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THE SWEDISH NATIONAL
KNEE LIGAMENT REGISTRY

The Swedish knee ligament registry. Annual Report 2019.

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3,951 primary operations and 394 revisions Clinics performing surgery in 2019:

AKADEMISKA SJUKHUSET ALERIS ORTOPEDI ÄNGELHOLM ALINGSÅS LASARETT ART CLINIC
ARTROCENTER BLEKINGESJUKHUSET CAPIO ARTRO CLINIC CAPIO LUNDBY NÄRSJUKHUS
CAPIO LÄKARGRUPPEN I ÖREBRO AB CARLANDERSKA ORTOPEDI CENTRALLASARETTET
VÄXJÖ CITYAKUTEN PRIVATVÅRD DANDERYDS SJUKHUS ELISABETHSJUKHUSET FALU
LASARETT FRÖLUNDA SPECIALISTSJUKHUS FRÖLUNDAORTOPEDEN GÄLLIVARE SJUKHUS
GÄVLE SJUKHUS HELSINGBORGS SJUKHUS HUDIKSVALLS SJUKHUS HÄSSLEHOLMS SJUKHUS
HÖGLANDSSJUKHUSET KALMAR SJUKHUS KARLSTAD CENTRALSJUKHUS KAROLINSKA
UNIVERSITETSSJUKHUSET/ORTOPEDKLINIKEN KUNGSBACKA SJUKHUS KUNGÄLVS SJUKHUS
KÄRNSJUKHUSET I SKÖVDE LINKÖPINGS UNIVERSITETSKLINIK LJUNGBY LASARETT
LÄKARHUSET HERMELINEN LÄNSSJUKHUSET RYHOV MOVEMENT MEDICAL AB MÄLARSJUK-
HUSET ESKILSTUNA NORRLANDS UNIVERSITETSSJUKHUS UMEÅ NORRTÄLJE SJUKHUS
NU-SJUKVÅRDEN NYKÖPINGS LASARETT ORTHOCENTER I SKÅNE ORTHOCENTER STOCKHOLM
ORTHOCENTER/IFK-KLINIKEN ORTOPEDISKA HUSET CAREMA ORTOPEDSPECIALISTER-
NA OSKARSHAMNS SJUKHUS PRAKTIKERTJÄNST ORTOPEDI STOCKHOLM SABBATSBERG
NÄRSJUKHUSET SAHLGRENSKA UNIVERSITETSSJUKHUSET SKELLEFTEÅ SJUKHUS SKÅ-
NES UNIVERSITETSSJUKHUS SOPHIAHEMMET SPECIALISTCENTER SCANDINAVIA SPORTS
MEDICINE UMEÅ SPORTSMED SUNDERBY SJUKHUS SÖDERMALMS ORTOPEDI SÖDERSJUKHUSET
SÖDRA ÄLVSBOGS SJUKHUS VISBY LASARETT VRINNEVISJUKHUSET VÄRNAMO SJUKHUS/
ORTOPEDKLINIKEN VÄSTERVIKS SJUKHUS VÄSTERÅS CENTRALLASARETTET ÖREBRO USÖ
ÖRNSKÖLDSVIKS SJUKHUS ÖSTERSUNDS 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. More 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 which, without satisfactory treatment, often helps to prevent young people from continuing to engage in heavy physical work or physical exercise and sport at recreational or elite level. 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 a year in Sweden would mean that some 8,000 individuals suffer ACL injuries every year and that approximately 3,500 undergo surgery. More 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 those 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 knee ligament registry began in 2005.

To begin with, the knee ligament registry was a surgical registry, 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 physical therapists in this work to a greater degree and we are also planning to improve our website when it comes to follow-ups after surgery and rehabilitation.

Goals and goal fulfillment

The overall goal of the registry 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, 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.

Registry 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 registry at ID number level. At the present time, more than 90% of all operations are registered.

ACL reconstruction

There are currently about 80 clinics in Sweden that provide orthopedic care. Of these, 66 (unchanged over time) have informed the knee ligament registry that they performed ACL surgery in 2019.

Validity of input data

Patient-reported data cannot be validated retrospectively, but they are assumed to be valid, as the patients themselves register them. Comprehensive error checks are made when the data are entered and control software is run the whole time.

The surgical data are fed in by surgeons and the target for the Swedish knee ligament registry is that at least 95% of all the data that are entered are a direct match with patient notes and surgery reports. This has been confirmed by a previous study.

Dissemination of registry data and results

The target is that registry data should be readily available to all caregivers and that the annual report from the registry 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 to English and through participation at different international meetings.

The registry 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 2019 report.

Future vision for the Swedish quality registry

Every individual who suffers an ACL injury in Sweden is to be included in the Swedish knee ligament registry 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.

One important line of development for the knee ligament registry 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 registry 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 registry 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 registry), 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 Karolinska University Hospital in its capacity as registry owner. Future collaboration with other orthopedic registries has now begun and the Swedish ACL Registry is involved in this work.

Areas for improvement and action

Inclusion of all injured individuals regardless of treatment

The registry is still largely a surgery registry, even if the aim for several years has been to include non-operated individuals with ACL injuries.

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. This work has, however, been delayed by GDPR and security-related issues.

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 60%. There is a large difference between clinics. 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 knee ligament registry's steering committee is hoping to encourage all county councils and insurance companies not only to participate in the knee ligament registry 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 was subsequently removed in 2016. The steering committee is working actively to make participation in different registries mandatory when new care selections are made.

Quality of input data

At the present time, the registry 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. A previous validation has revealed 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 of poorer quality. The steering committee has recently examined all the variables to facilitate registration and to remove variables with poor reliability. New variables have been added.

Data loss

The response rate for patient-reported data on all follow-up visits is low and no trend towards improvement can be seen. Instead, a deterioration has been observed. The follow-up data after one (55%), two (50%), five (45%) and ten years (40%), however, still have a low response rate. It is pleasing to report that the 10-year follow-up for 2005-2019 produced a response rate of around 40%, see Table 1A below. 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 working internationally to shorten the patient-reported (PROM) questionnaires, first and foremost the Knee injury and Osteoarthritis Outcome Score (KOOS), and to replace them with new questionnaires. 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. A sharp improvement in response rates is still a top priority.

Improvement seminar

In collaboration with selected clinics, an improvement seminar was run in 2017. A large training activity was planned for 2019, but it was cancelled due to questions related to future economy. A new seminar is planned in 2020.

Each surgeon is able to process the de-identified data in the registry 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 4,017 ACL operations (both primary operations and revisions with surgery code NGE41) in 2018. The knee ligament registry contains 4,131 registered operations in the same year.

Matching at personal ID number level reveals that the knee ligament registry and the patient registry have a total of 4,572 unique ACL operations.

The exact agreement on the number of ACL operations in the two registries was 78.2% in 2018. The reason for the small number of operations in the Swedish National Board of Health and Welfare's patient registry is probably due to shortcomings in reports to the registry and the fact that the Swedish National Board of Health and Welfare changed its data registration routines in 2015.

Another possible reason could be that 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 knee ligament registry covers more than 90% of all the ACL operations in Sweden. Data for 2019 are not yet available and this comparison has therefore been made with 2018.

TABLE 1A
Response rate KOOS distributed by year of surgery 2005-2019

Year	KOOS										
	Pre-op		One year postop		Two years postop		Five years postop		10 years postop		
	N	%	N	%	N	%	N	%	N	%	
2019	2737	63	114	9	0	0	0	0	0	0	0
2018	2521	61	1770	43	107	10	0	0	0	0	0
2017	2592	62	2122	51	1567	38	0	0	0	0	0
2016	2698	69	2058	53	1711	45	30	100	0	0	0
2015	2796	74	1882	50	1754	48	162	12	0	0	0
2014	2663	72	2147	58	1406	39	1221	36	0	0	0
2013	2831	76	2420	65	1894	52	1447	42	0	0	0
2012	2671	71	2315	62	1934	53	1531	44	10	100	100
2011	2540	71	2343	66	1858	54	1252	38	49	100	100
2010	2519	70	2185	61	2191	63	1587	48	100	5	5
2009	2427	74	1973	61	1664	53	1659	54	1140	39	39
2008	2114	67	1927	61	1533	50	1612	54	1197	42	42
2007	1680	58	1631	56	1501	53	1585	58	1182	45	45
2006	1545	59	1355	52	1309	51	1293	52	879	37	37
2005	1212	58	1082	52	1200	59	981	50	1103	59	59
Total	35546	67	27324	55	21629	49	14360	45	5660	38	38

TABLE 1B
Response rates EQ-5D and/or EQ-VAS distributed by year
of surgery 2005-2019

Year	EQ										
	Pre-op		One year postop		Two years postop		Five years postop		10 years postop		
	N	%	N	%	N	%	N	%	N	%	
2019	2495	57	112	9	0	0	0	0	0	0	0
2018	2366	57	1727	42	107	10	0	0	0	0	0
2017	2398	57	2100	50	1546	38	0	0	0	0	0
2016	2458	63	2025	52	1675	44	30	100	0	0	0
2015	2634	70	1818	48	1736	47	157	12	0	0	0
2014	2512	68	2093	57	1373	38	1199	35	0	0	0
2013	2704	72	2374	64	1856	51	1423	41	0	0	0
2012	2494	66	2266	60	1897	52	1505	43	10	100	100
2011	2296	65	2293	65	1827	53	1229	37	50	100	100
2010	2325	65	2119	59	2166	62	1561	47	98	5	5
2009	2280	70	1920	59	1625	51	1630	54	1114	38	38
2008	2007	63	1971	62	1486	48	1584	53	1169	41	41
2007	1681	58	1788	62	1447	51	1562	57	1162	44	44
2006	1331	51	1472	56	1310	51	1247	51	864	36	36
2005	976	47	1036	50	1224	60	921	47	1088	58	58
Total	32957	62	27114	55	21275	48	14048	45	5555	38	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 EQ-5D is slightly lower than that for the KOOS.

Funding the knee ligament registry

Taking balanced funds into account, no allocation has been granted for 2019. Compared with previous years, allocations have declined slightly and new reductions can be expected in the future. SEK 850,000 has been allocated for 2020. The chief of the registry, 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 knee ligament registry. Dan Friberg is involved in questionnaires and IT.

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 between SEK 25,000 and 30,000. 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 private 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 knee ligament registry is administered by Karolinska University Hospital and the principal is the board.

Magnus Forssblad 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 2019, the steering committee was made up of the following representatives from different regions in Sweden.

- Martin Englund, Professor, Lund University and Skåne University Hospital
- Karl Eriksson, Associate Professor, Söder Hospital, Institute of Clinical Research and Education Söder Hospital, Karolinska Institutet, Stockholm
- Magnus Forssblad, Associate Professor, Karolinska University Hospital and the Sports Trauma Research and Education Center, Karolinska Institutet, Stockholm, and Praktikertjänst Ortopedi Stockholm
- Anne Fältström, RPT, Linköping University and the Ryhov County Hospital, Jönköping
- Erik Hamrin Senorski, RPT, Sahlgrenska University Hospital, Gothenburg University and Sportrehab, Gotheburg
- Professor Jüri Kartus, NU-sjukvården, Trollhättan/Uddevalla
- Christina Mikkelsen, MD, Capio Arthro Clinic and Sports Trauma Research and Education Center, Karolinska Institutet, Stockholm
- Paul Neuman, MD, Skåne University Hospital
- Kristian Samuelsson, Professor, Sahlgrenska University Hospital and Gothenburg University, Gothenburg
- Anders Stålman, MD, Capio Arthro Clinic and Sports Trauma Research and Education Center, Karolinska Institutet, Stockholm

Anna Pappas, Capio Arthro Clinic, has been co-opted to the steering committee as an administrator. Dan Friberg, Praktikertjänst Ortopedi Stockholm, administers questionnaire dispatch. Tomas Antonelius,

Stockholm, has been consulted as patient representative. Henrik Hedevis, 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 knee ligament registry are administered by Karolinska University Hospital, with both a relationship database as the base and a web-based solution for all users. Data operations are administered by Datatrion AB.

Research partnerships

The Swedish knee ligament registry enables data based on a very large number of individuals to be studied. This is an advantage that increases the safety of research results compared with an individual clinical study which, for various reasons, often has problems encompassing such extensive patient material. In the Nordic region, Denmark and Norway also have effective national knee ligament registries which, like the Swedish registry, have been established for more than 15 years. To further increase the study population and thereby the accuracy of studies, the steering committee is encouraging national and international collaboration to enable data from different registries to be combined. It is pleasing to report that this has increased in recent years.

Research groups in Stockholm, Gothenburg and Linköping are currently running several projects in collaboration and they are planning to publish a number of reports over the next few years. Collaboration with Norway and Denmark continues and we can look forward to more studies including all the Nordic ACL patients. Registries have also been set up in other countries and their steering committees get together every year in conjunction with orthopedic meetings. This collaboration has resulted in a number of international initiatives such as ESSKA, ISAKOS and the ACL study group. More reports based on several international registries will also be initiated in the near future. A registry for children – PAMI – is an additional European initiative.

All the overarching registry projects involving data from the Swedish knee ligament registry are applied for and approved according to formal research agreements in accordance with the framework of the knee ligament registry.

Registry data

The registry 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 2005-2019, 49,095 primary ACL reconstructions and 3,721 revisions from a total of 91 clinics were registered.

Number of operations per clinic in 2019

TABLE 2
Primary reconstructions and revisions distributed by region
and clinic 2005-2017, 2018 and 2019

Region	Clinic	2019				2018				2005-2017					
		Primary		Revision		Answered KOOS pre-op		KOOS pre-op		Primary		Revision		Answered KOOS pre-op	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Greater Stockholm	KAROLINSKA UNIVERSITETSSJUKHUSET	0	0	0	0	0	0	0	0	209	1	137	65		
	ARTROCENTER	50	9	7	12	58	9	6	9	75	13	9	10		
	S:T GÖRANS SJUKHUS CAPIO	0	0	0	0	0	0	0	0	102	5	2	2		
	CITYAKUTEN PRIVATVÅRD	20	6	16	62	15	1	1	6	59	1	2	3		
	DANDERYDS SJUKHUS	26	2	13	46	24	3	6	22	379	18	164	41		
	LÖWETS SPECIALISTMOTTAGNING	0	0	0	0	0	0	0	0	247	0	217	88		
	KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	12	1	0	0	8	0	0	0	671	43	382	54		
	NACKA NÄRSJUKHUS	0	0	0	0	0	0	0	0	105	5	68	62		
	ODENPLANS LÄKARHUS	0	0	0	0	0	0	0	0	201	14	21	10		
	ORTOPEDISKA HUSET CAREMA	4	0	3	75	9	0	3	33	740	44	361	46		
	PRAKTIKERTJÄNST ORTOPEDI	311	33	261	76	193	17	151	72	41	9	12	24		
	SABBATSBERG NÄRSJUKHUSET	115	15	96	74	93	7	70	70	162	15	104	59		
	SÖDERMALMS ORTOPEDI	9	0	1	11	8	0	2	25	100	4	42	40		
	SÖDERTÄLJE SJUKHUS	0	0	0	0	0	0	0	0	91	0	10	11		
	SÖDERSJUKHUSET	91	15	37	35	76	14	57	63	1472	113	819	52		
	SOPHIAHEMMET	11	2	9	69	6	2	6	75	65	5	19	27		
	ORTHOCENTER STOCKHOLM	34	3	20	54	27	2	26	90	440	27	282	60		
	CAPIO ARTRO CLINIC	721	71	677	85	682	67	544	73	7842	742	7935	92		
	Total	1404	157	1140	73	1199	122	872	66	13001	1059	10586	75		
	Svealand + Gotland	AKADEMISKA SJUKHUSET	49	11	6	10	63	6	4	6	207	10	11	5	
BOLLNÄS SJUKHUS		0	0	0	0	0	0	0	0	12	2	10	71		
LASARETTET I ENKÖPING		0	0	0	0	12	0	0	0	103	7	14	13		
ELISABETHSJUKHUSET		78	14	58	63	92	16	74	69	852	84	593	63		
FALU LASARETT		43	2	16	36	50	2	13	25	569	33	253	42		
GÄVLE SJUKHUS		18	0	5	28	16	0	10	63	421	10	289	67		
HUDIKSVALLS SJUKHUS		8	1	6	67	13	1	12	86	310	19	277	84		
KARLSTAD CENTRALSJUKHUS		50	6	12	21	51	11	11	18	876	76	180	19		
KARLSKOGA LASARETT		0	0	0	0	0	0	0	0	11	0	11	100		
CAPIO LÄKARGRUPPEN I ÖREBRO AB		9	2	10	91	18	1	18	95	572	65	625	98		
MÅLARSJUKHUSET ESKILSTUNA		7	1	0	0	6	0	0	0	389	19	307	75		
NORRTÄLJE SJUKHUS		32	2	0	0	18	2	7	35	151	4	78	50		
NYKÖPINGS LASARETT		3	0	1	33	7	0	3	43	137	2	14	10		
ÖREBRO USÖ		61	4	52	80	79	3	58	71	431	25	171	38		
SAMARITERHEMMETS SJUKHUS		0	0	0	0	0	0	0	0	221	17	87	37		
SPECIALISTCENTER SCANDINAVIA		57	2	37	63	35	1	14	39	47	1	9	19		
VÄSTERÅS CENTRALLASARETTET		50	0	27	54	57	3	22	37	313	15	131	40		
VISBY LASARETT		7	0	0	0	8	1	4	44	106	4	82	75		
VÄSTERÅS ORTOPEDPRAKTIK		0	0	0	0	27	2	20	69	160	9	93	55		
Total		472	45	230	44	552	49	270	45	5888	402	3235	51		
Skåne	ALERIS ORTOPEDI ÄNGELHOLM	14	1	8	53	8	1	2	22	639	45	546	80		
	HÄSSLEHOLMS SJUKHUS	75	6	71	88	53	4	51	89	877	35	829	91		
	HELSINGBORGS SJUKHUS	85	2	54	62	89	6	79	83	647	31	590	87		
	LUNDS UNIVERSITET	0	0	0	0	0	0	0	0	412	21	265	61		
	MALMÖ ALLMÄNNA SJUKHUS	0	0	0	0	0	0	0	0	788	66	754	88		
	ORTHOCENTER I SKÅNE	53	4	43	75	39	1	32	80	139	15	112	73		
	SKÅNES UNIVERSITETSSJUKHUS	195	29	144	64	229	23	174	69	1708	141	1439	78		
	Total	422	42	320	69	418	35	338	75	5210	354	4535	82		

TABLE 2 continues on the next page.

Continuation of TABLE 2.

Region	Klinik	2019				2018				2005-2017			
		Primary Revisio		Answered KOOS pre-op		Primary Revisio		Answered KOOS pre-op		Primary Revisio		Answered KOOS pre-op	
		N	n	N	%	N	n	N	%	N	n	N	%
Halland	HALMSTADS SJUKHUS	0	0	0	0	0	0	0	0	68	6	37	50
	KUNGSBACKA SJUKHUS	137	13	82	55	109	10	49	41	852	64	576	63
	MOVEMENT MEDICAL AB	78	13	47	52	72	14	67	78	1155	94	845	68
	ORTOPEDSPECIALISTERNA	56	5	35	57	56	3	45	76	67	1	45	66
	Total	271	31	164	54	237	27	161	61	2142	165	1503	65
Småland + Blekinge	ART CLINIC	16	1	14	82	10	1	9	82	62	3	54	83
	HÖGLANDSSJUKHUSET	1	0	0	0	34	1	18	51	479	16	227	46
	KALMAR SJUKHUS	23	5	17	61	37	1	27	71	674	45	435	61
	BLEKINGESJUKHUSET	20	0	10	50	16	0	8	50	132	1	49	37
	LJUNGBY LASARETT	6	0	0	0	31	0	1	3	212	9	83	38
	OSKARSHAMNS SJUKHUS	31	0	23	74	18	0	14	78	356	5	255	71
	LÄNSSJUKHUSET RYHOV	30	3	10	30	43	6	16	33	361	21	172	45
	CENTRALLASARETTET VÄXJÖ	41	1	35	83	36	2	29	76	604	36	512	80
	VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	27	0	12	44	0	0	0	0	75	1	62	82
	VÄSTERVIKS SJUKHUS	11	0	7	64	11	1	5	42	163	3	46	28
Total	206	10	128	59	236	12	127	51	3118	140	1895	58	
Västra Götaland	ALINGSÅS LASARETT	5	0	3	60	14	0	4	29	330	31	302	84
	ART CLINIC GÖTEBORG	0	0	0	0	21	2	2	9	35	4	13	33
	SÖDRA ÄLVSBERGS SJUKHUS	33	2	8	23	12	0	7	58	204	1	108	53
	CARLANDERSKA ORTOPEDI	3	3	1	17	4	0	0	0	44	0	20	45
	DROTTNING SILVIAS BARN- OCH UNGDOMSSJUKHUS	0	0	0	0	12	0	0	0	60	1	4	7
	FRÖLUNDAORTOPEDEN	17	2	5	26	6	0	3	50	17	0	8	47
	FRÖLUNDA SPECIALISTSJUKHUS	33	1	8	24	21	3	9	38	280	29	270	87
	ORTHOCENTER/IFK-KLINIKEN	253	37	242	83	241	31	224	82	1368	148	1091	72
	KUNGÄLVS SJUKHUS	27	0	18	67	28	0	16	57	165	1	123	74
	CAPIO LUNDBY NÄRSJUKHUS	98	7	62	59	112	11	77	63	532	16	329	60
	LIDKÖPINGS SJUKHUS	0	0	0	0	0	0	0	0	226	8	31	13
	NU-SJUKVÅRDEN	66	10	46	61	69	7	48	63	1213	135	1064	79
	PERAGO ORTOPEDEKLINIK	0	0	0	0	0	0	0	0	124	14	50	36
	KÄRNSJUKHUSET I SKÖVDE	33	1	16	47	21	0	5	24	115	3	42	36
	SPORTSMED	41	3	19	43	15	2	7	41	105	5	54	49
	SAHLGRENSKA UNIVERSITETSSJUKHUSET	154	21	128	73	159	25	127	69	1799	179	1173	59
	VARBERGS SJUKHUS	0	0	0	0	0	0	0	0	279	4	190	67
	Total	763	87	556	65	735	81	529	65	6896	579	4872	65
Östergötland	LINKÖPINGS HEALTH CARE	0	0	0	0	0	0	0	0	1	0	1	100
	LINKÖPINGS UNIVERSITETSKLINIK	63	3	37	56	58	3	39	64	821	50	626	72
	VRINNEVISJUKHUSET	56	3	35	59	57	3	34	57	960	52	671	66
	Total	119	6	72	58	115	6	73	60	1782	102	1298	69
Norrländ	ALFREDSON TENDON CLINIC	0	0	0	0	0	0	0	0	2	1	0	0
	GÄLLIVARE SJUKHUS	8	1	4	44	0	0	0	0	65	1	36	55
	LÄKARHUSET HERMELINEN	8	0	5	63	9	0	1	11	76	0	36	47
	MEDICIN DIREKT	0	0	0	0	0	0	0	0	470	35	344	68
	ÖRNSKÖLDSVIKS SJUKHUS	24	0	24	100	22	0	22	100	160	8	162	96
	ÖSTERSUNDS SJUKHUS	77	6	23	28	58	8	49	74	141	4	61	42
	PITEÅ ÄLVDAL SJUKHUS	0	0	0	0	0	0	0	0	71	0	52	73
	SKELLEFTEÅ SJUKHUS	11	0	2	18	16	0	4	25	32	0	31	97
	SPORTS MEDICINE UMEÅ	30	2	23	72	36	5	25	61	415	37	321	71
	SOLLEFTEÅ SJUKHUS	0	0	0	0	5	0	0	0	55	1	42	75
	SUNDERBY SJUKHUS	82	1	34	41	69	4	41	56	610	18	510	81
	LÄNSSJUKHUSET SUNDSVALL	0	0	0	0	0	0	0	0	77	0	44	57
	NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	54	6	12	20	66	5	9	13	1120	67	725	61
Total	294	16	127	41	281	22	151	50	3294	172	2364	68	
Total	3951	394	2737	63	3773	354	2521	61	41331	2973	30288	68	

In 2019, the Högland Hospital performed 43 primary operations and two revisions, but they were reported too late and were therefore unfortunately not included in the statistics above.

KOOS pre-op = Number/percentage of patients who responded to a preoperative KOOS questionnaire within 150 days prior to surgery

One prerequisite when it comes to following up patients is that the clinics ensure that the patients undergoing surgery complete their preoperative questionnaire. Otherwise, no comparisons can be made in individual cases.

Age and gender distribution at surgery

The average age of patients undergoing ACL surgery in 2019 was 28 for women and 29 for men. This age has not change noticeably since the start of the registry in 2005. This can be interpreted as meaning that not only young, active sportsmen and sportswomen but also somewhat older individuals with unstable knees undergo surgery. For the first time since the registry was established, in 2005, the average age of men and women was the same in conjunction with primary ACL surgery. During the period 2005-2019, women were between one and three years younger on average 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.

In 2019, the average age at revision surgery was 28 for both women and men.

TABLE 3A
Average age at primary reconstruction distributed by gender and year of surgery 2005-2019

Year	Woman				Man				Total			
	N	Info missing	MV	SD	N	Info missing	MV	SD	N	Info missing	MV	SD
2019	1817	2	28	12	2127	5	29	10	3944	7	28	11
2018	1699	1	28	12	2069	4	28	10	3768	5	28	11
2017	1732	0	28	12	2120	15	29	10	3852	15	28	11
2016	1664	0	27	12	1927	5	28	10	3591	5	28	11
2015	1477	0	27	12	2004	3	28	10	3481	3	28	11
2014	1480	0	27	12	1940	1	28	10	3420	1	28	11
2013	1447	0	26	11	2006	2	28	9	3453	2	27	10
2012	1507	0	26	11	2020	0	27	9	3527	0	27	10
2011	1424	0	26	11	1915	1	28	9	3339	1	27	10
2010	1381	1	25	11	1970	1	28	9	3351	2	27	10
2009	1293	0	25	11	1781	0	28	9	3074	0	27	10
2008	1291	0	26	11	1686	2	28	9	2977	2	27	10
2007	1171	0	25	10	1576	0	28	9	2747	0	27	10
2006	1034	0	26	10	1464	0	28	9	2498	0	27	10
2005	827	0	26	10	1163	0	28	9	1990	0	27	10
Total	21244	4	27	11	27768	39	28	10	49012	43	27	10

MV, mean value; SD, standard deviation

TABLE 3B
Primary reconstructions distributed by age range at surgery
and year of surgery 2005-2019

Year	Age range at surgery														Total	
	7-15 years		16-20 years		21-25 years		26-30 years		31-35 years		36-40 years		> 40 years		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
2019	286	7	912	23	731	19	651	17	364	9	269	7	731	19	3944	100
2018	279	7	892	24	721	19	632	17	347	9	284	8	613	16	3768	100
2017	264	7	852	22	803	21	581	15	375	10	314	8	663	17	3852	100
2016	254	7	866	24	754	21	547	15	309	9	262	7	599	17	3591	100
2015	235	7	804	23	749	22	531	15	307	9	299	9	556	16	3481	100
2014	217	6	850	25	755	22	494	14	322	9	256	7	526	15	3420	100
2013	207	6	931	27	775	22	472	14	305	9	285	8	478	14	3453	100
2012	211	6	987	28	766	22	505	14	337	10	302	9	419	12	3527	100
2011	217	6	936	28	687	21	474	14	303	9	301	9	421	13	3339	100
2010	227	7	967	29	659	20	469	14	310	9	298	9	421	13	3351	100
2009	204	7	883	29	590	19	426	14	304	10	277	9	390	13	3074	100
2008	180	6	815	27	570	19	410	14	337	11	296	10	369	12	2977	100
2007	188	7	760	28	506	18	394	14	305	11	277	10	317	12	2747	100
2006	161	6	644	26	460	18	395	16	299	12	263	11	276	11	2498	100
2005	123	6	493	25	393	20	297	15	254	13	201	10	229	12	1990	100
Total	3253	7	12592	26	9919	20	7278	15	4778	10	4184	9	7008	14	49012	100

TABLE 4A
Average age at revision distributed by gender and year of
surgery 2005-2019

Year	Woman				Man				Total			
	N	Info			N	Info			N	Info		
		missing	MV	SD		missing	MV	SD		missing	MV	SD
2019	171	0	28	11	223	0	28	8	394	0	28	9
2018	170	0	27	9	184	0	28	9	354	0	27	9
2017	141	0	28	10	193	0	27	8	334	0	28	9
2016	137	0	26	9	168	0	28	9	305	0	27	9
2015	136	0	25	9	165	0	28	9	301	0	27	9
2014	122	0	25	9	159	0	27	8	281	0	26	9
2013	134	0	25	8	155	0	27	8	289	0	26	8
2012	108	0	24	8	136	0	28	9	244	0	26	8
2011	99	0	25	8	116	0	29	8	215	0	27	9
2010	88	0	26	10	135	0	29	8	223	0	28	9
2009	81	0	24	8	106	0	29	9	187	0	27	9
2008	78	0	27	9	112	1	29	8	190	1	28	9
2007	74	0	28	10	95	0	29	9	169	0	29	9
2006	60	0	28	10	68	0	29	8	128	0	29	9
2005	47	0	24	8	59	0	31	9	106	0	28	9
Total	1646	0	26	9	2074	1	28	8	3720	1	27	9

MV, mean value; SD, standard deviation

TABLE 4B
Revisions distributed by age range at surgery and year of surgery 2005-2019

Year	Age range at surgery														Total	
	7-15 years		16-20 years		21-25 years		26-30 years		31-35 years		36-40 years		> 40 years		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
2019	6	2	78	20	98	25	96	24	43	11	21	5	52	13	394	100
2018	5	1	85	24	97	27	68	19	29	8	33	9	37	10	354	100
2017	2	1	70	21	104	31	76	23	20	6	17	5	45	13	334	100
2016	3	1	80	26	87	29	50	16	33	11	21	7	31	10	305	100
2015	2	1	82	27	95	32	44	15	22	7	24	8	32	11	301	100
2014	3	1	80	28	81	29	42	15	32	11	15	5	28	10	281	100
2013	2	1	75	26	89	31	49	17	31	11	18	6	25	9	289	100
2012	4	2	75	31	71	29	31	13	25	10	20	8	18	7	244	100
2011	0	0	63	29	50	23	33	15	32	15	19	9	18	8	215	100
2010	4	2	53	24	54	24	39	17	26	12	24	11	23	10	223	100
2009	1	1	55	29	40	21	36	19	23	12	15	8	17	9	187	100
2008	1	1	42	22	46	24	32	17	31	16	20	11	18	9	190	100
2007	2	1	34	20	42	25	27	16	22	13	18	11	24	14	169	100
2006	1	1	24	19	33	26	20	16	22	17	12	9	16	13	128	100
2005	1	1	31	29	18	17	18	17	13	12	11	10	14	13	106	100
Total	37	1	927	25	1005	27	661	18	404	11	288	8	398	11	3720	100

The percentage of women has increased over the years and, in 2019, 46% were women.

We do not know why the average percentage of women in the registry has increased from 43% to 46% and this questions needs to be studied in more detail. Women who are younger and are involved in sports such as soccer and handball run a higher risk of suffering an ACL injury than men. Taken as a whole, far more men participate in these contact sports, so it is difficult to say whether women undergo ACL surgery to a greater or lesser degree than men. 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.

TABLE 5
 Primary reconstructions and revisions distributed by gender
 and year of surgery 2005-2019

Year	Primary reconstructions				Revisions				Total			
	Woman		Man		Woman		Man		Woman		Man	
	N	%	N	%	N	%	N	%	N	%	N	%
2019	1819	46	2132	54	171	43	223	57	1990	46	2355	54
2018	1700	45	2073	55	170	48	184	52	1870	45	2257	55
2017	1732	45	2135	55	141	42	193	58	1873	45	2328	55
2016	1664	46	1932	54	137	45	168	55	1801	46	2100	54
2015	1477	42	2007	58	136	45	165	55	1613	43	2172	57
2014	1480	43	1941	57	122	43	159	57	1602	43	2100	57
2013	1447	42	2008	58	134	46	155	54	1581	42	2163	58
2012	1507	43	2020	57	108	44	136	56	1615	43	2156	57
2011	1424	43	1916	57	99	46	116	54	1523	43	2032	57
2010	1382	41	1971	59	88	39	135	61	1470	41	2106	59
2009	1293	42	1781	58	81	43	106	57	1374	42	1887	58
2008	1291	43	1688	57	78	41	113	59	1369	43	1801	57
2007	1171	43	1576	57	74	44	95	56	1245	43	1671	57
2006	1034	41	1464	59	60	47	68	53	1094	42	1532	58
2005	827	42	1163	58	47	44	59	56	874	42	1222	58
Total	21248	43	27807	57	1646	44	2075	56	22894	43	29882	57

Activity in connection with injury

Among both men and women, soccer is still the most common activity associated with an ACL injury and this situation does not change from year to year. In 2019, soccer was the cause of ACL injuries in 26% of women and 50% of men. The second most common activity in connection with injury was downhill skiing for both women (27%) and men (10%).

As soccer is the leading cause of ACL injuries, it is interesting that projects including prophylactic training for young people playing soccer 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.

TABLE 6
Activity in connection with injury in primary reconstructions distributed by gender 2018 and 2019

Activity	2019						2018					
	Woman			Man			Woman			Man		
	N	K%	R%	N	K%	R%	N	K%	R%	N	K%	R%
ALPINE/TELEMARK	489	27	69	222	10	31	434	26	67	210	10	33
SOCCER	481	26	31	1057	50	69	484	28	32	1039	50	68
OTHER	151	8	49	156	7	51	126	7	45	156	8	55
HANDBALL	139	8	68	66	3	32	133	8	64	74	4	36
FLOORBALL	116	6	41	167	8	59	126	7	44	162	8	56
GYMNASTICS	53	3	90	6	0	10	40	2	87	6	0	13
OTHER SPORT LEISURE	48	3	49	49	2	51	57	3	62	35	2	38
MARTIAL ARTS	41	2	46	48	2	54	35	2	43	46	2	57
BASKETBALL	39	2	50	39	2	50	27	2	42	37	2	58
DANCING	30	2	75	10	0	25	28	2	74	10	0	26
EXERCISE	28	2	53	25	1	47	28	2	67	14	1	33
EQUESTRIAN SPORT	27	1	96	1	0	4	24	1	100	0	0	0
TRAFFIC	26	1	43	35	2	57	25	1	49	26	1	51
CYCLING	21	1	43	28	1	57	15	1	48	16	1	52
RACKET SPORTS	20	1	47	23	1	53	13	1	52	12	1	48
AMERICAN FOOTBALL/RUGBY	18	1	41	26	1	59	19	1	38	31	1	62
TRAMPOLINE	17	1	77	5	0	23	12	1	50	12	1	50
VOLLEYBALL	16	1	57	12	1	43	12	1	41	17	1	59
WORK	16	1	29	39	2	71	17	1	28	44	2	72
OUTDOOR LIFE	14	1	56	11	1	44	19	1	66	10	0	34
WRESTLING	6	0	35	11	1	65	5	0	50	5	0	50
SNOWBOARDING	6	0	32	13	1	68	5	0	33	10	0	67
ENDURO/MOTORCROSS	6	0	13	39	2	87	6	0	12	45	2	88
WAKEBOARDING/SURFING	4	0	80	1	0	20	0	0	0	3	0	100
ICE HOCKEY/BANDY	3	0	9	30	1	91	4	0	10	35	2	90
CROSS-COUNTRY SKIING	2	0	40	3	0	60	3	0	60	2	0	40
SKATEBOARDING	2	0	17	10	0	83	3	0	16	16	1	84
Total	1819	100	46	2132	100	54	1700	100	45	2073	100	55

K%, column percent by gender; R%, row percent within activity

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, 69% performed fewer than 30 operations in 2019. Over the years, there has definitely been an increase in the number of surgeons performing more than 30 operations a year and this is pleasing. The average duration of surgery for a primary ACL reconstruction is 74 minutes for a primary operation and just over 93 minutes for a revision.

TABLE 7
Total number of reconstructions and primary reconstructions per surgeon distributed by year of surgery 2005-2019

Year	Primary reconstructions and revisions per surgeon and year						Primary reconstructions per surgeon and year					
	< 30		≥ 30		Total		< 30		≥ 30		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
2019	114	69	51	31	165	100	117	71	48	29	165	100
2018	119	71	49	29	168	100	124	74	44	26	168	100
2017	112	67	54	33	166	100	116	70	50	30	166	100
2016	96	63	56	37	152	100	103	68	49	32	152	100
2015	111	69	50	31	161	100	116	72	45	28	161	100
2014	100	66	52	34	152	100	108	71	44	29	152	100
2013	103	65	56	35	159	100	108	68	51	32	159	100
2012	105	69	48	31	153	100	106	69	47	31	153	100
2011	106	69	47	31	153	100	106	69	47	31	153	100
2010	108	70	46	30	154	100	109	71	45	29	154	100
2009	109	74	39	26	148	100	112	76	36	24	148	100
2008	103	69	46	31	149	100	107	72	42	28	149	100
2007	104	74	37	26	141	100	108	77	33	23	141	100
2006	91	73	34	27	125	100	94	75	31	25	125	100
2005	81	77	24	23	105	100	82	78	23	22	105	100
Total	1562	69	689	31	2251	100	1616	72	635	28	2251	100

TABLE 8
Duration of surgery (mins) for primary reconstructions and revisions distributed by year of surgery 2005-2019

Year	Primary reconstructions					Revisions				
	N	Info missing	MV	SD	MD	N	Info missing	MV	SD	MD
2019	3720	231	74	29	70	368	26	93	32	90
2018	3619	154	73	29	68	323	31	94	35	90
2017	3669	198	75	30	70	316	18	94	32	90
2016	3464	132	76	30	70	293	12	99	37	92
2015	3334	150	73	28	69	284	17	95	38	90
2014	3263	158	75	29	70	262	19	96	35	91
2013	3275	180	76	28	72	274	15	102	41	96
2012	3315	212	73	28	70	224	20	95	36	90
2011	3214	126	75	29	72	208	7	89	36	87
2010	3173	180	73	28	70	213	10	89	34	89
2009	2884	190	76	26	72	169	18	88	32	90
2008	2746	233	76	27	70	174	17	87	32	83
2007	2584	163	76	28	71	155	14	86	31	80
2006	2290	208	75	27	72	115	13	90	32	89
2005	1780	210	76	27	70	93	13	90	36	80
Total	46330	2725	75	28	70	3471	250	93	35	90

MV, mean value; SD, standard deviation; MD, median

Time between injury and surgery

Since 2009, the average time between injury and surgery has been between 400 and 500 days. Nor are there any obvious differences between private and public caregivers. What can be seen is that Norrland (north of Sweden) has the longest time between injury and surgery, between 718 and 860 days.

The reason why there is a relatively long period between injury and surgery throughout Sweden 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 the extremely high 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 that patients with ACL injuries may not always require surgery but can instead eliminate their problems using rehabilitation and activity modification.

TABLE 9
Days between injury and primary reconstruction distributed by region (clinic) 2005-2019

Region	Year	Days between injury and surgery						
		N	Info missing	MV	SD	MD	K1	K3
Greater Stockholm	2019	1315	89	367	758	156	86	293
	2018	1162	37	528	1155	169	89	380
	2005-2017	12757	244	525	1040	199	106	427
Svealand + Gotland	2019	441	31	657	1145	280	163	561
	2018	528	24	590	909	264	153	558
	2005-2017	5755	133	697	1080	329	180	696
Skåne	2019	408	14	599	955	279	163	548
	2018	414	4	814	1416	297	152	783
	2005-2017	5083	127	684	1139	289	161	658
Halland	2019	259	12	515	1048	170	96	453
	2018	233	4	546	867	220	121	571
	2005-2017	2065	77	572	841	272	151	609
Småland + Blekinge	2019	194	12	504	712	249	144	521
	2018	225	11	533	968	258	170	500
	2005-2017	3012	106	477	767	227	130	471
Västra Götaland	2019	718	45	419	843	176	92	338
	2018	721	14	506	1038	199	100	423
	2005-2017	6716	180	562	968	251	133	516
Östergötland	2019	119	0	461	520	251	144	508
	2018	115	0	544	993	243	155	438
	2005-2017	1744	38	556	759	284	174	579
Norrland	2019	281	13	860	1515	310	160	658
	2018	276	5	718	1157	305	160	627
	2005-2017	3199	95	771	1246	332	166	776
Total	2019	3735	216	494	947	205	104	410
	2018	3674	99	581	1106	223	114	492
	2005-2017	40331	1000	595	1032	254	136	555

MV, mean value; SD, standard deviation MD, median; K1, 1st quartile (25%); K3, 3rd quartile (75%)

Percentage of day surgery in relation to in-patient care

The percentage of patients who undergo day surgery is slowly increasing and now accounts for more than 90% of the total number of operations, both primary and revisions. In 2005, the corresponding figure was 50%.

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 characterized by an extremely high percentage of day surgery.

TABLE 10
Day surgery in primary reconstructions and revisions distributed by year of surgery 2005-2019

Year	Primary				Revision				Total			
	Day surgery				Day surgery				Day surgery			
	Yes		No		Yes		No		Yes		No	
	N	%	N	%	N	%	N	%	N	%	N	%
2019	3575	90	376	10	333	85	61	15	3908	90	437	10
2018	3372	89	401	11	277	78	77	22	3649	88	478	12
2017	3380	87	487	13	254	76	80	24	3634	87	567	13
2016	3187	89	409	11	233	76	72	24	3420	88	481	12
2015	3012	86	472	14	242	80	59	20	3254	86	531	14
2014	2916	85	505	15	221	79	60	21	3137	85	565	15
2013	2922	85	533	15	223	77	66	23	3145	84	599	16
2012	2957	84	570	16	178	73	66	27	3135	83	636	17
2011	2754	82	586	18	154	72	61	28	2908	82	647	18
2010	2670	80	683	20	154	69	69	31	2824	79	752	21
2009	2450	80	624	20	140	75	47	25	2590	79	671	21
2008	2212	74	767	26	144	75	47	25	2356	74	814	26
2007	1688	61	1059	39	87	51	82	49	1775	61	1141	39
2006	1350	54	1148	46	72	56	56	44	1422	54	1204	46
2005	1004	50	986	50	54	51	52	49	1058	50	1038	50
Total	39449	80	9606	20	2766	74	955	26	42215	80	10561	20

TABLE 11
Day surgery in primary reconstructions and revisions
distributed by region 2005-2019

Region	Year	Primary				Revision				Total			
		Day surgery				Day surgery				Day surgery			
		Yes		No		Yes		No		Yes		No	
		N	%	N	%	N	%	N	%	N	%	N	%
Greater Stockholm	2019	1315	94	89	6	135	86	22	14	1450	93	111	7
	2018	1080	90	119	10	85	70	37	30	1165	88	156	12
	2005-2017	9466	73	3535	27	675	64	384	36	10141	72	3919	28
Svealand + Gotland	2019	362	77	110	23	31	69	14	31	393	76	124	24
	2018	430	78	122	22	30	61	19	39	460	77	141	23
	2005-2017	4234	72	1654	28	261	65	141	35	4495	71	1795	29
Skåne	2019	403	95	19	5	40	95	2	5	443	95	21	5
	2018	405	97	13	3	34	97	1	3	439	97	14	3
	2005-2017	4759	91	451	9	310	88	44	12	5069	91	495	9
Halland	2019	242	89	29	11	23	74	8	26	265	88	37	12
	2018	200	84	37	16	20	74	7	26	220	83	44	17
	2005-2017	1497	70	645	30	81	49	84	51	1578	68	729	32
Småland + Blekinge	2019	176	85	30	15	8	80	2	20	184	85	32	15
	2018	204	86	32	14	11	92	1	8	215	87	33	13
	2005-2017	2112	68	1006	32	110	79	30	21	2222	68	1036	32
Västra Götaland	2019	695	91	68	9	75	86	12	14	770	91	80	9
	2018	684	93	51	7	69	85	12	15	753	92	63	8
	2005-2017	6047	88	849	12	482	83	97	17	6529	87	946	13
Östergötland	2019	115	97	4	3	6	100	0	0	121	97	4	3
	2018	109	95	6	5	6	100	0	0	115	95	6	5
	2005-2017	1681	94	101	6	95	93	7	7	1776	94	108	6
Norrland	2019	267	91	27	9	15	94	1	6	282	91	28	9
	2018	260	93	21	7	22	100	0	0	282	93	21	7
	2005-2017	2706	82	588	18	142	83	30	17	2848	82	618	18
Total	2019	3575	90	376	10	333	85	61	15	3908	90	437	10
	2018	3372	89	401	11	277	78	77	22	3649	88	478	12
	2005-2017	32502	79	8829	21	2156	73	817	27	34658	78	9646	22

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.

TABLE 12
Primary reconstructions in children under 15 years of
age distributed by gender, region and clinic 2005-2019

Region	Clinic	Children under 15 years of age							
		2019		2018		2005-2017		Total	
		Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy
		N	N	N	N	N	N	N	N
Greater Stockholm	KAROLINSKA UNIVERSITETSSJUKHUSET	0	0	0	0	97	89	97	89
	ARTROCENTER	1	1	1	0	2	0	4	1
	0	0	0	0	1	3	1	3	
	ORTOPEDISKA Huset CAREMA	0	0	0	0	2	1	2	1
	PRAKTIKERTJÄNST ORTOPEDI STOCKHOLM	7	4	4	5	0	0	11	9
	SABBATSBERG NÄRSJUKHUSET	6	3	2	0	2	0	10	3
	SÖDERSJUKHUSET	0	0	0	0	3	1	3	1
	ORTHOCENTER STOCKHOLM	2	0	0	0	7	7	9	7
	CAPIO ARTRO CLINIC	26	12	13	30	203	120	242	162
Total	42	20	20	35	317	221	379	276	
Svealand + Gotland	ELISABETHSJUKHUSET	0	0	1	0	11	0	12	0
	FALU LASARETT	0	0	4	0	13	4	17	4
	GÄVLE SJUKHUS	0	0	0	0	5	2	5	2
	HUDIKSVALLS SJUKHUS	0	0	0	0	2	1	2	1
	KARLSTAD CENTRALSJUKHUS	1	0	2	1	11	4	14	5
	CAPIO LÄKARGRUPPEN I ÖREBRO AB	2	0	0	0	9	1	11	1
	MÄLARSJUKHUSET ESKILSTUNA	0	0	0	1	2	1	2	2
	NORRTÄLJE SJUKHUS	0	1	0	0	1	0	1	1
	NYKÖPINGS LASARETT	0	0	0	0	1	1	1	1
	ÖREBRO USÖ	2	2	4	0	13	3	19	5
	SPECIALISTCENTER SCANDINAVIA	2	0	1	0	0	0	3	0
	VÄSTERÅS CENTRALLASARETTET	1	1	0	0	3	3	4	4
	VISBY LASARETT	0	0	0	0	0	1	0	1
	VÄSTERÅS ORTOPEDPRAKTIK	0	0	0	0	4	2	4	2
	Total	8	4	12	2	75	23	95	29
Skåne	ALERIS ORTOPEDI ÄNGELHOLM	0	0	0	0	7	1	7	1
	HÄSSLEHOLMS SJUKHUS	1	0	1	0	6	1	8	1
	HELSINGBORGS SJUKHUS	2	1	1	0	10	1	13	2
	LUNDS UNIVERSITET	0	0	0	0	12	1	12	1
	MALMÖ ALLMÄNNA SJUKHUS	0	0	0	0	11	9	11	9
	ORTHOCENTER I SKÅNE	0	0	0	0	0	1	0	1
	SKÅNES UNIVERSITETSSJUKHUS	3	1	2	0	35	13	40	14
	Total	6	2	4	0	81	27	91	29
Halland	HALMSTADS SJUKHUS	0	0	0	0	1	1	1	1
	KUNGSBACKA SJUKHUS	3	4	1	0	9	3	13	7
	MOVEMENT MEDICAL AB	0	0	0	0	6	1	6	1
	Total	3	4	1	0	16	5	20	9

TABLE 12 continues on the next page.

Continuation of TABLE 12.

Region	Clinic	Children under 15 years of age							
		2019		2018		2005-2017		Total	
		Girl N	Boy N	Girl N	Boy N	Girl N	Boy N	Girl N	Boy N
Småland + Blekinge	ART CLINIC	0	0	0	0	1	0	1	0
	HÖGLANDSSJUKHUSET	0	0	2	1	8	7	10	8
	KALMAR SJUKHUS	2	1	0	0	15	4	17	5
	BLEKINGESJUKHUSET	0	0	1	0	1	0	2	0
	LJUNGBY LASARETT	0	0	0	0	5	0	5	0
	OSKARSHAMNS SJUKHUS	1	0	2	0	9	3	12	3
	LÄNSSJUKHUSET RYHOV	2	0	1	1	6	4	9	5
	CENTRALLASARETTET VÄXJÖ	1	2	3	2	17	4	21	8
	VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	1	0	0	0	0	1	1	1
	VÄSTERVIKS SJUKHUS	0	0	0	0	5	0	5	0
Total	7	3	9	4	67	23	83	30	
Västra Götaland	ALINGSÅS LASARETT	0	0	0	0	7	0	7	0
	SÖDRA ÄLVSBOGERS SJUKHUS	0	0	0	0	2	0	2	0
	DROTTNING SILVIAS BARN- OCH UNGDOMSSJUKHUS	0	0	5	1	24	7	29	8
	ORTHOCENTER/IFK-KLINIKEN	2	2	7	2	24	4	33	8
	KUNGÄLVS SJUKHUS	0	0	0	0	2	0	2	0
	CAPIO LUNDBY NÄRSJUKHUS	2	1	1	0	12	0	15	1
	NU-SJUKVÅRDEN	0	1	2	1	26	12	28	14
	PERAGO ORTOPEDKLINIK	0	0	0	0	4	0	4	0
	KÄRNSJUKHUSET I SKÖVDE	4	0	1	0	3	2	8	2
	SAHLGRENSKA UNIVERSITETSSJUKHUSET	5	0	1	1	24	11	30	12
	VARBERGS SJUKHUS	0	0	0	0	5	2	5	2
Total	13	4	17	5	133	38	163	47	
Östergötland	LINKÖPINGS UNIVERSITETSKLINIK	1	0	2	0	14	1	17	1
	VRINNEVISJUKHUSET	0	1	0	0	7	1	7	2
	Total	1	1	2	0	21	2	24	3
Norrland	GÄLLIVARE SJUKHUS	0	0	0	0	1	0	1	0
	LÄKARHUSET HERMELINEN	0	0	1	0	2	0	3	0
	MEDICIN DIREKT	0	0	0	0	10	0	10	0
	ÖRNSKÖLDSVIKS SJUKHUS	2	1	0	0	6	0	8	1
	ÖSTERSUNDS SJUKHUS	3	0	0	0	3	0	6	0
	PITEÅ ÄLVDAL SJUKHUS	0	0	0	0	2	0	2	0
	SKELLEFTEÅ SJUKHUS	1	1	1	0	0	0	2	1
	SPORTS MEDICINE UMEÅ	1	0	0	0	7	4	8	4
	SOLLEFTEÅ SJUKHUS	0	0	0	0	2	0	2	0
	SUNDERBY SJUKHUS	1	0	2	2	26	1	29	3
	NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	1	0	0	1	19	6	20	7
Total	9	2	4	3	78	11	91	16	
Total	89	40	69	49	788	350	946	439	

About half the patients had meniscal injuries, half of which were resected and half sutured. Girls accounted for 75% of the patients. The cause of accidents is similarly distributed between boys and girls. Soccer dominates as a cause of ACL injury, followed by alpine skiing.

Surgical variables

Graft selection - type of ligament

The use of hamstring grafts has recently declined from almost 98% to 85% in 2019. Instead, the percentage of patellar grafts and, first and foremost quadriceps grafts, has increased. This matches international trends. By far the most common graft selection is still 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. Interest is, however, currently increasing in quadrupling the semitendinosus, 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, registry 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, however, declined in favor of the patellar tendon and, to some degree, also the quadriceps, even if the absolute figures are still low.

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 graft probably results in less anterior knee pain than the patellar graft. A recent prospective, randomized study comparing the quadriceps graft with the hamstring graft reveals no differences in terms of the risk of reoperation, knee stability or subjective function at a two-year follow-up (Lind et al., Br J Sports Med 2020). More studies are needed and there are plans to study the results after surgery involving quadriceps grafts in the Swedish registry when sufficient two-year data for this group are available.

There is speculation about whether the patellar graft and the quadriceps graft should be considered more frequently as a graft alternative in patient groups in which a greater risk of graft rupture can be anticipated. This has taken place in Norway where patellar grafts are currently being used in approximately 70% of operations.

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. 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, patellar grafts are being used increasingly in revision surgery. Allografts and quadriceps grafts are also frequently used in revision surgery.

TABLE 13
ACL grafts (groups) in primary reconstructions distributed
by region and year of surgery 2005-2019

Region	Graft	2019		2018		2005-2017		Total	
		N	%	N	%	N	%	N	%
Greater Stockholm	Patellar graft	78	6	64	5	765	6	907	6
	Hamstring graft	1134	81	981	82	11477	91	13592	89
	Quadriceps graft	170	12	138	12	269	2	577	4
	Other*	14	1	9	1	100	1	123	1
	Total	1396	100	1192	100	12611	100	15199	100
Svealand + Gotland	Patellar graft	13	3	12	2	332	6	357	5
	Hamstring graft	454	97	532	97	5458	94	6444	94
	Quadriceps graft	3	1	1	0	24	0	28	0
	Other*	0	0	3	1	20	0	23	0
	Total	470	100	548	100	5834	100	6852	100
Skåne	Patellar graft	15	4	19	5	376	7	410	7
	Hamstring graft	365	87	370	89	4669	90	5404	90
	Quadriceps graft	31	7	13	3	14	0	58	1
	Other*	8	2	14	3	111	2	133	2
	Total	419	100	416	100	5170	100	6005	100
Halland	Patellar graft	17	6	11	5	161	8	189	7
	Hamstring graft	254	94	223	95	1925	92	2402	93
	Quadriceps graft	0	0	0	0	1	0	1	0
	Other*	0	0	0	0	3	0	3	0
	Total	271	100	234	100	2090	100	2595	100
Småland + Blekinge	Patellar graft	11	5	6	3	234	8	251	7
	Hamstring graft	192	94	228	97	2862	92	3282	93
	Quadriceps graft	1	0	0	0	2	0	3	0
	Other*	1	0	0	0	10	0	11	0
	Total	205	100	234	100	3108	100	3547	100
Västra Götaland	Patellar graft	150	20	74	10	315	5	539	6
	Hamstring graft	576	76	636	87	6410	94	7622	92
	Quadriceps graft	17	2	13	2	24	0	54	1
	Other*	12	2	6	1	85	1	103	1
	Total	755	100	729	100	6834	100	8318	100
Östergötland	Patellar graft	5	4	6	5	21	1	32	2
	Hamstring graft	112	96	108	95	1748	98	1968	98
	Quadriceps graft	0	0	0	0	0	0	0	0
	Other*	0	0	0	0	7	0	7	0
	Total	117	100	114	100	1776	100	2007	100
Norrland	Patellar graft	9	3	0	0	129	4	138	4
	Hamstring graft	268	92	261	94	3030	92	3559	92
	Quadriceps graft	13	4	15	5	121	4	149	4
	Other*	2	1	3	1	2	0	7	0
	Total	292	100	279	100	3282	100	3853	100
Total	Patellar graft	298	8	192	5	2333	6	2823	6
	Hamstring graft	3355	85	3339	89	37579	92	44273	92
	Quadriceps graft	235	6	180	5	455	1	870	2
	Other*	37	1	35	1	338	1	410	1
	Total	3925	100	3746	100	40705	100	48376	100

* Allograft or some other graft

TABLE 14
ACL grafts (groups) in revisions distributed by region
and year of surgery 2005-2019

Region	Graft	2019		2018		2005-2017		Total	
		N	%	N	%	N	%	N	%
Greater Stockholm	Patellar graft	59	38	52	43	564	54	675	51
	Hamstring graft	41	26	29	24	323	31	393	30
	Quadriceps graft	43	28	29	24	93	9	165	13
	Other*	13	8	10	8	56	5	79	6
	Total	156	100	120	100	1036	100	1312	100
Svealand + Gotland	Patellar graft	26	58	34	71	196	49	256	52
	Hamstring graft	17	38	13	27	191	48	221	45
	Quadriceps graft	1	2	1	2	7	2	9	2
	Other*	1	2	0	0	2	1	3	1
	Total	45	100	48	100	396	100	489	100
Skåne	Patellar graft	5	12	10	29	140	40	155	36
	Hamstring graft	6	15	8	23	111	31	125	29
	Quadriceps graft	27	66	11	31	14	4	52	12
	Other*	3	7	6	17	89	25	98	23
	Total	41	100	35	100	354	100	430	100
Halland	Patellar graft	25	81	20	74	101	62	146	66
	Hamstring graft	6	19	7	26	51	31	64	29
	Quadriceps graft	0	0	0	0	2	1	2	1
	Other*	0	0	0	0	10	6	10	5
	Total	31	100	27	100	164	100	222	100
Småland + Blekinge	Patellar graft	6	60	8	67	66	48	80	50
	Hamstring graft	3	30	3	25	69	50	75	47
	Quadriceps graft	1	10	1	8	2	1	4	3
	Other*	0	0	0	0	1	1	1	1
	Total	10	100	12	100	138	100	160	100
Västra Götaland	Patellar graft	69	79	55	69	262	46	386	53
	Hamstring graft	7	8	9	11	193	34	209	29
	Quadriceps graft	8	9	12	15	29	5	49	7
	Other*	3	3	4	5	82	14	89	12
	Total	87	100	80	100	566	100	733	100
Östergötland	Patellar graft	3	50	5	83	64	63	72	63
	Hamstring graft	3	50	0	0	35	34	38	33
	Quadriceps graft	0	0	1	17	3	3	4	4
	Other*	0	0	0	0	0	0	0	0
	Total	6	100	6	100	102	100	114	100
Norrland	Patellar graft	4	25	7	32	44	26	55	26
	Hamstring graft	6	38	7	32	87	51	100	48
	Quadriceps graft	4	25	6	27	38	22	48	23
	Other*	2	13	2	9	3	2	7	3
	Total	16	100	22	100	172	100	210	100
Total	Patellar graft	197	50	191	55	1437	49	1825	50
	Hamstring graft	89	23	76	22	1060	36	1225	33
	Quadriceps graft	84	21	61	17	188	6	333	9
	Other*	22	6	22	6	243	8	287	8
	Total	392	100	350	100	2928	100	3670	100

* Allograft or some other graft

Tibial fixation

The most common form of tibial fixation at the present time is the cortical button and, in 2019, it was used in 60% of operations. Resorbable screws and metal screws were used in 18% and 18% of operations respectively. The use of resorbable screws increased sharply between 2008 and 2013, but it has since declined steadily in recent years. One of the reasons for this is to avoid the removal of fixation material in revisions. The use of metal screws experienced a declining trend in 2005-2013, but it has since stabilized at around 20% during the past five years.

TABLE 15
Tibial fixations in primary reconstructions distributed by
year of surgery 2005-2019

Tibial fixation		Year of surgery										Total
		2019	2018	2017	2016	2015	2014	2013	2012	2011	2010-2005	
Cortical	Cobra	<1%					<1%			<1%	<1%	<1%
	Staple	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
	Endobutton	<1%	<1%	<1%	<1%	1%	<1%	<1%	<1%	<1%	<1%	<1%
	AO screw	23%	24%	22%	21%	21%	21%	16%	18%	18%	13%	18%
	TightRope	29%	28%	28%	27%	24%	20%	7%	1%	1%		12%
	Suture washer	7%	4%	3%	3%	<1%						1%
	Infinity button	<1%										<1%
	<i>Total</i>	<i>60%</i>	<i>57%</i>	<i>53%</i>	<i>51%</i>	<i>48%</i>	<i>41%</i>	<i>24%</i>	<i>19%</i>	<i>20%</i>	<i>15%</i>	<i>33%</i>
Intrafix/Rigidfix	Intrafix		<1%	<1%	1%	2%	3%	7%	8%	8%	19%	8%
	Rigidfix	<1%	<1%	<1%		<1%	<1%	<1%	<1%	<1%	5%	2%
	<i>Total</i>	<i><1%</i>	<i><1%</i>	<i><1%</i>	<i>1%</i>	<i>2%</i>	<i>3%</i>	<i>7%</i>	<i>9%</i>	<i>9%</i>	<i>24%</i>	<i>10%</i>
Close to joint	Metal screw	18%	17%	19%	18%	16%	17%	23%	24%	31%	36%	25%
	Metal screw/staple	<1%	2%	2%	3%	4%	4%	6%	7%	9%	11%	6%
	Retroscrew	<1%	<1%	<1%		<1%	<1%	<1%	<1%	2%	3%	1%
	Retrobouton	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
	Resorbable screw	18%	19%	21%	21%	23%	28%	33%	34%	25%	10%	20%
	Metal screw/osteosuture	1%	1%	1%	2%	2%	3%	3%	3%	3%	<1%	2%
	Resorbable/post	2%	2%	2%	3%	2%	3%	4%	3%	2%		2%
	<i>Total</i>	<i>39%</i>	<i>42%</i>	<i>46%</i>	<i>47%</i>	<i>48%</i>	<i>56%</i>	<i>68%</i>	<i>71%</i>	<i>71%</i>	<i>60%</i>	<i>56%</i>
Other	Mitek anchor	<1%								<1%	<1%	<1%
	Other	<1%	1%	<1%	<1%	2%	<1%	1%	<1%	<1%	1%	<1%
	<i>Total</i>	<i><1%</i>	<i>1%</i>	<i><1%</i>	<i><1%</i>	<i>2%</i>	<i><1%</i>	<i>1%</i>	<i><1%</i>	<i><1%</i>	<i>1%</i>	<i><1%</i>
Total N		3951	3773	3858	3556	3439	3388	3427	3486	3314	16478	48670

Femoral fixation

The most common form of femoral fixation at the present time is the cortical button, which is used in 88% of all femoral fixations. The use of the TightRope has risen sharply in the past few years and has overtaken the Endobutton. At the same time, the use of the Ultrabutton, which is similar to the TightRope, is increasing. 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 10% in 2005 to 88% in 2019. 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 27% of patients in 2005, when the knee ligament registry was created, but this figure has fallen steadily in recent years and is currently around 10%.

TABLE 16
Femoral fixations in primary reconstructions distributed by year of surgery 2005-2019

Femoral fixation		Year of surgery										Total
		2019	2018	2017	2016	2015	2014	2013	2012	2011	2010-2005	
Cortical	Endobutton	22%	24%	23%	38%	44%	49%	57%	59%	59%	32%	38%
	Staple			<1%			<1%		<1%	<1%	<1%	<1%
	AO screw	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
	Toggleloc	<1%	<1%	<1%	<1%	1%	1%	1%	1%	3%	<1%	<1%
	TightRope	55%	58%	62%	50%	42%	38%	30%	22%	9%	<1%	27%
	Interference screw				<1%						<1%	<1%
	Graftmax	<1%	<1%	<1%	<1%							<1%
	Ultrabutton	9%	7%	5%								2%
	XO button	<1%	<1%									<1%
	Infinity button	<1%										<1%
	Total	88%	90%	91%	89%	88%	89%	88%	82%	71%	33%	68%
Rigidfix/Tra nsfix	Rigidfix	<1%		<1%	<1%	<1%	<1%	2%	4%	7%	30%	11%
	Transfix			<1%		<1%	<1%	<1%	1%	4%	13%	5%
	Total	<1%		<1%	<1%	<1%	<1%	3%	5%	11%	43%	16%
Close to joint	Metal screw	12%	9%	7%	7%	9%	10%	8%	11%	15%	21%	14%
	Retrobutton	<1%		<1%	<1%	<1%		<1%	<1%	2%	3%	1%
	Retroscrew	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
	Ezloc									<1%	<1%	<1%
	Metal screw/Endopearl	<1%		<1%		<1%	<1%	<1%		<1%	<1%	<1%
	Total	12%	9%	8%	7%	9%	10%	8%	12%	18%	24%	15%
Other	Other	<1%	1%	2%	2%	2%	<1%	<1%	<1%	<1%	<1%	<1%
	Total	<1%	1%	2%	2%	2%	<1%	<1%	<1%	<1%	<1%	<1%
Total N		3951	3773	3861	3558	3454	3396	3430	3492	3322	16524	48761

Revisions and surgery on the contralateral side

A total of 3,721 revisions were registered in the knee ligament registry in 2005-2019. No primary surgery has been registered for a number of these as it took place before the knee ligament registry was established. If we instead choose to follow the patients whose primary surgery and revision were registered, the figure for revisions is 2,184. Taken as a whole, 2,097 (4.0%) surgeries on the contralateral knee have also been registered during this period. In overall terms, women underwent revisions on a larger scale than men; 5.6% compared with 5.2% for the same knee and 4.3% compared with 3.7% for the contralateral knee. The total average age for revisions in 2019 was 28 years. Generally speaking, the report shows that the largest number of revisions are performed on the patient group under the age of 20 years at their first surgery. When it comes to ACL reconstructions on the contralateral knee, the younger population is also overrepresented. The very highest frequency of these operations is found in the patient group with an age range of 21-25 years, where 6.2% of all patients underwent surgery on the contralateral knee.

In half (50%) of revisions, a patellar graft is used, whereas quadriceps grafts are used in 21%. This can be explained by the fact that a hamstring graft is by far the most common choice in primary surgery and this graft has therefore probably already been used in the patients requiring a revision. The following table shows the revision frequency within two years of the index operation and the total revision frequency, distributed by graft type at the index operation. The hamstring graft has a slightly higher revision frequency compared with the patellar graft at two years (2.3% compared with 1.6%), but, as far more patients are given hamstring grafts, it is difficult to draw any conclusions about the impact of graft selection on the risk of revision. The following table presents the number of revisions on the same knee within two years and per clinic. A quadriceps graft has been revised in 2.1% of cases, but this is a far more recent technique.

TABLE 17
 ACL index leading to revision within two years distributed
 by ACL index graft and tibial fixation
*ACL index during the surgery period 1 January 2005 to
 31 December 2017*

Graft	Tibial fixation	Revision within two years					Revision				
		Yes		No		ACL index	Yes		No		ACL index
		N	%	N	%		N	%	N	%	
Patellar graft	Cortical	1	0,8	121	99,2	122	2	1,6	120	98,4	122
	Intrafix/Rigidfix	0	0,0	14	100,0	14	2	14,3	12	85,7	14
	Close to joint	34	1,7	1992	98,3	2026	99	4,9	1927	95,1	2026
	Other	0	0,0	6	100,0	6	0	0,0	6	100,0	6
	Total	35	1,6	2133	98,4	2168	103	4,8	2065	95,2	2168
Hamstring graft	Cortical	289	2,8	10049	97,2	10338	581	5,6	9757	94,4	10338
	Intrafix/Rigidfix	74	1,5	4776	98,5	4850	229	4,7	4621	95,3	4850
	Close to joint	465	2,3	19865	97,7	20330	1117	5,5	19213	94,5	20330
	Other	9	2,7	322	97,3	331	24	7,3	307	92,7	331
	Total	837	2,3	35012	97,7	35849	1951	5,4	33898	94,6	35849
Quadriceps graft	Cortical	6	10,0	54	90,0	60	8	13,3	52	86,7	60
	Intrafix/Rigidfix	0	0,0	1	100,0	1	0	0,0	1	100,0	1
	Close to joint	3	0,8	353	99,2	356	8	2,2	348	97,8	356
	Other	0	0,0	1	100,0	1	0	0,0	1	100,0	1
	Total	9	2,2	409	97,8	418	16	3,8	402	96,2	418
Allograft	Cortical	1	4,2	23	95,8	24	2	8,3	22	91,7	24
	Close to joint	3	1,7	174	98,3	177	9	5,1	168	94,9	177
	Other	0	0,0	4	100,0	4	0	0,0	4	100,0	4
	Total	4	2,0	201	98,0	205	11	5,4	194	94,6	205
Other	Cortical	0	0,0	25	100,0	25	1	4,0	24	96,0	25
	Intrafix Rigidfix	0	0,0	7	100,0	7	0	0,0	7	100,0	7
	Close to joint	2	3,2	61	96,8	63	4	6,3	59	93,7	63
	Other	1	14,3	6	85,7	7	1	14,3	6	85,7	7
	Total	3	2,9	99	97,1	102	6	5,9	96	94,1	102
Total	Cortical	297	2,8	10272	97,2	10569	594	5,6	9975	94,4	10569
	Intrafix/Rigidfix	74	1,5	4798	98,5	4872	231	4,7	4641	95,3	4872
	Close to joint	507	2,2	22445	97,8	22952	1237	5,4	21715	94,6	22952
	Other	10	2,9	339	97,1	349	25	7,2	324	92,8	349
	Total	888	2,3	37854	97,7	38742	2087	5,4	36655	94,6	38742

TABLE 18
 ACL index leading to revision within two years distributed
 by ACL index graft and femoral fixation
*ACL index during the surgery period 1 January 2005 to
 31 December 2017*

Graft	Femoral fixation	Revision within two years					Revision				
		Yes		No		ACL index	Yes		No		ACL index
		N	%	N	%		N	%	N	%	
Patellar graft	Cortical	8	2,1	375	97,9	383	15	3,9	368	96,1	383
	Rigidfix/Transfix	0	0,0	7	100,0	7	0	0,0	7	100,0	7
	Close to joint	26	1,5	1747	98,5	1773	87	4,9	1686	95,1	1773
	Other	1	12,5	7	87,5	8	2	25,0	6	75,0	8
	Total	35	1,6	2136	98,4	2171	104	4,8	2067	95,2	2171
Hamstring graft	Cortical	594	2,5	23252	97,5	23846	1304	5,5	22542	94,5	23846
	Rigidfix/Transfix	102	1,3	7454	98,7	7556	341	4,5	7215	95,5	7556
	Close to joint	133	3,1	4127	96,9	4260	293	6,9	3967	93,1	4260
	Other	8	3,0	263	97,0	271	14	5,2	257	94,8	271
	Total	837	2,3	35096	97,7	35933	1952	5,4	33981	94,6	35933
Quadriceps graft	Cortical	9	2,4	373	97,6	382	13	3,4	369	96,6	382
	Close to joint	0	0,0	38	100,0	38	3	7,9	35	92,1	38
	Other	0	0,0	3	100,0	3	0	0,0	3	100,0	3
	Total	9	2,1	414	97,9	423	16	3,8	407	96,2	423
Allograft	Cortical	4	2,5	154	97,5	158	11	7,0	147	93,0	158
	Rigidfix/Transfix	0	0,0	10	100,0	10	0	0,0	10	100,0	10
	Close to joint	0	0,0	35	100,0	35	0	0,0	35	100,0	35
	Other	0	0,0	2	100,0	2	0	0,0	2	100,0	2
	Total	4	2,0	201	98,0	205	11	5,4	194	94,6	205
Other	Cortical	1	1,5	64	98,5	65	4	6,2	61	93,8	65
	Rigidfix/Transfix	0	0,0	4	100,0	4	0	0,0	4	100,0	4
	Close to joint	1	4,5	21	95,5	22	1	4,5	21	95,5	22
	Other	1	9,1	10	90,9	11	1	9,1	10	90,9	11
	Total	3	2,9	99	97,1	102	6	5,9	96	94,1	102
Total	Cortical	616	2,5	24218	97,5	24834	1347	5,4	23487	94,6	24834
	Rigidfix/Transfix	102	1,3	7475	98,7	7577	341	4,5	7236	95,5	7577
	Close to joint	160	2,6	5968	97,4	6128	384	6,3	5744	93,7	6128
	Other	10	3,4	285	96,6	295	17	5,8	278	94,2	295
	Total	888	2,3	37946	97,7	38834	2089	5,4	36745	94,6	38834

Revisions of the same knee within two years by clinic are shown below. The clinics that are presented are those that initially performed the first surgery but not necessarily the revision. The steering committee has chosen to present all the clinics without taking account of the number of primary operations.

TABLE 19
 ACL index leading to revision within two years distributed
 by region and clinic where ACL index was used
 ACL index during surgery period 1 January 2005 to 31 December 2017

Region	Clinic	Revision within two years					Revision				
		Yes		No		ACL index	Yes		No		ACL index
		N	%	N	%		N	%	N	%	
Greater Stockholm	KAROLINSKA UNIVERSITETSSJUKHUSET	3	1,5	203	98,5	206	11	5,3	195	94,7	206
	ARTROCENTER	3	4,3	66	95,7	69	4	5,8	65	94,2	69
	S:T GÖRANS SJUKHUS CAPIO, STOCKHOLM	3	3,0	97	97,0	100	6	6,0	94	94,0	100
	CITYAKUTEN PRIVATVÅRD	0	0,0	58	100,0	58	0	0,0	58	100,0	58
	DANDERYDS SJUKHUS	9	2,4	365	97,6	374	20	5,3	354	94,7	374
	LÖWETS SPECIALISTMOTTAGNING	5	2,1	238	97,9	243	18	7,4	225	92,6	243
	KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	19	2,9	627	97,1	646	38	5,9	608	94,1	646
	NACKA NÄRSJUKHUS	2	1,9	102	98,1	104	7	6,7	97	93,3	104
	ODENPLANS LÄKARHUS	4	2,2	180	97,8	184	14	7,6	170	92,4	184
	ORTOPEDISKA HUSET CAREMA	14	1,9	709	98,1	723	27	3,7	696	96,3	723
	PRAKTIKERTJÄNST ORTOPEDI STOCKHOLM	2	5,0	38	95,0	40	3	7,5	37	92,5	40
	SABBATSBERG NÄRSJUKHUSET	3	1,9	153	98,1	156	4	2,6	152	97,4	156
	SÖDERMALMS ORTOPEDI	1	1,0	96	99,0	97	1	1,0	96	99,0	97
	SÖDERTÄLJE SJUKHUS	3	3,4	85	96,6	88	5	5,7	83	94,3	88
	SÖDERSJUKHUSET	34	2,4	1389	97,6	1423	85	6,0	1338	94,0	1423
	SOPHIAHEMMET	0	0,0	63	100,0	63	0	0,0	63	100,0	63
	ORTHOCENTER STOCKHOLM	11	2,6	413	97,4	424	25	5,9	399	94,1	424
	CAPIO ARTRO CLINIC	182	2,4	7252	97,6	7434	422	5,7	7012	94,3	7434
	Total	298	2,4	12134	97,6	12432	690	5,6	11742	94,4	12432
	Svealand + Gotland	AKADEMISKA SJUKHUSET	7	3,6	189	96,4	196	14	7,1	182	92,9
BOLLNÄS SJUKHUS		0	0,0	12	100,0	12	1	8,3	11	91,7	12
LASARETTET I ENKÖPING		2	2,0	100	98,0	102	3	2,9	99	97,1	102
ELISABETHSJUKHUSET		23	2,8	793	97,2	816	58	7,1	758	92,9	816
FALU LASARETT		9	1,6	544	98,4	553	23	4,2	530	95,8	553
GÄVLE SJUKHUS		4	1,0	407	99,0	411	17	4,1	394	95,9	411
HUDIKSVALLS SJUKHUS		8	2,7	291	97,3	299	14	4,7	285	95,3	299
KARLSTAD CENTRALSJUKHUS		14	1,6	842	98,4	856	44	5,1	812	94,9	856
KARLSKOGA LASARETT		0	0,0	11	100,0	11	3	27,3	8	72,7	11
CAPIO LÄKARGRUPPEN I ÖREBRO AB		23	4,2	529	95,8	552	44	8,0	508	92,0	552
MÄLARSJUKHUSET ESKILSTUNA		6	1,6	375	98,4	381	12	3,1	369	96,9	381
NORRTÄLJE SJUKHUS		2	1,3	147	98,7	149	6	4,0	143	96,0	149
NYKÖPINGS LASARETT		2	1,5	131	98,5	133	9	6,8	124	93,2	133
ÖREBRO USÖ		10	2,4	405	97,6	415	21	5,1	394	94,9	415
SAMARITERHEMMETS SJUKHUS		1	0,5	217	99,5	218	9	4,1	209	95,9	218
SPECIALISTCENTER SCANDINAVIA		0	0,0	46	100,0	46	0	0,0	46	100,0	46
VÄSTERÅS CENTRALLASARETTET		1	0,3	307	99,7	308	6	1,9	302	98,1	308
VISBY LASARETT		3	2,9	99	97,1	102	7	6,9	95	93,1	102
VÄSTERÅS ORTOPEDPRAKTIK		4	2,6	150	97,4	154	5	3,2	149	96,8	154
Total		119	2,1	5595	97,9	5714	296	5,2	5418	94,8	5714
Skåne	ALERIS ORTOPEDI ÄNGELHOLM	10	1,6	613	98,4	623	26	4,2	597	95,8	623
	HÄSSLEHOLMS SJUKHUS	14	1,6	842	98,4	856	45	5,3	811	94,7	856
	HELSINGBORGS SJUKHUS	15	2,4	605	97,6	620	25	4,0	595	96,0	620
	LUNDS UNIVERSITET	6	1,5	397	98,5	403	26	6,5	377	93,5	403
	MALMÖ ALLMÄNNA SJUKHUS	17	2,2	745	97,8	762	51	6,7	711	93,3	762
	ORTHOCENTER I SKÅNE	5	3,9	124	96,1	129	9	7,0	120	93,0	129
	SKÅNES UNIVERSITETSSJUKHUS	30	1,8	1599	98,2	1629	78	4,8	1551	95,2	1629
Total	97	1,9	4925	98,1	5022	260	5,2	4762	94,8	5022	

TABLE 19 continues on the next page.

Continuation of TABLE 19.

Region	Clinic	Revision within two years					Revision				
		Yes		No		ACL index	Yes		No		ACL index
		N	%	N	%		N	%	N	%	
Halland	HALMSTADS SJUKHUS	3	4,6	62	95,4	65	7	10,8	58	89,2	65
	KUNGSBACKA SJUKHUS	20	2,5	793	97,5	813	41	5,0	772	95,0	813
	MOVEMENT MEDICAL AB	41	3,7	1065	96,3	1106	85	7,7	1021	92,3	1106
	ORTOPEDSPECIALISTERNA	1	1,6	63	98,4	64	2	3,1	62	96,9	64
	Total	65	3,2	1983	96,8	2048	135	6,6	1913	93,4	2048
Småland + Blekinge	ART CLINIC	1	1,8	56	98,2	57	1	1,8	56	98,2	57
	HÖGLANDSSJUKHUSET	7	1,5	452	98,5	459	19	4,1	440	95,9	459
	KALMAR SJUKHUS	17	2,6	627	97,4	644	36	5,6	608	94,4	644
	BLEKINGESJUKHUSET	0	0,0	127	100,0	127	3	2,4	124	97,6	127
	LJUNGBY LASARETT	5	2,5	199	97,5	204	8	3,9	196	96,1	204
	OSKARSHAMNS SJUKHUS	0	0,0	345	100,0	345	7	2,0	338	98,0	345
	LÄNSSJUKHUSET RYHOV	9	2,6	341	97,4	350	17	4,9	333	95,1	350
	CENTRALLASARETTET VÄXJÖ	7	1,2	563	98,8	570	25	4,4	545	95,6	570
	VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	1	1,3	74	98,7	75	4	5,3	71	94,7	75
	VÄSTERVIKS SJUKHUS	1	0,6	153	99,4	154	4	2,6	150	97,4	154
	Total	48	1,6	2937	98,4	2985	124	4,2	2861	95,8	2985
Västra Götaland	ALINGSÅS LASARETT	12	3,7	309	96,3	321	29	9,0	292	91,0	321
	ART CLINIC GÖTEBORG	2	6,3	30	93,8	32	4	12,5	28	87,5	32
	SÖDRA ÄLVSBORGS SJUKHUS	3	1,5	196	98,5	199	6	3,0	193	97,0	199
	CARLANDERSKA ORTOPEDI	2	4,8	40	95,2	42	2	4,8	40	95,2	42
	DROTTNING SILVIAS BARN- OCH UNGDOMSSJUKHUS	2	3,3	58	96,7	60	5	8,3	55	91,7	60
	FRÖLUNDAORTOPEDEN	0	0,0	17	100,0	17	0	0,0	17	100,0	17
	FRÖLUNDA SPECIALISTSJUKHUS	10	3,7	262	96,3	272	17	6,3	255	93,8	272
	ORTHOCENTER/IFK-KLINIKEN	68	5,3	1220	94,7	1288	118	9,2	1170	90,8	1288
	KUNGÄLVS SJUKHUS	3	1,8	161	98,2	164	7	4,3	157	95,7	164
	CAPIO LUNDBY NÄRSJUKHUS	16	3,2	491	96,8	507	27	5,3	480	94,7	507
	LIDKÖPINGS SJUKHUS	3	1,4	215	98,6	218	7	3,2	211	96,8	218
	NU-SJUKVÅRDEN	44	3,8	1114	96,2	1158	94	8,1	1064	91,9	1158
	PERAGO ORTOPEDKLINIK	6	5,0	113	95,0	119	7	5,9	112	94,1	119
	KÄRNSJUKHUSET I SKÖVDE	3	2,8	104	97,2	107	6	5,6	101	94,4	107
	SPORTSMED	0	0,0	103	100,0	103	1	1,0	102	99,0	103
	SAHLGRENSKA UNIVERSITETSSJUKHUSET	43	2,5	1692	97,5	1735	86	5,0	1649	95,0	1735
	VARBERGS SJUKHUS	4	1,5	270	98,5	274	11	4,0	263	96,0	274
	Total	221	3,3	6395	96,7	6616	427	6,5	6189	93,5	6616
Östergötland	LINKÖPINGS HEALTH CARE	0	0,0	1	100,0	1	0	0,0	1	100,0	1
	LINKÖPINGS UNIVERSITETSKLINIK	8	1,0	782	99,0	790	35	4,4	755	95,6	790
	VRINNEVISJUKHUSET	8	0,9	909	99,1	917	34	3,7	883	96,3	917
	Total	16	0,9	1692	99,1	1708	69	4,0	1639	96,0	1708
Norrland	ALFREDSON TENDON CLINIC	0	0,0	2	100,0	2	0	0,0	2	100,0	2
	GÄLLIVARE SJUKHUS	0	0,0	64	100,0	64	0	0,0	64	100,0	64
	LÄKARHUSET HERMELINEN	2	2,7	71	97,3	73	4	5,5	69	94,5	73
	MEDICIN DIREKT	9	2,1	430	97,9	439	35	8,0	404	92,0	439
	ÖRNSKÖLDSVIKS SJUKHUS	1	0,6	157	99,4	158	8	5,1	150	94,9	158
	ÖSTERSUNDS SJUKHUS	3	2,3	129	97,7	132	7	5,3	125	94,7	132
	PITEÅ ÄLVDAL SJUKHUS	0	0,0	68	100,0	68	2	2,9	66	97,1	68
	SKELLEFTEÅ SJUKHUS	0	0,0	32	100,0	32	2	6,3	30	93,8	32
	SPORTS MEDICINE UMEÅ	13	3,3	381	96,7	394	24	6,1	370	93,9	394
	SOLLEFTEÅ SJUKHUS	0	0,0	54	100,0	54	0	0,0	54	100,0	54
	SUNDERBY SJUKHUS	6	1,0	586	99,0	592	18	3,0	574	97,0	592
	LÄNSSJUKHUSET SUNDSVALL	1	1,3	74	98,7	75	3	4,0	72	96,0	75
	NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	12	1,1	1063	98,9	1075	44	4,1	1031	95,9	1075
	Total	47	1,5	3111	98,5	3158	147	4,7	3011	95,3	3158
Total	911	2,3	38772	97,7	39683	2148	5,4	37535	94,6	39683	

KOOS knee-related quality of life

Only looking at revisions as an indication of a failed index operation does not tell the whole story, as it is not certain that a patient will undergo a revision in spite of poor knee function. One way of identifying patients who probably do not have a fully functional ACL is to look at the percentage who have given an rating of under 44 points in the category for knee-related quality of life on the KOOS two years after the primary operation. The following table shows the response frequency for KOOS knee-related quality of life at two years postoperatively and the percentage who have given a rating of under 44 points, distributed by region and clinic.

TABLE 20
ACL index leading to revision within two years distributed
by region and clinic where ACL index was used
ACL index during surgery period 1 January 2005 to 31 December 2017

Region	Clinic	KOOS knee-related quality of life two years postop								ACL Index
		QoL < 44		QoL ≥ 44		Response rate		No response because of new		
		N	%	N	%	N	%	N	%	
Greater Stockholm	KAROLINSKA UNIVERSITETSSJUKHUSET	18	14	108	86	126	61	6	3	206
	ARTROCENTER	8	27	22	73	30	43	5	7	69
	S:T GÖRANS SJUKHUS CAPIO, STOCKHOLM	12	20	49	80	61	61	2	2	100
	CITYAKUTEN PRIVATVÅRD	10	36	18	64	28	48	0	0	58
	DANDERYDS SJUKHUS	57	37	96	63	153	41	10	3	374
	LÖWETS SPECIALISTMOTTAGNING	28	20	111	80	139	57	11	5	243
	KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	84	30	200	70	284	44	26	4	646
	NACKA NÄRSJUKHUS	17	34	33	66	50	48	1	1	104
	ODENPLANS LÄKARHUS	14	18	66	83	80	43	8	4	184
	ORTOPEDISKA Huset CAREMA	81	23	268	77	349	48	17	2	723
	PRAKTIKERTJÄNST ORTOPEDI STOCKHOLM	2	29	5	71	7	18	1	3	40
	SABBATSBERG NÄRSJUKHUSET	25	38	40	62	65	42	4	3	156
	SÖDERMALMS ORTOPEDI	5	11	40	89	46	47	1	1	97
	SÖDERTÄLJE SJUKHUS	17	50	17	50	34	39	1	1	88
	SÖDERSJUKHUSET	191	31	427	69	618	43	32	2	1423
	SOPHIAHEMMET	5	17	24	83	29	46	1	2	63
	ORTHOCENTER STOCKHOLM	60	29	149	71	209	49	14	3	423
	CAPIO ARTRO CLINIC	853	22	3079	78	3933	53	226	3	7434
	Total	1487	24	4752	76	6241	50	366	3	12431
	Svealand + Gotland	AKADEMISKA SJUKHUSET	14	26	40	74	55	28	10	5
BOLLNÄS SJUKHUS		2	40	3	60	5	42	0	0	12
LASARETTET I ENKÖPING		13	39	20	61	33	32	1	1	102
ELISABETHSJUKHUSET		90	27	243	73	333	41	26	3	816
FALU LASARETT		91	36	160	64	252	46	12	2	553
GÄVLE SJUKHUS		74	39	115	61	189	46	7	2	411
HUDIKSVALLS SJUKHUS		42	33	87	67	129	43	9	3	299
KARLSTAD CENTRALSJUKHUS		146	35	269	65	416	49	18	2	856
KARLSKOGA LASARETT		4	67	2	33	6	55	0	0	11
CAPIO LÄKARGRUPPEN I ÖREBRO AB		108	36	196	64	304	55	24	4	552
MÄLARSJUKHUSET ESKILSTUNA		73	38	118	62	191	50	4	1	381
NORRTÄLJE SJUKHUS		14	26	39	74	53	36	1	1	149
NYKÖPINGS LASARETT		22	39	35	61	57	43	5	4	133
ÖREBRO USÖ		69	37	117	63	186	45	12	3	415
SAMARITERHEMMETS SJUKHUS		33	31	75	69	108	50	2	1	218
SPECIALISTCENTER SCANDINAVIA		8	40	12	60	20	43	1	2	46
VÄSTERÅS CENTRALLASARETTET		63	46	75	54	138	45	5	2	308
VISBY LASARETT		20	38	32	62	52	51	2	2	102
VÄSTERÅS ORTOPEDPRAKTIK		20	36	36	64	56	36	4	3	154
Total		906	35	1674	65	2583	45	143	3	5714

TABLE 20 continues on the next page.

		KOOS knee-related quality of life two years postop												
Region	Clinic	QoL < 44				QoL ≥ 44				Response rate		No response because of new		ACL Index
		N		%		N		%		N		%		
		N	%	N	%	N	%	N	%	N	%			
Skåne	ALERIS ORTOPEDI ÄNGELHOLM	77	28	203	73	280	45	14	2	623				
	HÄSSLEHOLMS SJUKHUS	127	30	297	70	424	50	9	1	856				
	HELSINGBORGS SJUKHUS	104	38	169	62	273	44	16	3	620				
	LUNDS UNIVERSITET	61	28	157	72	218	54	10	2	403				
	MALMÖ ALLMÄNNA SJUKHUS	147	40	223	60	370	49	24	3	762				
	ORTHOCENTER I SKÅNE	18	28	47	72	65	50	4	3	129				
	SKÅNES UNIVERSITETSSJUKHUS	278	36	492	64	770	47	39	2	1629				
	Total	812	34	1588	66	2400	48	116	2	5022				
Halland	HALMSTADS SJUKHUS	12	32	26	68	38	58	3	5	65				
	KUNGSBACKA SJUKHUS	121	31	275	69	396	49	25	3	813				
	MOVEMENT MEDICAL AB	190	34	370	66	560	51	50	5	1106				
	ORTOPEDSPECIALISTERNA	5	16	26	84	31	48	1	2	64				
	Total	328	32	697	68	1025	50	79	4	2048				
Småland + Blekinge	ART CLINIC	4	15	23	85	27	47	1	2	57				
	HÖGLANDSSJUKHUSET	74	30	175	70	249	54	12	3	459				
	KALMAR SJUKHUS	84	29	204	71	288	45	21	3	644				
	BLEKINGESJUKHUSET	18	34	35	66	53	42	1	1	127				
	LJUNGBY LASARETT	24	25	73	75	97	48	7	3	204				
	OSKARSHAMNS SJUKHUS	62	33	124	67	187	54	1	0	345				
	LÄNSSJUKHUSET RYHOV	53	31	118	69	171	49	11	3	350				
	CENTRALLASARETTET VÄXJÖ	78	28	205	72	283	50	8	1	570				
	VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	10	36	18	64	28	37	1	1	75				
VÄSTERVIKS SJUKHUS	26	35	48	65	74	48	1	1	154					
	Total	433	30	1023	70	1457	49	64	2	2985				
Västra Götaland	ALINGSÅS LASARETT	52	35	96	65	148	46	15	5	321				
	ART CLINIC GÖTEBORG	6	50	6	50	12	38	2	6	32				
	SÖDRA ÄLVSBOGGS SJUKHUS	46	48	50	52	96	48	2	1	199				
	CARLANDERSKA ORTOPEDI	5	28	13	72	18	43	1	2	42				
	DROTTNING SILVIAS BARN- OCH UNGDOMSSJUKHUS	6	21	22	79	28	47	3	5	60				
	FRÖLUNDAORTOPEDEN	1	13	7	88	8	47	0	0	17				
	FRÖLUNDA SPECIALISTSJUKHUS	44	30	102	70	146	54	9	3	272				
	ORTHOCENTER/IFK-KLINIKEN	179	26	522	74	701	54	77	6	1288				
	KUNGÄLVS SJUKHUS	37	37	63	63	100	61	4	2	164				
	CAPIO LUNDBY NÄRSJUKHUS	69	27	182	73	251	50	20	4	507				
	LIDKÖPINGS SJUKHUS	49	43	64	57	113	52	4	2	218				
	NU-SJUKVÅRDEN	209	33	433	67	642	55	53	5	1158				
	PERAGO ORTOPEDEKLINIK	15	26	43	74	58	49	5	4	119				
	KÄRNSJUKHUSET I SKÖVDE	11	21	41	79	52	49	5	5	107				
	SPORTSMED	16	27	43	73	59	57	0	0	103				
	SAHLGRENSKA UNIVERSITETSSJUKHUSET	299	35	550	65	849	49	50	3	1735				
VARBERGS SJUKHUS	52	33	106	67	158	58	3	1	274					
	Total	1096	32	2343	68	3439	52	253	4	6616				
Östergötland	LINKÖPINGS HEALTH CARE	0	0	1	100	1	100	0	0	1				
	LINKÖPINGS UNIVERSITETSKLINIK	136	37	236	63	372	47	13	2	790				
	VRINNEVISJUKHUSET	145	33	290	67	435	47	16	2	917				
	Total	281	35	527	65	808	47	29	2	1708				
Norrland	ALFREDSON TENDON CLINIC	0	0	1	100	1	50	0	0	2				
	GÄLLIVARE SJUKHUS	10	23	33	77	43	67	1	2	64				
	LÄKARHUSET HERMELINEN	8	20	32	80	40	55	2	3	73				
	MEDICIN DIREKT	66	30	155	70	221	50	9	2	439				
	ÖRNSKÖLDSEVIKS SJUKHUS	44	48	48	52	92	58	1	1	158				
	ÖSTERSUNDS SJUKHUS	16	30	37	70	53	40	4	3	132				
	PITEÅ ÄLVDAL SJUKHUS	13	35	24	65	37	54	0	0	68				
	SKELLEFTEÅ SJUKHUS	6	35	11	65	17	53	0	0	32				
	SPORTS MEDICINE UMEÅ	63	32	135	68	198	50	14	4	394				
	SOLLEFTEÅ SJUKHUS	10	50	10	50	20	37	0	0	54				
	SUNDERBY SJUKHUS	93	33	191	67	284	48	12	2	592				
	LÄNSSJUKHUSET SUNDSVALL	10	36	18	64	28	37	2	3	75				
	NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	175	34	338	66	514	48	22	2	1075				
	Total	514	33	1033	67	1548	49	67	2	3158				
	Total	5857	30	13637	70	19501	49	1117	3	39682				

Multiligament injuries

Even if the majority of injuries registered in the knee ligament registry are anterior cruciate ligament injuries, multiligament and isolated injuries to other ligaments are also registered. In all, 108 multiligament injuries were registered in 2019, corresponding to 2.7% of all operations. By far the most common combination was the reconstruction of the ACL with an injury to the medial cruciate ligament (MCL), where 49 operations were performed. Twelve operations involved different combinations of the ACL and collateral ligament (LCL). On 23 occasions, there was a combined injury to both the ACL and posterior cruciate ligament (PCL) and, on one occasion, there was an extremely extensive injury involving the ACL, PCL, MCL, LCL and the “outer rear complex” posterolateral cruciate (PLC).

The following table shows combinations of all multiligament injuries that were registered in conjunction with primary operations in the knee ligament registry.

TABLE 21
Combinations of multiligament injuries in primary reconstructions during the period 2005-2019

					2019		2018		2005-2017		Total	
					N	%	N	%	N	%	N	%
ACL*	---	---	---	---	3843	97,3	3684	97,6	40423	97,8	47950	97,7
ACL*	---	MCL	---	---	49	1,2	38	1,0	379	0,9	466	0,9
ACL*	PCL	---	---	---	23	0,6	18	0,5	176	0,4	217	0,4
ACL*	---	---	LCL	---	12	0,3	10	0,3	107	0,3	129	0,3
ACL*	PCL	MCL	---	---	6	0,2	6	0,2	68	0,2	80	0,2
ACL*	---	---	LCL	PLC	6	0,2	6	0,2	69	0,2	81	0,2
ACL*	PCL	---	LCL	PLC	4	0,1			36	0,1	40	0,1
ACL*	---	---	---	PLC	3	0,1	1	0,0	19	0,0	23	0,0
ACL*	PCL	---	LCL	---	2	0,1	5	0,1	19	0,0	26	0,1
ACL*	PCL	---	---	PLC	2	0,1	1	0,0	14	0,0	17	0,0
ACL*	PCL	MCL	LCL	PLC	1	0,0	1	0,0	9	0,0	11	0,0
ACL*	PCL	MCL	---	PLC					1	0,0	1	0,0
ACL*	---	MCL	LCL	PLC			2	0,1	4	0,0	6	0,0
ACL*	---	MCL	LCL	---			1	0,0	5	0,0	6	0,0
ACL*	---	MCL	---	PLC					2	0,0	2	0,0
Total					3951	100,0	3773	100,0	41331	100,0	49055	100,0

* Also include the ACLs without information on transplants

Meniscal sutures

The registry data from 2005 to 2019 from the whole of Sweden clearly demonstrate that there has been an increase in the number of cases of meniscal suturing in conjunction with an ACL reconstruction.

The frequency has successively increased from just under 4% to just over 20% when both primary and revision ACL surgery are included. There was no real difference in the frequency of meniscal suturing between primary ACL reconstructions and revisions between 2005 and 2019.

There are large differences between different clinics/regions when reporting the number of meniscal suturing cases to the registry.

A worrying number of clinics report a frequency of 0% or close to 0% of meniscal suture cases, which appears to be indefensible based on the current consensus relating to the occurrence and treatment of these injuries at the present time. It is probably possible to suture a meniscal injury in purely technical surgical terms in as many as a quarter of all ACL reconstructions, but there is no strict consensus and no established selection criteria and more research therefore needs to be focused on following this up in the future.

Portals

Some 90% of operations are performed using the medial portal technique, while the transtibial technique is used in 6%. In 2019, only 10 operations were performed using the double-tunnel technique. 2008 was a record year for this technique when it was used in 203 operations. Since 2015, some ten operations have been performed every year.

New Ligaments

In recent years, there has been a lively discussion on the important role played by anterolateral structures in knee stability and in cartilage surgery. The ALL is a structure within the anterolateral complex, primarily comprising the tractus iliotibialis (ITB), superficial and deep part, plus the capsule and the ALL. The ALL is probably not a morphologic ligament but is more likely a structure within the capsule anterolaterally. This structure is thought to run from the lateral femoral condyle posteriorly and proximally of the lateral collateral ligament (LCL) to the proximal tibia between Gerdy's tubercle and the caput fibula. The structure that is primarily of the greatest significance for anterior translation and inward rotation in connection with extension is, however, the anterior cruciate ligament (ACL), while other stabilizers are the ITB, the lateral meniscus and the ALL/anterolateral capsule. Methods for tenodesis with a view to resembling the ALL have been presented. The most common method at the present time is a so-called modified LeMaire in which part of the ITB is loosened and passed under the LCL, after which it is fixed dorsally and proximally of the LCL in the lateral femoral epicondyle. There is currently insufficient clinical evidence to support the importance of lateral tenodesis in ACL surgery. The indications for adding this as a reinforcement in ACL reconstruction that have been mentioned are in connection with extreme pivoting, especially among athletes planning to return to pivoting sports, excess mobility or in revision surgery. In connection with a lateral tenodesis, it is important not to create too much tension and to fix the tibia in a neutral to outwardly rotated position as the question of whether a lateral tenodesis may create increased pressure and load in the lateral compartment, especially in the event of a meniscal injury, has been raised. At the present time, there is still insufficient knowledge in this area. Since 2018, it has been possible to register a lateral tenodesis in conjunction with an ACL reconstruction. So far, this has not made a breakthrough and, in 2019, only 52 ALLs, 25 in primary reconstructions and 27 in revisions, were registered. The technique that is primarily used is the modified LeMaire.

Antibiotic prophylaxis

Antibiotics are basically administered in connection with all surgery.

A number of studies, describing a reduced risk of infection if the graft is prepared preoperatively with vancomycin, have recently been published (Vertullo 2012, Phegan 2016). These initial studies reveal a very marked reduction in the incidence of infection, but they may be biased in terms of their design, as a comparison has been made with historic material and the result may have been influenced by other improvement measures that were implemented during the study period. In 2018, vancomycin was administered in 23% of all ACL operations in the registry. Preoperative intravenous prophylaxis was also administered. The studies that have been published report a dramatic reduction in infection incidence, but the risk of antibiotic resistance, fear of the way vancomycin could affect the graft and possibly the result of surgery, together with the risk of revision, are currently the subject of discussion. The publications that are currently available report no proven increase in the risk of an impact on tendon structure or articular cartilage or the risk of a poorer subjective result or risk of revision (Naendrup 2018).

The question today is whether the available data give us reason to recommend administering vancomycin to every patient undergoing an ACL reconstruction or whether it should be reserved for patient groups among whom an increase in the risk of infection can be assumed to exist. A large randomized study or registry-based study of more extensive material should perhaps be conducted. A study of the registry is planned in 2020 when a sufficient number of operations with vancomycin have been registered to enable conclusions to be drawn.

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 -0.594 (worse than being dead) 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 2019 do not differ markedly from those in previous years.

The following table shows 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 2007-2016. The table presents two constructed average values, the first for the first three dimensions of the KOOS, i.e. pain, other symptoms, such as swelling, joint mobility and mechanical symptoms, and functional impairment in connection with daily activity, while the second presents the dimensions of functional impairment in connection with sport and recreational activities and knee-related quality of life.

TABLE 22
 KOOS pain, symptoms & ADL (mean value) and function and
 knee-related quality of life (mean value) two years
 postoperatively distributed by region and clinic
*Primary hamstring graft during surgery period 2007-2017
 for the age range of 20-30 years*

Region	Clinic	KOOS two years postop									Loss*	Primary ACL
		Pain, Symptoms & ADL			Function & Quality of Life			Response rate				
		N	MV	SD	N	MV	SD	N	%			
Greater Stockholm	ARTROCENTER	9	92,1	12,2	9	76,7	26,5	9	34,6	1	27	
	CITYAKUTEN PRIVATVÅRD	10	82,4	18,4	10	64,3	20,5	10	50,0	0	20	
	DANDERYDS SJUKHUS	46	76,3	19,1	46	50,2	28,4	46	35,4	4	134	
	LÖWETS SPECIALISTMOTTAGNING	47	86,3	15,3	47	68,5	25,5	47	55,3	2	87	
	KAROLINSKA UNIVERSITETSSJUKHUSET/ ORTOPEDKLINIKEN	88	84,6	14,0	88	60,5	26,2	88	44,0	6	206	
	NACKA NÄRSJUKHUS	13	85,2	9,4	13	68,5	22,3	13	38,2	1	35	
	ODENPLANS LÄKARHUS	27	84,9	14,3	27	64,7	23,1	27	36,0	6	81	
	ORTOPEDISKA HUSET CAREMA	81	87,1	11,9	81	67,2	23,6	81	36,0	6	231	
	PRAKTIKERTJÄNST ORTOPEDI	1	98,8		1	97,5		1	10,0	1	11	
	SABBATSBERG NÄRSJUKHUSET	12	79,5	15,1	12	52,7	23,0	12	37,5	0	32	
	SÖDERMALMS ORTOPEDI	2	70,8	6,9	2	48,8	6,2	2	50,0	0	4	
	SÖDERTÄLJE SJUKHUS	9	78,1	11,6	9	47,4	23,3	9	28,1	0	32	
	SÖDERSJUKHUSET	202	83,7	15,0	202	61,3	24,4	202	40,6	13	511	
	SOPHIAHEMMET	3	69,5	10,0	3	45,6	10,7	3	25,0	1	13	
	ORTHOCENTER STOCKHOLM	56	83,0	13,3	56	60,9	23,1	56	45,5	6	129	
	CAPIO ARTRO CLINIC	930	86,9	12,4	930	67,0	22,4	930	48,0	63	2000	
Total	1536	85,7	13,5	1536	65,0	23,6	1536	44,6	110	3553		
Svealand + Gotland	AKADEMISKA SJUKHUSET	22	84,5	11,8	21	59,8	21,9	22	24,7	2	91	
	BOLLNÄS SJUKHUS	1	62,4		1	21,9		1	20,0	0	5	
	LASARETTET I ENKÖPING	9	74,7	16,7	9	49,5	30,0	9	20,0	0	45	
	ELISABETHSJUKHUSET	137	87,0	11,7	137	66,7	19,9	137	38,1	14	374	
	FALU LASARETT	72	81,1	14,7	72	58,8	23,2	72	39,8	5	186	
	GÄVLE SJUKHUS	60	79,7	18,3	60	56,3	26,2	60	45,5	2	134	
	HUDIKSVALLS SJUKHUS	54	79,7	14,6	54	57,8	22,9	54	38,6	2	142	
	KARLSTAD CENTRALSJUKHUS	117	79,7	16,6	116	57,0	25,0	117	47,4	4	251	
	CAPIO LÄKARGRUPPEN I ÖREBRO AB	96	82,2	14,7	96	59,5	25,2	96	50,3	6	197	
	MÄLARSJUKHUSET ESKILSTUNA	51	85,9	11,9	51	63,9	22,8	51	41,1	0	124	
	NORRTÄLJE SJUKHUS	21	84,4	14,9	21	63,0	23,4	21	29,2	0	72	
	NYKÖPINGS LASARETT	17	79,4	19,5	17	55,3	23,6	17	37,8	1	46	
	ÖREBRO USÖ	54	83,4	15,2	54	62,3	26,0	54	36,2	4	153	
	SAMARITERHEMMETS SJUKHUS	18	82,0	15,2	18	63,7	21,2	18	39,1	0	46	
	SPECIALISTCENTER SCANDINAVIA	5	72,1	25,1	5	55,8	28,3	5	33,3	0	15	
	VÄSTERÅS CENTRALLASARETTET	39	80,1	17,1	39	57,7	22,9	39	37,5	1	105	
	VISBY LASARETT	18	85,6	11,3	18	62,6	25,8	18	41,9	0	43	
	VÄSTERÅS ORTOPEDPRAKTIK	21	80,1	18,7	21	55,9	27,1	21	33,3	2	65	
Total	812	82,3	15,2	810	60,2	23,9	812	39,6	43	2094		
Skåne	ALERIS ORTOPEDI ÄNGELHOLM	58	83,6	12,0	58	57,4	23,3	58	43,3	4	138	
	HÄSSLEHOLMS SJUKHUS	181	83,1	15,6	181	61,3	24,2	181	50,6	2	360	
	HELSINGBORGS SJUKHUS	79	77,6	17,9	79	54,0	26,8	79	37,4	6	217	
	LUNDS UNIVERSITET	55	85,3	12,3	55	63,8	21,7	55	56,7	1	98	
	MALMÖ ALLMÄNNA SJUKHUS	86	81,4	16,4	86	56,9	26,3	86	48,6	6	183	
	ORTHOCENTER I SKÅNE	25	83,4	16,2	25	67,0	25,9	25	59,5	0	42	
	SKÅNES UNIVERSITETSSJUKHUS	280	80,5	16,3	280	55,8	25,0	280	42,0	12	678	
Total	764	81,6	15,8	764	58,1	24,9	764	45,3	31	1716		

TABLE 22 continues on the next page.

Continuation of TABLE 22.

Region	Clinic	KOOS two years postop									Primary ACL
		Pain, Symptoms & ADL			Function & Quality of Life			Response rate		Loss*	
		N	MV	SD	N	MV	SD	N	%		
Halland	HALMSTADS SJUKHUS	8	73,2	11,0	8	44,0	19,3	8	34,8	3	26
	KUNGSBACKA SJUKHUS	141	83,5	14,8	141	61,0	23,9	141	45,5	17	327
	MOVEMENT MEDICAL AB	193	83,3	14,8	193	61,6	24,4	193	47,2	17	426
	ORTOPEDSPECIALISTERNA	15	91,4	4,9	15	72,9	24,3	15	53,6	1	29
	Total	357	83,5	14,6	357	61,4	24,3	357	46,4	38	808
Småland + Blekinge	ART CLINIC	7	92,4	5,5	7	78,8	12,0	7	33,3	1	22
	HÖGLANDSSJUKHUSET	72	84,2	14,9	72	64,4	27,0	72	50,3	3	146
	KALMAR SJUKHUS	108	82,0	16,9	108	58,4	24,7	108	44,3	7	251
	BLEKINGESJUKHUSET	19	76,9	17,2	19	50,3	20,3	19	30,6	0	62
	LJUNGBY LASARETT	43	82,0	15,1	43	61,7	23,5	43	45,3	3	98
	OSKARSHAMNS SJUKHUS	62	82,9	11,7	61	58,3	22,3	62	50,0	0	124
	LÄNSSJUKHUSET RYHOV	58	85,7	12,5	58	64,2	22,0	58	42,0	5	143
	CENTRALLASARETTET VÄXJÖ	83	84,8	12,8	83	64,4	22,8	83	42,1	4	201
	VÄRNAMO SJUKHUS/ORTOPEDKLINIKEN	11	78,7	14,0	11	50,1	22,5	11	34,4	1	33
	VÄSTERVIKS SJUKHUS	27	74,1	18,6	27	51,1	23,0	27	36,0	1	76
	Total	490	82,8	14,8	489	60,7	23,9	490	43,3	25	1156
Västra Götaland	ALINGSÅS LASARETT	40	82,4	14,8	40	54,1	25,3	40	41,2	3	100
	ART CLINIC GÖTEBORG	7	84,6	17,6	7	65,4	26,1	7	33,3	0	21
	SÖDRA ÄLVSBOGERS SJUKHUS	42	79,7	19,0	42	53,4	25,9	42	48,8	2	88
	CARLANDERSKA ORTOPEDI	5	90,0	9,6	5	66,1	26,5	5	31,3	1	17
	FRÖLUNDAORTOPEDEN	1	78,8		1	60,6		1	50,0	0	2
	FRÖLUNDA SPECIALISTSJUKHUS	53	82,1	14,8	53	58,5	25,4	53	50,5	4	109
	ORTHOCENTER/IFK-KLINIKEN	205	85,7	13,6	205	66,6	24,6	205	50,7	23	427
	KUNGÄLVS SJUKHUS	29	83,6	12,5	29	59,9	25,9	29	58,0	1	51
	CAPIO LUNDBY NÄRSJUKHUS	116	88,7	11,8	116	68,3	22,3	116	50,2	8	239
	LIDKÖPINGS SJUKHUS	46	77,6	18,7	46	50,1	23,3	46	51,1	2	92
	NU-SJUKVÅRDEN	159	81,9	16,1	159	58,3	25,3	159	49,1	11	335
	PERAGO ORTOPEDKLINIK	17	82,2	13,5	17	59,9	24,4	17	34,0	3	53
	KÄRNSJUKHUSET I SKÖVDE	19	85,4	14,2	19	64,5	22,3	19	40,4	1	48
	SPORTSMED	17	84,6	18,9	17	62,8	27,8	17	60,7	0	28
	SAHLGRENSKA UNIVERSITETSSJUKHUSET	262	84,2	15,3	262	62,0	24,6	262	44,0	17	612
	VARBERGS SJUKHUS	29	82,2	14,1	29	56,2	28,8	29	53,7	0	54
	Total	1047	83,9	15,1	1047	61,6	25,0	1047	47,6	76	2276
Östergötland	LINKÖPINGS UNIVERSITETSKLINIK	130	81,8	16,3	130	57,9	25,1	130	43,8	1	298
	VRINNEVISJUKHUSET	165	81,4	15,5	165	59,8	24,3	165	42,7	4	390
	Total	295	81,5	15,9	295	59,0	24,6	295	43,2	5	688
Norrland	LÄKARHUSET HERMELINEN	15	85,0	11,2	15	62,5	18,7	15	75,0	0	20
	MEDICIN DIREKT	55	85,5	11,6	55	64,9	18,4	55	41,7	3	135
	ÖRNSKÖLDSEVIKS SJUKHUS	20	74,6	16,5	20	42,3	22,1	20	47,6	0	42
	ÖSTERSUNDS SJUKHUS	14	85,3	11,5	14	61,8	22,2	14	46,7	2	32
	PITEÅ ÄLVDAL SJUKHUS	10	82,2	21,0	10	60,4	25,0	10	55,6	0	18
	SKELLEFTEÅ SJUKHUS	1	96,4		1	85,0		1	50,0	0	2
	SPORTS MEDICINE UMEÅ	80	84,2	13,2	80	61,9	23,1	80	48,2	2	168
	SOLLEFTEÅ SJUKHUS	10	74,9	12,5	10	48,4	25,3	10	35,7	0	28
	SUNDERBY SJUKHUS	78	83,8	14,9	78	62,7	22,9	78	40,0	4	199
	LÄNSSJUKHUSET SUNDSVALL	8	82,3	15,2	8	58,8	18,1	8	28,6	2	30
	NORRLANDS UNIVERSITETSSJUKHUS, UMEÅ	170	84,3	13,6	170	59,9	24,0	170	42,2	6	409
	Total	461	83,7	13,9	461	60,5	23,0	461	43,3	19	1084
Total		5762	83,6	14,7	5759	61,5	24,2	5762	44,2	347	13375

* Anticipated loss due to new operation; MV, mean value; SD, standard deviation

Functional assessments

The registry is constantly developing and the target now is to include functional assessments made by physical therapists. This will make it possible to create a more complete picture of the results following an ACL injury and a possible ACL reconstruction.

Patients with an ACL injury are normally in regular contact with a physical therapist, regardless of whether they have been treated with or without an ACL reconstruction. The physical therapist regularly evaluates the result of rehabilitation. The functional assessments that are made normally include measurements of knee mobility, measurements of stability manually or with the KT 1000, any loss of sensibility, strength tests of the quadriceps and hamstrings, different hop tests and patient-reported outcome measurements. When a patient has undergone an ACL reconstruction, it is common for these tests and assessments to be conducted six, nine and 12 months postoperatively, for example. The current test results are entered into the patient's notes by the person making the assessments. The idea is that it should be possible for these data to be entered in the Swedish knee ligament registry and for the results to be entered in a template which can then be given to the patient for feedback, to increase motivation and to be entered directly in the patient's notes. The aim here is to link the test data with the surgery data and patient-reported outcome measurements. The functional assessments that are made of patients who do not undergo surgery are also entered.

Just like the surgeon, the physical therapist can obtain feedback on how his/her particular patients have progressed and compare the results between different hospitals and caregivers in different parts of the country. The results are also important for the surgeon to obtain a complete picture of the patient's function. The results can subsequently be used in improvement programs, when it comes to the care and rehabilitation of people who have suffered an ACL injury, and for research purposes.

Work on structuring the entry of functional assessments is in progress, but the first contact with a QRC (Qualified Rehabilitation Consultant) lawyer unfortunately resulted in a rejection of the proposal to create a physical therapy module. The reason is that physical therapists are not allowed access to data such as the surgical data in the registry. Work is continuing with a view to finding a solution to this problem. An overview of patient-reported outcome measurements is also being conducted.

Fifteen years with the Scandinavian ACL registries

High-quality national quality registries aim to 1) improve treatment results at national level by giving hospitals and clinics relevant feedback, 2) identify poorer treatment alternatives and 3) identify prognostic factors for good and poor results. The Scandinavian knee ligament registries were set up in 2004 and 2005 and contain data from more than 70,000 patients, resulting so far in more than 70 publications (2019). This summary reports the information that has been obtained, limitations and what the future may hold for the Scandinavian knee ligament registries.

What has been learned

Two systematic review articles comprising all the studies from the registries were published in 2018 and turned the spotlight on factors which 1) increase the risk of a new ACL injury and 2) influence patient-reported knee function following an ACL injury and reconstruction. The main findings from these review articles are summarized below.

Table 1 Risk factors identified from the Scandinavian knee ligament registries

Patient factors	Younger patients report better knee function and run an increased risk of revision. Smoking increases the risk in inferior results.
	There are no gender differences in terms of the risk of revision.
	Women run an increased risk of contralateral ACL reconstruction.
Surgical factors	More than 90% of all ACL reconstructions in Sweden and more than 80% in Denmark are performed with hamstring grafts. In Norway, the majority of ACL reconstructions in 2018 were performed with patellar grafts.
	Hamstring tendon grafts are associated with slightly better knee function in the short term compared with patellar grafts.
	Hamstring tendon grafts are associated with slightly better knee function in the short term compared with patellar grafts.
	The risk of revision is reduced by 14% for every 0.5 mm increase in diameter in conjunction with a hamstring tendon graft.
Injury factors	Associated knee injuries produce poorer patient-reported knee function.
	Associated cartilage injuries are associated with a lower risk of revision.

Limitations

The three most commonly used outcome measurements in the Scandinavian knee ligament registries have been: 1) revision, 2) quality of life (EQ-5D) and 3) patient-reported knee function (KOOS). Even though revision is a definitive outcome measurement, there are limitations in the validity of the outcome, as not all patients who re-injure their ACL choose a revision. The percentage of patients who choose not to have a revision is as yet unknown at national level. For several years, the KOOS outcome measurement has been the subject of discussion, as it is not specific to patients with an ACL injury. A publication by Ingelsrud et al. from 2016 reported that the minimal important change, MIC, that is regarded as important for the patient on the subscale of function in sport and motion on the KOOS is 12.1, while it is 18.3 points for quality of life. A review of all the published results from the registries makes it clear that changes in patient-reported knee function rarely exceeded the MIC, which is worrying. As a result, the way the KOOS can be improved is currently being evaluated by determining which questions on the KOOS subscales are most relevant to patients with an ACL injury. It is hoped that it will be possible for the data that have already been collected from several hundred thousand follow-ups over 10 years to be safeguarded and re-analyzed. We shall also be deciding whether the patient-reported outcome measurements from the Scandinavian knee ligament registries need to be replaced by a more responsive, specific outcome. The interesting point when it comes to this question is that an improvement in knee function that exceeds the MIC has been reported in patients who receive high-quality rehabilitation. At the present time, the quality of rehabilitation is not reported to the registries and this has initiated a program to set up a physical therapy section in the registries in the future.

Three proposals for the future for the Scandinavian knee ligament registries

1. Actively recruit patients who are treated non-surgically following an ACL injury: ten years ago, Granan et al. reported that as many as 50% of patients who sustained an ACL injury were treated non-surgically. In spite of this, there is only one study of patients from the Swedish registry who have undergone non-surgical treatment. In this cross-sectional analysis, patients who were treated non-surgically reported poorer KOOS scores on virtually all the subscales at follow-ups of up to five years. We need to learn more about what characterizes these patients, whether they achieve acceptable function and reasonable clinical results and, first and foremost, whether there is a selection bias for the patients who are treated either surgically or non-surgically.

2. Conduct randomized, controlled studies (RCTs) in the registries: registry RCTs are an innovative, promising method that can be performed using data from the Scandinavian knee ligament registries. This method is particularly suitable for studying the effect of treatment, as studies will be facilitated by the speedy recruitment of patients, the generation of generalizable results and the potential for conducting these studies at a low cost compared with conventional RCTs. At the same time, an update of the registries, comprising challenges to secure data quality and obtain consent from participating patients and hospitals/clinics, will be necessary. One example of a registry RCT in Sweden is the TASTE (Thrombus Aspiration under ST segment Elevation myocardial infarction) study, a large-scale registry-based RCT, which used the SWEDEHEART registry to study the effect of percutaneous coronary intervention alone compared with thrombectomy on 30-day mortality. As the registry contained existing information, data collection could be performed rapidly, no patient missed the follow-up and the cost of the study was approximately SEK 500 per patient.

3. International collaboration: international collaboration between knee ligament registries enables analyses of large cohorts and extremely generalizable results, together with the opportunity to study the effect on treatment in specific subgroups. To facilitate international collaboration, the data elements that will be reported in the registries will be standardized. The Scandinavian knee ligament registries are making good progress on all three development suggestions thanks to studies at both the planning and analysis stages. The success of the Scandinavian knee ligament registries has always been made possible by the contributing clinics which reliably report data to the registries, together with all the excellent collaboration between the registries. We shall continue to work as a team to overcome the challenges that lie ahead. Together we are stronger!

Discussion

The Swedish knee ligament registry 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 registry. The project with the highest priority aims to transform the knee ligament register from a surgery registry to a diagnosis registry. 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 knee ligament registry is collaborating with other orthopedic registries and with a number of other quality registries. The aim is to help in the development of simplified methods for the collection and feedback of data. The knee ligament registry'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 registry would like to thank all the participating clinics and users. Without your contributions, this kind of registry cannot survive.

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