUS	2	3
SPORTS MEDICINE UMEÅ	0	2
HÄSSLEHOLMS SJUKHUS	0	2
CAPIO LÄKARGRUPPEN I ÖREBRO AB	0	2
FALU LASARETT	1	2
CAPIO LUNDBY NÄRSJUKHUS	2	2
KÄRNSJUKHUSET I SKÖVDE	0	2
ELISABETH SJUKHUSET	2	2
SKÅNES UNIVERSITETSSJUKHUS	4	2
KUNGSBACKA SJUKHUS	1	2
ÖREBRO USÖ	2	2
CENTRALLASARETTET VÄXJÖ	2	2
ALINGSÅS LASARETT	1	2
VÄSTERVIKS SJUKHUS	1	1
LÄNSSJUKHUSET RYHOV	2	1
ORTHOCENTER I SKÅNE	0	1
ÖRNSKÖLDSVIKS SJUKHUS	0	1
NU-SJUKVÅRDEN	1	1
MEDICIN DIREKT	2	1
MOVEMENT MEDICAL AB	0	1
OSKARSHAMNS SJUKHUS	1	1
KALMAR SJUKHUS	3	1
VÄSTERÅS CENTRALLASARETTET	0	1
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	1	0
SABBATSBERG NÄRSJUKHUSET	1	0
ORTHOCENTER STOCKHOLM	1	0
HUDIKSVALLS SJUKHUS	1	0
VÄSTERÅS ORTOPEDPRAKTIK	2	0

SAHLGRENSKA UNIVERSITETSSJUKHUSET	9	0
LINKÖPINGS UNIVERSITETSKLINIK	1	0
SOLLEFTEÅ SJUKHUS	1	0
GÄVLE SJUKHUS	1	0
LJUNGBY LASARETT	1	0
	95	115

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 2015, only 11 (28 in 2014) such operations were performed, which corresponds to fewer than 1% of all the operations performed.

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. A reduction to 96% has taken place in recent years. 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. In 2015, 1,717 operations of this kind were performed compared with 859 operations using the quadrupled semitendinosus and gracilis. 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 17% from 2014 to 2015 (131 in 2014 to 153 in 2015).

Increasing interest has also been shown in the use of quadriceps grafts. The quadriceps tendon can be used as a free graft 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. In 2015, 75 operations of this kind were performed compared with 77 in 2014.

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 2015, 26 allografts were used in primary surgery, 11 more than in 2014. 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 (58%). Interest in the quadriceps in revisions has declined somewhat, from 30 to 23 compared with 2014. Allografts are being used increasingly in revision surgery (10%).

## Tibial fixation

The use of the Tightrope in the tibia currently dominates and it was used in 24% in 2015. Resorbable screws were used in 23% of operations. This method was introduced in 2012. The use of resorbable screws has doubled since 2009. One of the reasons for this is to avoid the removal of fixation material in revisions. 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 both 2014 and 2015. 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 85% of all femoral fixations. The most common cortical button is still the Endobutton (1,556 in 2015), although the use of the Tightrope (1,485 in 2015) 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 85% in 2015. 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 9-10%.

## Revisions and surgery on the contralateral side

A total of 2,330 revisions were registered in the ACL Register in 2005-2015. If we instead choose to follow the patients who initially underwent surgery within the framework of the ACL Register and then underwent revisions, 1,290 (3.5%) 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 2015 during that same

year. In addition, 1,162 (3.2%) underwent a new ACL operation on the contralateral knee. Women underwent revisions on a larger scale than men – 3.8% compared with 3.4% for the same knee and 3.4% compared with 3.0% for the contralateral knee.

Only 63 patients underwent revisions on two occasions and only six patients have undergone surgery three times. No one in the register has undergone more than three revisions.

Patients receiving hamstring tendon grafts underwent revisions on the same knee in 3.6% of cases compared with 3.0% for patients receiving patellar tendon grafts, but this figure is difficult to assess, as the number of primary patellar tendon operations is only around 3,057 compared with 31,871 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 and the period 2005-2015 is analyzed, the number of revisions for patellar tendons is 2.2% compared with 2.9% for hamstring tendons. This still indicates a 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; 6.0% underwent revisions on the same knee, while the percentage for the contralateral knee was 6.5%.

For the second year in a row, we have chosen to present revisions on the same knee by clinic, regardless of age or graft type. The following table presents the number of revisions within two years. 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 1.1.2005-31.12.2013

CLINIC	Number of op	Number of rev	Pct
ORTHOCENTER I SKÅNE	45	3	6,7 %
PERAGO ORTOPEDKLINIK	92	6	6,5 %
HALMSTADS SJUKHUS	64	3	4,7 %
CAPIO LÄKARGRUPPEN I ÖREBRO AB	434	20	4,6 %
SÖDERTÄLJE SJUKHUS	47	2	4,3 %
SPORTS MEDICINE UMEÅ	232	9	3,9 %
ORTHOCENTER/IFK-KLINIKEN	843	32	3,8 %
NU-SJUKVÅRDEN	1 075	38	3,5 %
LÄNSSJUKHUSET RYHOV	213	7	3,3 %
FRÖLUNDA SPECIALISTSJUKHUS	190	6	3,2 %
ALINGSÅS LASARETT	257	8	3,1 %
MOVEMENT MEDICAL AB	928	28	3,0 %
S:T GÖRANS SJUKHUS CAPIO, STOCKHOLM	107	3	2,8 %
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN	622	17	2,7 %
ÖREBRO USÖ	260	7	2,7 %
KUNGSBACKA SJUKHUS	525	14	2,7 %
ÖSTERSUNDS SJUKHUS	77	2	2,6 %
DANDERYDS SJUKHUS	204	5	2,5 %
KALMAR SJUKHUS	533	13	2,4 %
VISBY LASARETT	42	1	2,4 %
CAPIO ARTRO CLINIC	5 382	128	2,4 %
ORTOPEDISKA HUSET CAREMA	423	10	2,4 %
SAHLGRENSKA UNIVERSITETSSJUKHUSET	1 414	33	2,3 %

VÄSTERÅS ORTOPEDPRAKTIK	44	1	2,3%
SÖDERSJUKHUSET	1 063	24	2,3%
HELSINGBORGS SJUKHUS	270	6	2,2%
LÄKARHUSET HERMELINEN	45	1	2,2%
HUDIKSVALLS SJUKHUS	228	5	2,2%
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	47	1	2,1%
KARLSTAD CENTRALSJUKHUS	676	14	2,1%
LÖWETS SPECIALISTMOTTAGNING	247	5	2,0%
MALMÖ ALLMÄNNA SJUKHUS	869	17	2,0%
ORTHOCENTER STOCKHOLM	257	5	1,9%
Skånes Universitetssjukhus	888	17	1,9%
SÖDRA ÄLVSBORGS SJUKHUS	105	2	1,9%
LÄNSSJUKHUSET SUNDSVALL	53	1	1,9%
NACKA NÄRSJUKHUS	110	2	1,8%
ELISABETH SJUKHUSET	610	11	1,8%
LJUNGBY LASARETT	168	3	1,8%
KUNGÄLVS SJUKHUS	116	2	1,7%
ODENPLANS LÄKARHUS	180	3	1,7%
MÄLARSJUKHUSET ESKILSTUNA	364	6	1,6%
CENTRALLASARETTET VÄXJÖ	433	7	1,6%
SABBATSBERG NÄRSJUKHUSET	62	1	1,6%
FALU LASARETT	383	6	1,6%
VARBERGS SJUKHUS	283	4	1,4%
HÖGLANDSSJUKHUSET	429	6	1,4%
LUNDS UNIVERSITET	433	6	1,4%
MEDICIN DIREKT	295	4	1,4%
HÄSSLEHOLMS SJUKHUS	616	8	1,3%
LIDKÖPINGS SJUKHUS	234	3	1,3%
NORRTÄLJE SJUKHUS	82	1	1,2%
KAROLINSKA UNIVERSITETSSJUKHUSET / ALB	174	2	1,1%
NYKÖPINGS LASARETT	96	1	1,0%
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	896	9	1,0%
ÖRNSKÖLDVIKS SJUKHUS	100	1	1,0%
ALERIS ORTOPEDI ÄNGELHOLM	614	6	1,0%
CAPIO LUNDBY NÄRSJUKHUS	126	1	0,8%
VRINNEVISJUKHUSET	648	5	0,8%
LINKÖPINGS UNIVERSITETSKLINIK	656	5	0,8%
GÄVLE SJUKHUS	271	2	0,7%
VÄSTERÅS CENTRALLASARETTET	227	1	0,4%
SAMARITERHEMMETS SJUKHUS	249	1	0,4%
SUNDERBY SJUKHUS	390	1	0,3%
OSKARSHAMNS SJUKHUS	275	0	0,0%
GÄLLIVARE SJUKHUS	51	0	0,0%
SKELLEFTEÅ SJUKHUS	30	0	0,0%
KARLSKOGA LASARETT	11	0	0,0%
PITEÅ ÄLVDAL SJUKHUS	71	0	0,0%
VÄSTERVIKS SJUKHUS	108	0	0,0%
SOPHIAHEMMET	27	0	0,0%
BLEKINGESJUKHUSET	67	0	0,0%
SOLLEFTEÅ SJUKHUS	44	0	0,0%

KÄRNSJUKHUSET I SKÖVDE	14	0	0,0 %
SPORTSMED	28	0	0,0 %
ART CLINIC	12	0	0,0 %
CITYAKUTEN PRIVATVÅRD	13	0	0,0 %
AKADEMISKA SJUKHUSET	8	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 Op	QOL < 44	No of KOOS	Pct
ORTOPEDISKA HUSET CAREMA	298	29	130	22 %
SKELLEFTEÅ SJUKHUS	2	1	1	100 %
SÖDERTÄLJE SJUKHUS	47	10	15	67 %
ÖRNSKÖLDSVIKS SJUKHUS	49	13	24	54 %
ÖSTERSUNDS SJUKHUS	8	1	2	50 %
VISBY LASARETT	36	9	18	50 %
KARLSKOGA LASARETT	10	2	4	50 %
ÖREBRO USÖ	172	41	83	49 %
SOLLEFTEÅ SJUKHUS	43	7	15	47 %
VÄSTERÅS CENTRALLASARETTET	145	29	63	46 %
ALINGSÅS LASARETT	164	42	92	46 %
LIDKÖPINGS SJUKHUS	216	49	108	45 %
SÖDRA ÄLVSBORGS SJUKHUS	104	23	53	43 %
GÄVLE SJUKHUS	225	45	104	43 %
LINKÖPINGS UNIVERSITETSKLINIK	372	67	155	43 %
LÄNSSJUKHUSET SUNDSVALL	53	8	19	42 %
FALU LASARETT	275	57	139	41 %
MÄLARSJUKHUSET ESKILSTUNA	267	52	128	41 %
MALMÖ ALLMÄNNA SJUKHUS	388	71	176	40 %
VÄSTERÅS ORTOPEDPRAKTIK	41	6	15	40 %
DANDERYDS SJUKHUS	112	13	33	39 %
SABBATSBERG NÄRSJUKHUSET	56	10	26	38 %
SUNDERBY SJUKHUS	187	30	80	38 %
KARLSTAD CENTRALSJUKHUS	416	72	194	37 %
LÄNSSJUKHUSET RYHOV	184	34	92	37 %
NYKÖPINGS LASARETT	82	14	38	37 %
SAHLGRENSKA UNIVERSITETSSJUKHUSET	995	179	493	36 %
SKÅNES UNIVERSITETSSJUKHUS	774	138	390	35 %
VRINNEVISJUKHUSET	481	78	221	35 %
ORTHOCENTER I SKÅNE	41	6	17	35 %
CAPIO LÄKARGRUPPEN I ÖREBRO AB	259	51	145	35 %
HELSINGBORGS SJUKHUS	255	43	123	35 %
VÄSTERVIKS SJUKHUS	105	16	46	35 %
LÄKARHUSET HERMELINEN	45	8	23	35 %
MOVEMENT MEDICAL AB	609	107	310	35 %

BLEKINGESJUKHUSET	66	10	29	34 %
VARBERGS SJUKHUS	140	26	76	34 %
HUDIKSVALLS SJUKHUS	177	25	75	33 %
HALMSTADS SJUKHUS	55	10	30	33 %
ORTHOCENTER STOCKHOLM	120	19	57	33 %
KUNGÄLVS SJUKHUS	75	15	45	33 %
MEDICIN DIREKT	279	46	140	33 %
SPORTS MEDICINE UMEÅ	220	34	106	32 %
HÄSSLEHOLMS SJUKHUS	371	65	203	32 %
OSKARSHAMNS SJUKHUS	183	31	97	32 %
PITEÅ ÄLVDAL SJUKHUS	71	11	35	31 %
CENTRALLASARETTET VÄXJÖ	305	44	142	31 %
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	538	78	254	31 %
CAPIO LUNDBY NÄRSJUKHUS	107	15	49	31 %
FRÖLUNDA SPECIALISTSJUKHUS	157	24	79	30 %
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN	407	54	178	30 %
NU-SJUKVÅRDEN	606	107	354	30 %
SÖDERSJUKHUSET	673	91	303	30 %
KUNGSBACKA SJUKHUS	433	65	218	30 %
NACKA NÄRSJUKHUS	88	12	41	29 %
ORTHOCENTER/IFK-KLINIKEN	601	98	340	29 %
HÖGLANDSSJUKHUSET	255	38	139	27 %
ALERIS ORTOPEDI ÄNGELHOLM	292	35	131	27 %
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	46	4	15	27 %
PERAGO ORTOPEDKLINIK	67	9	34	26 %
LUNDS UNIVERSITET	180	26	100	26 %
SAMARITERHEMMETS SJUKHUS	79	8	31	26 %
KALMAR SJUKHUS	350	41	160	26 %
GÄLLIVARE SJUKHUS	25	5	20	25 %
CITYAKUTEN PRIVATVÅRD	13	1	4	25 %
ELISABETH SJUKHUSET	458	47	191	25 %
NORRTÄLJE SJUKHUS	79	7	29	24 %
CAPIO ARTRO CLINIC	3 246	419	1743	24 %
LJUNGBY LASARETT	158	17	82	21 %
ODENPLANS LÄKARHUS	169	14	68	21 %
SOPHIAHEMMET	27	3	15	20 %
SPORTSMED	26	3	15	20 %
LÖWETS SPECIALISTMOTTAGNING	212	24	123	20 %
S:T GÖRANS SJUKHUS CAPIO, STOCKHOLM	71	7	36	19 %
KAROLINSKA UNIVERSITETSSJUKHUSET / ALB	102	8	56	14 %
KÄRNSJUKHUSET I SKÖVDE	14	1	9	11 %
ART CLINIC	11	0	6	0 %
AKADEMISKA SJUKHUSET	7	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 2015 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 2015 totaled 50, of which 24 were isolated. There were 35 medial cruciate ligament injuries and 30 lateral collateral ligament (LCL) injuries, plus 11 posterolateral cruciate (PLC) injuries.

The following table shows the different combinations of multi-ligament injuries.

## 2015

## Primary

ACL	---	---	---	---	3 382
ACL	---	MCL	---	---	27
---	PCL	---	---	---	24
ACL	---	---	LCL	---	11
ACL	---	---	LCL	PLC	7
ACL	PCL	---	---	---	6
---	PCL	---	LCL	PLC	4
ACL	PCL	MCL	---	---	4
---	PCL	---	LCL	---	3
ACL	PCL	---	LCL	PLC	3
---	PCL	MCL	---	---	2
---	---	MCL	---	---	1
ACL	PCL	---	LCL	---	1
ACL	PCL	---	---	PLC	1
---	PCL	---	---	PLC	1
ACL	PCL	MCL	LCL	PLC	1
ACL	---	---	---	PLC	1

## 2005-2015

## Primary

ACL	---	---	---	---	32 760
ACL	---	MCL	---	---	290
---	PCL	---	---	---	159
ACL	---	---	LCL	---	89
ACL	PCL	---	---	---	61
ACL	---	---	LCL	PLC	52
ACL	PCL	MCL	---	---	43
---	PCL	MCL	---	---	30
ACL	PCL	---	LCL	PLC	22
---	PCL	---	LCL	PLC	20
ACL	---	---	---	PLC	14
ACL	PCL	---	LCL	---	12
---	---	MCL	---	---	10
---	PCL	---	LCL	---	10
---	PCL	---	---	PLC	8
ACL	PCL	MCL	LCL	PLC	7
ACL	PCL	---	---	PLC	7
ACL	---	MCL	LCL	---	4
---	---	---	---	PLC	4
---	PCL	MCL	LCL	PLC	4
---	---	---	LCL	PLC	2

ACL	---	MCL	LCL	PLC	2
ACL	---	MCL	---	PLC	1
---	---	MCL	LCL	PLC	1
ACL	PCL	MCL	---	PLC	1
---	---	---	LCL	---	1

## Late-responder analysis

### 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 it 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 soccer 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 2015 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 2008-2013. 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 2008-2013

CLINIC	No of op	Average age	No of responses	KOOS
LÄKARHUSET HERMELINEN	13	24,5	7	88,4
SUNDERBY SJUKHUS	87	24,0	32	88,3
NACKA NÄRSJUKHUS	29	25,4	12	87,8
PITEÅ ÄLVDAL SJUKHUS	19	24,4	9	87,5
ELISABETH SJUKHUSET	201	23,7	77	87,4

LUNDS UNIVERSITET	74	23,8	38	87,1
CAPIO ARTRO CLINIC	1 079	24,9	506	87,1
LÖWETS SPECIALISTMOTTAGNING	76	24,2	40	86,4
SAMARITERHEMETS SJUKHUS	30	23,5	12	86,4
ORTOPEDISKA HUSET CAREMA	101	24,4	37	86,2
CAPIO LUNDBY NÄRSJUKHUS	41	25,0	19	86,0
MÄLARSJUKHUSET ESKILSTUNA	98	23,7	47	85,7
LÄNSSJUKHUSET RYHOV	73	24,1	32	85,5
MEDICIN DIREKT	77	24,6	30	85,2
SÖDERSJUKHUSET	280	24,7	110	85,1
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN	149	24,7	63	84,8
FRÖLUNDA SPECIALISTSJUKHUS	65	24,7	32	84,7
LJUNGBY LASARETT	75	23,0	37	84,6
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	223	24,0	97	84,5
HÖGLANDSSJUKHUSET	104	24,5	53	84,3
OSKARSHAMNS SJUKHUS	76	23,5	36	84,1
KUNGÄLVS SJUKHUS	26	23,8	11	84,0
ODENPLANS LÄKARHUS	66	24,5	23	84,0
ORTHOCENTER/IFK-KLINIKEN	213	24,2	110	83,7
SAHLGRENSKA UNIVERSITETSSJUKHUSET	398	24,4	174	83,7
ALERIS ORTOPEDI ÄNGELHOLM	86	23,5	37	83,6
KALMAR SJUKHUS	144	24,1	58	83,4
HÄSLEHOLMS SJUKHUS	184	23,8	103	83,3
CENTRALLASARETTET VÄXJÖ	118	23,8	48	83,2
MOVEMENT MEDICAL AB	266	24,1	123	83,1
VARBERGS SJUKHUS	42	23,9	21	83,0
NORRTÄLJE SJUKHUS	35	25,3	10	82,9
SABBATSBERG NÄRSJUKHUSET	13	24,6	5	82,8
PERAGO ORTOPEDKLINIK	28	24,4	10	82,8
SPORTS MEDICINE UMEÅ	89	24,1	37	82,7
CAPIO LÄKARGRUPPEN I ÖREBRO AB	108	24,0	56	82,6
MALMÖ ALLMÄNNA SJUKHUS	147	24,5	65	82,1
ORTHOCENTER STOCKHOLM	49	24,4	22	81,9
ORTHOCENTER I SKÅNE	15	24,5	9	81,9
NU-SJUKVÅRDEN	193	24,3	108	81,8
GÄVLE SJUKHUS	74	23,6	33	81,6
VRINNEVISJUKHUSET	203	23,7	86	81,4
LÄNSSJUKHUSET SUNDSVALL	23	23,7	7	81,2
BLEKINGESJUKHUSET	27	24,3	9	81,0
KUNGSBACKA SJUKHUS	176	24,1	79	80,8
LINKÖPINGS UNIVERSITETSKLINIK	161	23,8	63	80,8
ÖREBRO USÖ	74	24,1	31	80,5
DANDERYDS SJUKHUS	55	24,5	16	80,4
FALU LASARETT	107	24,6	46	80,4
VÄSTERÅS CENTRALLASARETTET	54	23,4	18	80,1
NYKÖPINGS LASARETT	26	23,3	12	80,1
VÄSTERVIKS SJUKHUS	50	23,2	13	80,1
ALINGSÅS LASARETT	49	23,4	27	79,9
Skånes Universitetssjukhus	314	24,3	133	78,9



KARLSTAD CENTRALSJUKHUS	136	24,1	67	78,3
LIDKÖPINGS SJUKHUS	92	24,0	44	77,6
HUDIKSVALLS SJUKHUS	79	23,2	30	77,5
SÖDRA ÄLVSBORGS SJUKHUS	44	23,6	23	77,1
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	19	23,8	5	76,8
HELSINGBORGS SJUKHUS	84	23,9	33	75,7
SOLLEFTEÅ SJUKHUS	23	24,2	9	74,6
ÖRNSKÖLDSVIKS SJUKHUS	18	23,8	8	74,1
HALMSTADS SJUKHUS	22	24,3	8	69,3

AVERAGE KOOS SCORES FOR FUNCTION AND QUALITY  
OF LIFE FOR PATIENTS UNDERGOING SURGERY IN 2007-2013

CLINIC	No of op	Average age	No of responses	KOOS
NACKA NÄRSJUKHUS	29	25,4	12	73,3
SAMARITERHEMETS SJUKHUS	30	23,5	12	72,4
LUNDS UNIVERSITET	74	23,8	38	69,6
SUNDERBY SJUKHUS	87	24,0	32	68,3
ELISABETH SJUKHUSET	201	23,7	77	67,2
CAPIO ARTRO CLINIC	1 079	24,9	506	67,2
LÖWETS SPECIALISTMOTTAGNING	76	24,2	40	67,1
HÖGLANDSSJUKHUSET	104	24,5	53	65,8
LJUNGBY LASARETT	75	23,0	37	65,5
LÄNSSJUKHUSET RYHOV	73	24,1	32	65,4
PITEÅ ÄLVDAL SJUKHUS	19	24,4	9	65,4
ORTHOCENTER/IFK-KLINIKEN	213	24,2	110	64,5
MÄLARSJUKHUSET ESKILSTUNA	98	23,7	47	64,4
NORRTÄLJE SJUKHUS	35	25,3	10	64,0
ODENPLANS LÄKARHUS	66	24,5	23	63,8
ORTOPEDISKA HUSET CAREMA	101	24,4	37	63,6
LÄKARHUSET HERMELINEN	13	24,5	7	63,3
HÄSLEHOLMS SJUKHUS	184	23,8	103	63,2
MEDICIN DIREKT	77	24,6	30	63,0
SÖDERSJUKHUSET	280	24,7	110	62,5
CAPIO LUNDBY NÄRSJUKHUS	41	25,0	19	62,2
FRÖLUNDA SPECIALISTSJUKHUS	65	24,7	32	62,1
SPORTS MEDICINE UMEÅ	89	24,1	37	62,0
KALMAR SJUKHUS	144	24,1	58	61,7
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN	149	24,7	63	61,6
ORTHOCENTER I SKÅNE	15	24,5	9	61,4
OSKARSHAMNS SJUKHUS	76	23,5	36	61,3
CENTRALLASARETTET VÄXJÖ	118	23,8	48	61,0
CAPIO LÄKARGRUPPEN I ÖREBRO AB	108	24,0	56	61,0
MOVEMENT MEDICAL AB	266	24,1	123	60,8
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	223	24,0	97	60,3
KUNGÄLVS SJUKHUS	26	23,8	11	60,1
SABBATSBERG NÄRSJUKHUSET	13	24,6	5	60,0
SAHLGRENSKA UNIVERSITETSSJUKHUSET	398	24,4	174	60,0

ORTHOCENTER STOCKHOLM	49	24,4	22	59,2
NU-SJUKVÅRDEN	193	24,3	108	58,9
ALERIS ORTOPEDI ÄNGELHOLM	86	23,5	37	58,7
PERAGO ORTOPEDKLINIK	28	24,4	10	58,7
NYKÖPINGS LASARETT	26	23,3	12	58,5
VRINNEVISJUKHUSET	203	23,7	86	58,3
LÄNSSJUKHUSET SUNDSVALL	23	23,7	7	58,0
VARBERGS SJUKHUS	42	23,9	21	57,9
GÄVLE SJUKHUS	74	23,6	33	57,5
KUNGSBACKA SJUKHUS	176	24,1	79	57,2
DANDERYDS SJUKHUS	55	24,5	16	57,2
VÄSTERVIKS SJUKHUS	50	23,2	13	57,1
ÖREBRO USÖ	74	24,1	31	56,5
MALMÖ ALLMÄNNA SJUKHUS	147	24,5	65	56,1
LINKÖPINGS UNIVERSITETSKLINIK	161	23,8	63	56,0
HUDIKSVALLS SJUKHUS	79	23,2	30	55,6
FALU LASARETT	107	24,6	46	55,5
SKÅNES UNIVERSITETSSJUKHUS	314	24,3	133	54,6
HELSINGBORGS SJUKHUS	84	23,9	33	54,2
KARLSTAD CENTRALSJUKHUS	136	24,1	67	54,2
VÄSTERÅS CENTRALLASARETTET	54	23,4	18	53,8
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	19	23,8	5	52,0
BLEKINGESJUKHUSET	27	24,3	9	51,9
SOLLEFTEÅ SJUKHUS	23	24,2	9	51,4
ALINGSÅS LASARETT	49	23,4	27	51,1
LIDKÖPINGS SJUKHUS	92	24,0	44	50,2
SÖDRA ÄLVSBORGS SJUKHUS	44	23,6	23	49,8
ÖRNSKÖLDSEVIKS SJUKHUS	18	23,8	8	45,3
HALMSTADS SJUKHUS	22	24,3	8	35,3
NACKA NÄRSJUKHUS	29	25,4	12	73,3
SAMARITERHEMMETS SJUKHUS	30	23,5	12	72,4
LUNDS UNIVERSITET	74	23,8	38	69,6
SUNDERBY SJUKHUS	87	24,0	32	68,3
ELISABETH SJUKHUSET	201	23,7	77	67,2
CAPIO ARTRO CLINIC	1 079	24,9	506	67,2
LÖWETS SPECIALISTMOTTAGNING	76	24,2	40	67,1
HÖGLANDSSJUKHUSET	104	24,5	53	65,8
LJUNGBY LASARETT	75	23,0	37	65,5
LÄNSSJUKHUSET RYHOV	73	24,1	32	65,4
PITEÅ ÄLVDAL SJUKHUS	19	24,4	9	65,4
ORTHOCENTER/IFK-KLINIKEN	213	24,2	110	64,5
MÄLARSJUKHUSET ESKILSTUNA	98	23,7	47	64,4
NORRTÄLJE SJUKHUS	35	25,3	10	64,0
ODENPLANS LÄKARHUS	66	24,5	23	63,8
ORTOPEDISKA HUSET CAREMA	101	24,4	37	63,6
LÄKARHUSET HERMELINEN	13	24,5	7	63,3
HÄSSLEHOLMS SJUKHUS	184	23,8	103	63,2
MEDICIN DIREKT	77	24,6	30	63,0
SÖDERSJUKHUSET	280	24,7	110	62,5

CAPIO LUNDBY NÄRSJUKHUS	41	25,0	19	62,2
FRÖLUNDA SPECIALISTSJUKHUS	65	24,7	32	62,1
SPORTS MEDICINE UMEÅ	89	24,1	37	62,0
KALMAR SJUKHUS	144	24,1	58	61,7
KAROLINSKA UNIVERSITETSSJUKHUSET / ORTOPEDKLINIKEN	149	24,7	63	61,6
ORTHOCENTER I SKÅNE	15	24,5	9	61,4
OSKARSHAMNS SJUKHUS	76	23,5	36	61,3
CENTRALLASARETTET VÄXJÖ	118	23,8	48	61,0
CAPIO LÄKARGRUPPEN I ÖREBRO AB	108	24,0	56	61,0
MOVEMENT MEDICAL AB	266	24,1	123	60,8
NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	223	24,0	97	60,3
KUNGÄLVS SJUKHUS	26	23,8	11	60,1
SABBATSBERG NÄRSJUKHUSET	13	24,6	5	60,0
SAHLGRENSKA UNIVERSITETSSJUKHUSET	398	24,4	174	60,0
ORTHOCENTER STOCKHOLM	49	24,4	22	59,2
NU-SJUKVÅRDEN	193	24,3	108	58,9
ALERIS ORTOPEDI ÄNGELHOLM	86	23,5	37	58,7
PERAGO ORTOPEDKLINIK	28	24,4	10	58,7
NYKÖPINGS LASARETT	26	23,3	12	58,5
VRINNEVISJUKHUSET	203	23,7	86	58,3
LÄNSSJUKHUSET SUNDSVALL	23	23,7	7	58,0
VARBERGS SJUKHUS	42	23,9	21	57,9
GÄVLE SJUKHUS	74	23,6	33	57,5
KUNGSBACKA SJUKHUS	176	24,1	79	57,2
DANDERYDS SJUKHUS	55	24,5	16	57,2
VÄSTERVIKS SJUKHUS	50	23,2	13	57,1
ÖREBRO USÖ	74	24,1	31	56,5
MALMÖ ALLMÄNNA SJUKHUS	147	24,5	65	56,1
LINKÖPINGS UNIVERSITETSKLINIK	161	23,8	63	56,0
HUDIKSVALLS SJUKHUS	79	23,2	30	55,6
FALU LASARETT	107	24,6	46	55,5
SKÅNES UNIVERSITETSSJUKHUS	314	24,3	133	54,6
HELSINGBORGS SJUKHUS	84	23,9	33	54,2
KARLSTAD CENTRALSJUKHUS	136	24,1	67	54,2
VÄSTERÅS CENTRALLASARETTET	54	23,4	18	53,8
VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	19	23,8	5	52,0
BLEKINGESJUKHUSET	27	24,3	9	51,9
SOLLEFTEÅ SJUKHUS	23	24,2	9	51,4
ALINGSÅS LASARETT	49	23,4	27	51,1
LIDKÖPINGS SJUKHUS	92	24,0	44	50,2
SÖDRA ÄLVSBORGS SJUKHUS	44	23,6	23	49,8
ÖRNSKÖLDSVIKS SJUKHUS	18	23,8	8	45,3
HALMSTADS SJUKHUS	22	24,3	8	35,3

## Unreconstructed ACL injuries

In 2014-2015, a research project was conducted in which we compared the self-reported knee function and quality of life of patients who underwent ACL reconstruction and patients with an ACL injury which was not reconstructed. Since the register was set up, all patients with an ACL injury have been able to answer the KOOS and EQ5D questionnaires. For the analysis, the data they have filled in have been categorized in four time intervals: within six month after the injury (baseline, n = 306) and one year (n = 350), two years (n = 358) and five years (n = 114) 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. In all, there were 879 unique patients (some answered questionnaires on several occasions) and approximately 56% of all patients were men. To enable comparisons with patients who have undergone a reconstruction, four equally large 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 (baseline, 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.

	BASELINE/PRE-OP				1 YEAR	
	Non-op n = 298	Op n = 305	Mean difference (95% CI)		Non-op n = 348	Op n = 348
<b>KOOS SYMPTOMS [MEAN (SD)]</b>						
	65.3* (20.1)	71.0 (18.5)	5.7 (2.6-8.8)		73.7 (18.4)	76.3 (18.5) 2.6 (-0.2-5.3)
<b>KOOS PAIN [MEAN (SD)]</b>						
	70.8* (18.7)	76.3 (16.5)	5.5 (2.7-8.3)		80.5* (16.7)	84.5 (16.3) 4.0 (1.5-6.5)
<b>KOOS ADL [MEAN (SD)]</b>						
	80.3* (19.8)	85.0 (16.5)	4.7 (1.8-7.6)		88.0* (15.1)	91.3 (14.0) 3.4 (1.1-5.5)
<b>KOOS SPORT [MEAN (SD)]</b>						
	37.0* (26.9)	42.4 (26.2)	5.4 (1.1-9.6)		54.5* (29.8)	66.9 (26.6) 12.4 (8.2-16.6)
<b>KOOS QOL [MEAN (SD)]</b>						
	33.3 (18.3)	34.4 (18.7)	1.1 (-1.8-4.1)		47.1* (24.3)	60.3 (23.5) 13.2 (9.6-16.7)
<b>EQ-5D [MEAN (SD)]</b>						
	0.62* (0.28)	0.69 (0.24)	0.07 (0.03-0.11)		0.74* (0.24)	0.80 (0.20) 0.06 (0.03-0.10)
<b>EQ-VAS [MEAN (SD)]</b>						
	60.0 (24.5)	63.3 (23.9)	3.3 (-0.7-7.3)		67.4* (25.0)	75.4 (20.6) 7.9 (4.4-11.4)

Note. \*P < 0.05; KOOS, Knee injury and Osteoarthritis Outcome; ADL, activities of daily living; QoL, quality of life; EQ, EuroQol; VAS, visual analog scale

The results reveal that at baseline patients who did not undergo reconstruction reported slightly poorer function in their knees (KOOS symptoms, pain, daily activities and sport, on average four to five points lower) and poorer health-related quality of life measured by the EQ5D index. The results were similar at the one- and two-year follow-ups, where patients who did not undergo reconstruction reported poorer function in connection with sport and quality of life (average difference at one year 12.4 points and 13.2 points respectively and, at two years, 4.5 and 6.9 points). At the five-year follow-up, patients who did not undergo reconstruction reported somewhat lower values.

When interpreting these results, it must be remembered that the register only follows up a limited number of patients who do not undergo reconstruction. According to epidemiologic studies, it can be expected that some 3,000 patients who sustain an ACL every year choose not to undergo a reconstruction. This would mean that our follow-up is based on fewer than 20% of all patients.

This study has been accepted for publication in the *Scandinavian Journal of Medicine and Science in Sports*.

	2 YEARS			5 YEARS		
	Non-op n = 356	Op n = 351	Mean difference (95% CI)	Non-op n = 112	Op n = 114	Mean difference (95% CI)
	76.0 (18.8)	77.6 (18.0)	1.6 (-1.1-4.3)	79.4* (18.7)	84.7 (15.3)	5.3 (0.8-9.8)
	82.2 (16.6)	84.6 (15.9)	2.4 (0.03-4.8)	85.7 (16.7)	89.0 (12.6)	3.3 (-0.5-7.2)
	89.5 (14.6)	91.2 (13.2)	1.7 (0.3-3.8)	91.6 (14.2)	94.3 (9.1)	2.7 (-0.5-5.8)
	59.9* (28.7)	64.4 (27.7)	4.5 (0.3-8.6)	67.5 (26.0)	71.2 (26.7)	3.8 (-3.1-10.7)
	53.8* (25.1)	60.7 (24.7)	6.9 (3.2-10.5)	62.4* (25.0)	69.2 (22.9)	6.8 (0.5-13.1)
	0.78 (0.22)	0.80 (0.21)	0.03 (-0.004-0.1)	0.80* (0.25)	0.89 (0.11)	0.09 (0.04-0.1)
	70.1* (25.1)	76.8 (20.0)	6.7 (3.3-10.1)	72.6* (24.4)	79.4 (17.3)	6.8 (1.3-12.4)

## Venous thromboembolism following ACL surgery

The incidence of venous thromboembolism (VTE) following ACL reconstruction varies (0.5-1.5%) depending on the type of study and whether clinical or subclinical VTE has been analyzed. In an ongoing research project, data from the Swedish ACL Register have been combined with data from the Swedish Board of Health and Welfare's patient, drug and cause-of-death register. All ACLs between 2006 and 2013 have been included.

The preliminary results reveal a VTE incidence of 0.4% (n = 98, 12 lung emboli and 86 deep vein thromboses). Age  $\geq 35$  was the only significant risk factor that increased the risk of VTE (OR 2.08 [95% CI, 1.38-3.12]). Other risk factors (gender, BMI, smoking, meniscal suture, operation time, primary/revision operation, day surgery/in-patient care) did not affect VTE incidence in the cohort.

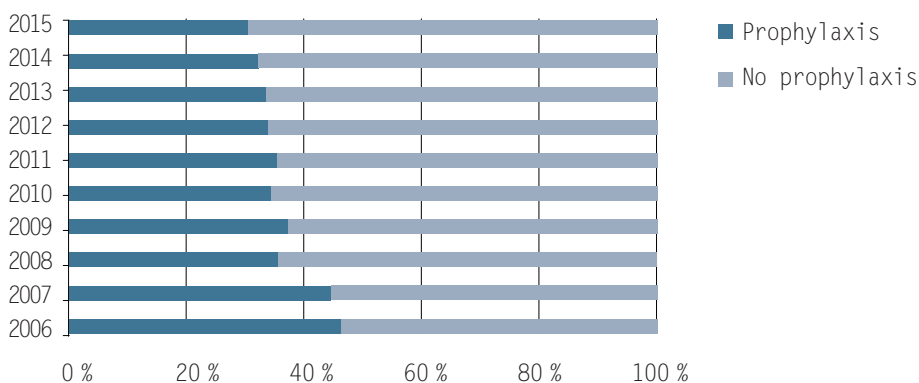
This study, which is expected to be completed in 2016, will continue with an extended analysis of risk factors.

## Thromboprophylaxis in the ACL Register

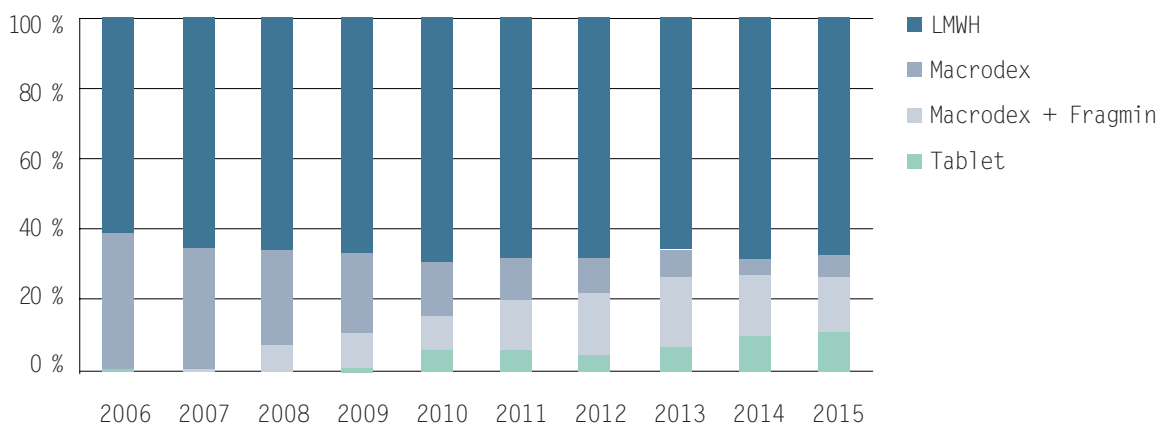
Last year's report established that thromboprophylaxis administered in conjunction with surgery is declining. This trend appears to have been maintained, as the total percentage of patients who received thromboprophylaxis in 2015 was 30.5%. One explanation of the reduction in the use of thromboprophylaxis could be that Macrodex is being used on a smaller scale and has not been replaced by another drug. When Macrodex is administered at the present time, it is frequently administered in combination with Fragmin.

When it comes to the choice of other drugs, low-molecular-weight heparin (LMWH) is still the most commonly used. The use of tablets is increasing slowly and currently accounts for 11% of administered thromboprophylaxis. *Tablettbehandling ökar sakta och utgör idag 11 % av given trombosprofylax.*

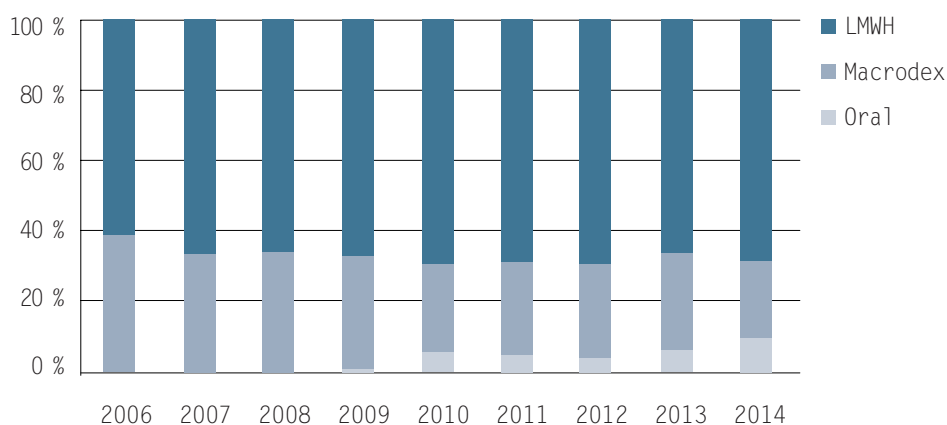
Percentage of patients who, according to the register, received some form of thromboprophylaxis



Distribution (%) of administered thromboprophylaxis according to the register



Anticoagulants



## 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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