

RIKSHÖFT



THE SWEDISH NATIONAL REGISTRY FOR HIP FRACTURES

ANNUAL REPORT 2020

Containing data from 2019 follow up

THE SWEDISH NATIONAL REGISTRY FOR HIP FRACTURES

ANNUAL REPORT 2020

Containing data from
2019, including 4 months
follow up

ISBN 978-91-88017-34-5

CONTENTS

<u>SUMMARY</u>	5
<u>NEWS</u>	6
<u>ANNUAL DATA</u>	7
Average age of hip fracture and sex ratio	7
Fracture types	8
Residence	11
<u>SURGICAL METHODS</u>	15
Walking ability before and 4 months after hip fracture	23
Waiting time to surgery	27
Length of stay at hospital	29
Pain 4 months after hip fracture	29
Mortality	31
Data per region	34
<u>DEVELOPMENTS IN SWEDEN</u>	37
Degree of linking and coverage	37
Quality of data and degree of reporting	38
Open data	42
Developments in relevant quality indicators and the registry's part in care	42
<u>CARE DEVELOPMENT AND RESEARC 2019/2020</u>	45
The Swedish Hip Fracture Register and National Patient Register were valuable for research on hip fractures: comparison of two registers	45
Identification of the high-risk hip fracture patients	
<u>PUBLICATIONS</u>	50
Peer reviewed articles	50

Reports	61
Book chapters	61
Doctoral thesis	63
THE CHAIRMEN OF RIKSHÖFT	64

SUMMARY

The number of older people in Sweden is increasing and with them the number of hip fractures. Since a few years back, RIKSHÖFT (the Swedish National Registry for Hip Fractures) have collaborated with the Swedish Osteoporosis Society to combat the challenge of osteoporosis and bone fractures – focusing particularly on hip fractures, which increases exponentially in patients who are 50 years and older. RIKSHÖFT was started in 1988 with the intent of following the lasting effects of medical and surgical treatment, nursing, rehabilitation and technological advancements on patients with hip fractures. Today, there are more than 300 000 patients registered in RIKSHÖFT. Patients with hip fractures need considerable rehabilitation efforts immediately after surgery and follow-up is necessary after patients have been discharged from the hospital. The registration method in RIKSHÖFT provides a particular kind of quality control, since we follow our patients from the moment the fracture occurs and four months afterwards. The strength of the RIKSHÖFT registry is the fact that it follows up on the patient's de facto function, which is provided by the patient or someone close to them already after four months. This makes the data reliable, since problems with functionality can more safely be connected to the hip fracture, compared to follow ups that are not made until a year later, which is the method employed by the Swedish Registry for Fractures, for example. Almost 30% of all patients with hip fracture have died a year later and during that time a lot of other things could have affected these older individuals.

RIKSHÖFT's data is sought after by regional councils, a number of Swedish authorities, WHO and international hip fracture registries for data comparisons. RIKSHÖFT participates in "Health in numbers" (www.vardenisiffror.com) with five indicators – time until surgery, time until return home, indoors walking ability, outdoors walking ability 4 months after a hip fracture and degree of pain relief after hip fracture.

Out of the quality indicators, many regional councils have chosen to focus on time from arrival at hospital until surgery. This indicator is a national target – 80 % of all patients with a hip fracture should be operated within 24 hours since this reduces care time and

the risk of complications. The hospitals that achieve this target of 80 % of all patients operated upon within 24 hours are: Eksjö 82 %, Jönköping/Ryhov 81 %, Kristianstad 85 %, Kungälv 84 %, Mora 84 %, Södertälje 82 %, Visby 83 % and Västervik 81 %. The average care time and to where patients are discharged differ greatly between hospitals. In this year's report we have decided to chiefly contrast 2019's numbers with those of 2015. It is also clear that surgical methods differ between participating hospitals. RIKSHÖFT now has direct transmission of journals to the register in a number of hospitals, a fact we are very happy for, since it lessens the burden on the staff. Our ambition is to start direct transfer in other regional councils in the coming year.

A sincere thank you to all departments that have contributed with valuable data. Together we influence the care of patients with hip fracture. All statistical data has been produced together with DataAnalys and Register Centrum, Skåne.

NEWS

The steering group of RIKSHÖFT remained the same in 2019, but during the spring of 2020 our patient representative Gunilla Gosman Hedström resigned. We thank her for all her valuable contributions throughout the years. The new patient representative is Anneli Norrman. The steering group has also been expanded to include Carl Mellner, orthopedic surgeon.

The COVID-19 pandemic has had far reaching consequences. In 2020 RIKSHÖFT participates in a nationwide study in Sweden concerning risk factors when contracting COVID-19 and resulting complications and death. A collaboration with the Scottish Hip Fracture Registry IMPACT study is also ongoing, including international multi-center studies, which COVID-19 positive hip fracture patients are a part of.

ANNUAL DATA

The number of Swedish hip fracture patients remain more or less the same. Hip fracture is the most common osteoporosis-related fracture that always demands surgery and hospital care. For the oldest patient, a hip fracture is a traumatic event that has negative effects on both function and daily life, and therefore on quality of life. Older people are more prone to suffering hip fractures as a consequence of age-related osteoporosis and an increasing tendency to fall.

Fractures in younger people are mostly because of severe trauma from traffic and bicycle accidents and fall from heights, while the most common reason for fractures in the older people is a fall from standing height or less. In the analyses in the yearly report patients from 50 years of age and upwards are included and those with a non-pathological fracture. Data for the younger patients (<50 years) are presented separately in some tables and in one abstract taken from a student work. For those who are interested, RIKSHÖFT can report data for younger people and for those with pathological fractures. In that case contact coordinator Lena Jönsson (www.rikshoft@skane.se)

AVERAGE AGE FOR HIP FRACTURE AND GENDER DISTRIBUTION

The gender distribution has changed since the year 2000, when it was 75% female and 25% male. In 2019 it was 66% female and 34% male, which is a marginal change from the year prior. The average age for hip fractures has continually increased. In 1988 it was 79 and is now 82. Almost half (43%) of the patients live alone when they fracture a hip. There is a small decrease in the number of people who live alone that suffer a hip fracture, which could be explained by the fact that the number of men has increased. The men are younger when they fracture their hips, with an average age of 80 years compared to women who are 83 years old. Only 33 % of men live alone, compared to 47 % of women.

TYPES OF HIP FRACTURE

Hip fractures are classified based on x-ray. Visualizations both in frontal and side planes are necessary. The two most common types are femoral neck fractures and trochanteric fractures. The number of femoral neck and trochanteric hip fractures are evenly distributed, they constitute one half each. The femoral neck fractures can be divided into displaced and undisplaced ones. The trochanteric hip fractures are divided into two-part fragment (stable) and multi-fragment (unstable). Below them one finds the subtrochanteric fractures. There are more complex classification systems, but they have shown themselves to be less reliable and with weak correlation between different assessments and assessors. The AO-classification that has been developed for the long bones can only with difficulty be applied on hip fractures. For example, the trochanteric fractures are divided into nine groups and the subtrochanteric into six groups [Blundell et al 1998].

The simple system for classification has shown itself to be very reliable in RIKSHÖFT and is used in most of the national hip fracture registries throughout the world. A validation of the fracture classification in RIKSHÖFT has now been done and the results are presented separately in this year's report (Anna Meyer). Since RIKSHÖFT started in 1988 the fracture pattern has remained largely unchanged. There is no biological reason why the pattern for hip fractures would change in such a short period of time, therefore the stability in the data shows that the classification is easy to use and reproduce. In this year's report the distribution is compared to the distribution from 5 years before and the group with age under 50 is shown separately.

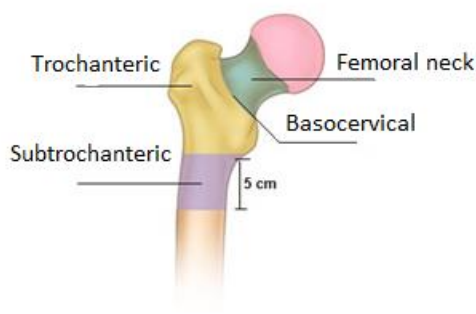


Fig. 1 Types of hip fracture, femoral neck, basocervical, trochanteric and subtrochanteric

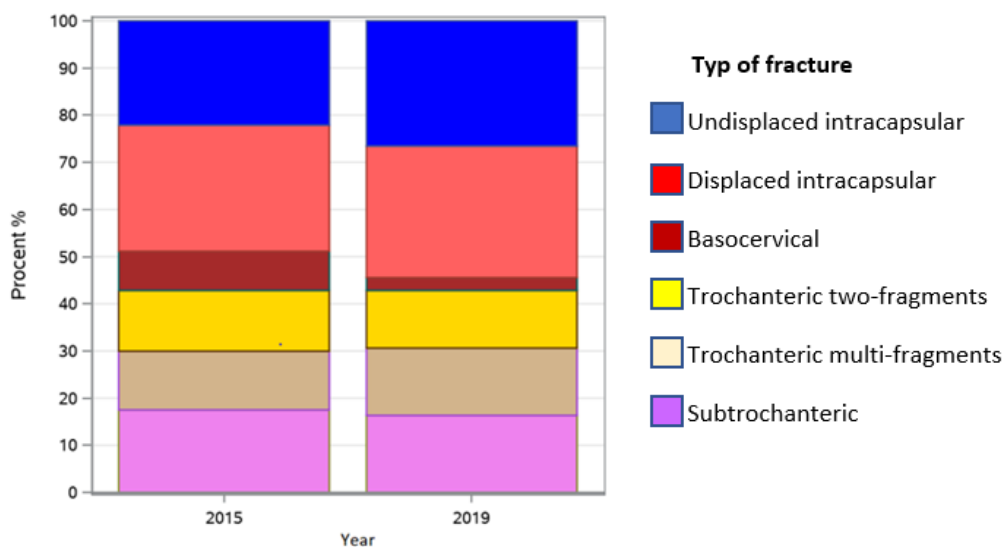
Types of fracture divided according to age groups, for people between 15-49 and for people 50 years and older, 2019 compared to 2015

The number of patients under 50 years with hip fracture is low (about 150-200 per year). Types of fractures in younger patients differ from those in older patients. The femoral neck fractures are more usual in patients under 50 and one also finds more undisplaced fractures (fig. 2)

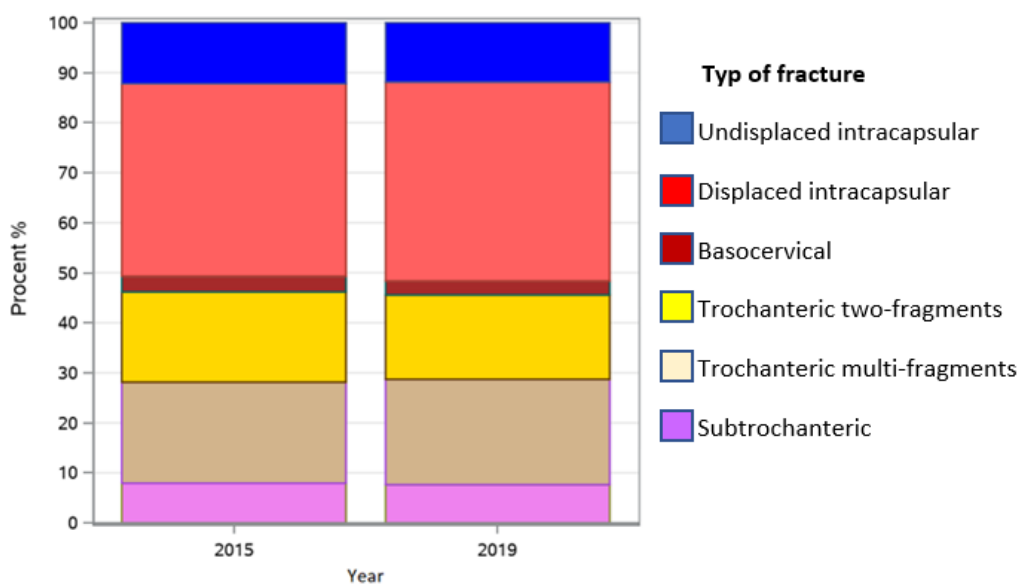
In 2019 (data from 2015 in brackets) there were 26,5% (22%) undisplaced femoral neck fractures (fracture type 1) registered in Sweden for patients between 15 and 49 years. Thus, the amount of undisplaced femoral neck fractures has increased since 2015 for the younger age group (fig 2). The number of displaced femoral neck fractures (fracture type 2) was 28% (27%), basocervical fractures (fracture type 3) 3% (8%), trochanteric two-part fragments (fracture type 4) 12% (13%), trochanteric multi-fragment (fracture type 5) 14% (12%) and subtrochanteric hip fractures (fracture type 6) 16% (17,5%).

For the older age group, 50 years and older, the share of undisplaced fractures was unchanged at about 12%, displaced 40% (38%). Trochanteric two-fragment fractures 17% (18%), multi-fragment fractures 21% (20%), subtrochanteric fractures unchanged at 8 % and the basocervical fractures are unchanged as well at about 3% (fig. 3).

RIKSHÖFT / TYPES OF FRACTURE TOTAL 15-49 YEARS / FIG. 2



RIKSHÖFT / TYPES OF FRACTURE TOTAL 50+ YEARS / FIG. 3

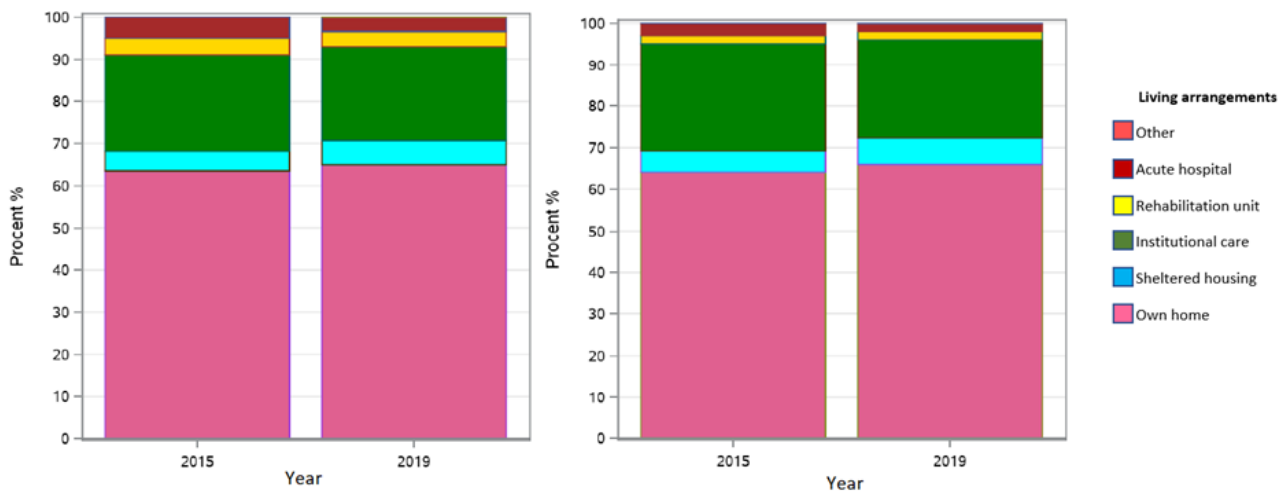


RESIDENCE

Place of living for the oldest (80+) before hip fracture, 2019 compared to 2015

The part of patients that live at home before a fracture has increased slightly since 2015. Male patients, older than 80 lived at home in 65% of cases before a fracture, compared with 64% in 2015 (fig. 4). For females the corresponding number was 66% in 2019 compared to 64% in 2015 (fig. 5).

RIKSHÖFT / PLACE OF LIVING BEFORE FRACTURE AGE GROUP 80+
 FOR MEN / FIG. 4 FOR WOMEN / FIG. 5

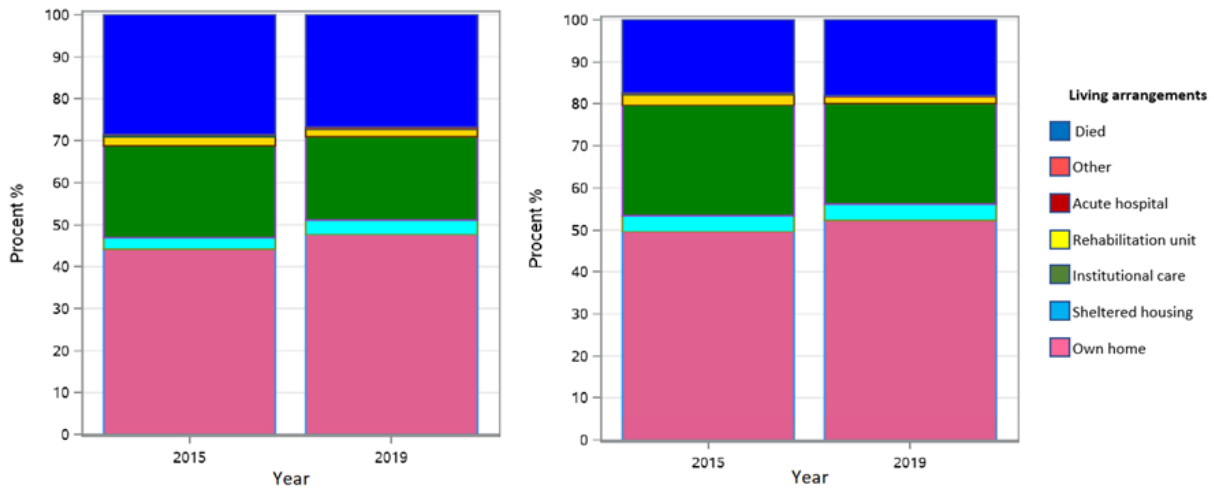


An increase in patients living at home 4 months after hip fracture compared to 5 years earlier

In 2019 48% of men lived at home 4 months after the fracture compared to 44% in 2015 (fig. 6). Corresponding number for the women was 52% in 2019 and 50% in 2015 (fig. 7).

RIKSHÖFT / PLACE OF LIVING 4M AFTER FRACTURE IN AGE GROUP 80+
 FOR MEN / FIG. 6

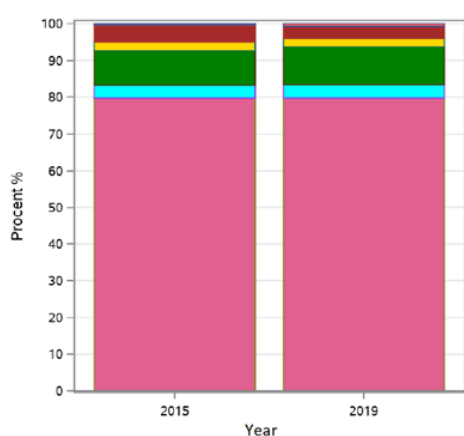
FOR WOMEN / FIG. 7



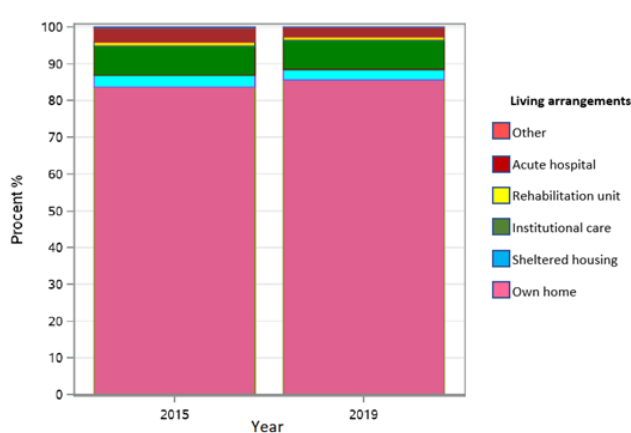
Residence for 50–79-year-olds before fracture

Women live at home to a larger degree, both before and after the hip fracture (fig. 9, 11). Male patients between 50 and 79 lived at home in 80% of the cases in 2019 and to the same extent in 2015, 80% (fig. 8). For female patients, the number was 86% in 2019, compared to 84% in 2015 (fig. 9).

RIKSHÖFT / LIVING ARRANGEMENTS BEFORE FRACTURE IN AGE GROUP 50-79
FOR MEN / FIG. 8



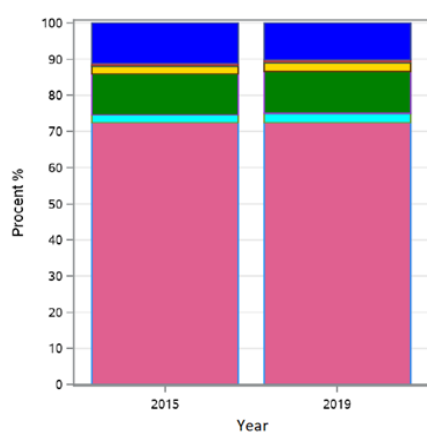
FOR WOMEN / FIG. 9



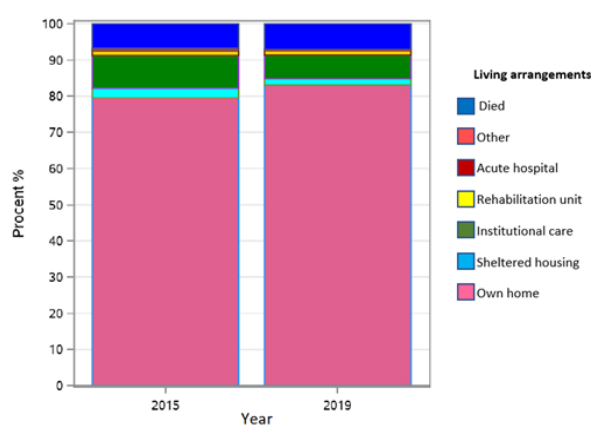
Residence 4 months after hip fracture, for the age group 50 to 79 years

The part of men who lived at home 4 months after a hip fracture was 73 % both in 2019 and in 2015 (fig. 10). For women the corresponding number was 83% in 2019 and 80% in 2015 (fig. 11).

RIKSHÖFT / LIVING ARRANGEMENTS 4M AFTER FRACTURE IN AGE GROUP 50-79
FOR MEN / FIG. 10



FOR WOMEN / FIG. 11

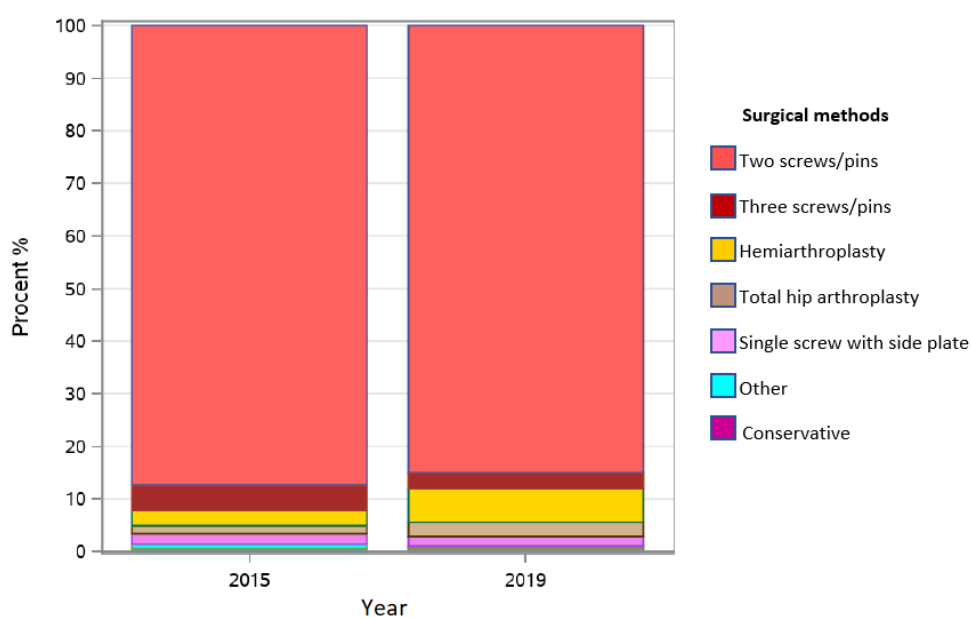


SURGICAL METHODS

Surgical methods differ throughout the country, and for each fracture type.

The undisplaced femoral neck fractures were, as expected, operated upon with two screws/pins (fig. 12)

RIKSHÖFT / SURGICAL METHODS FOR FRACTURE TYPE=1 IN AGE GROUP 50+ YEARS / FIG. 12

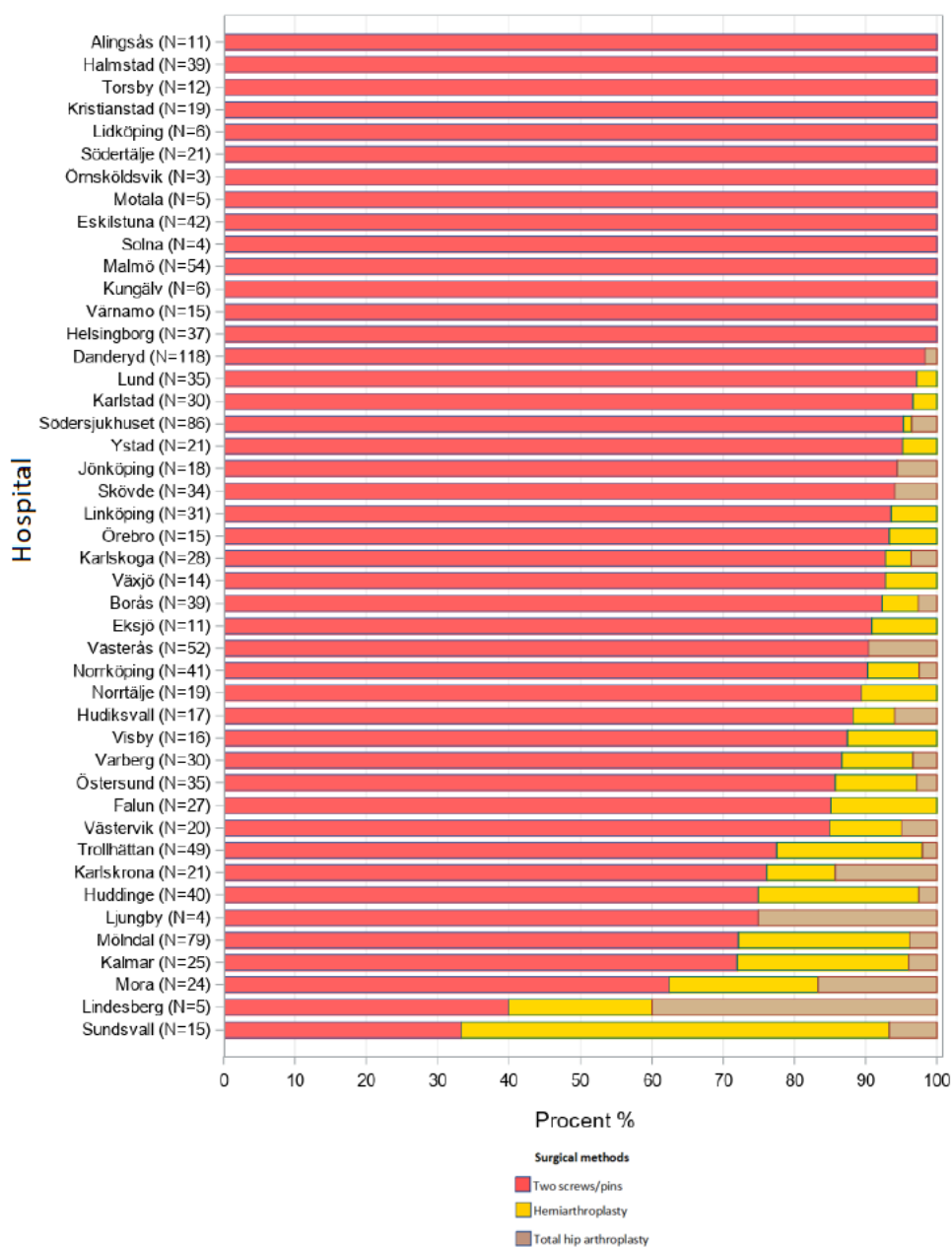


Undisplaced femoral neck fractures, age 65+

There are certain regional differences concerning choice of surgical method. Many hospitals choose two screws/pins in all surgeries on undisplaced femoral neck fractures, while others opt for hemiarthroplasties and in certain cases even total hip arthroplasty (fig. 13). Possibly, this can be explained with patient related factors, such as age and level of function and the surgeon's experience and preference.

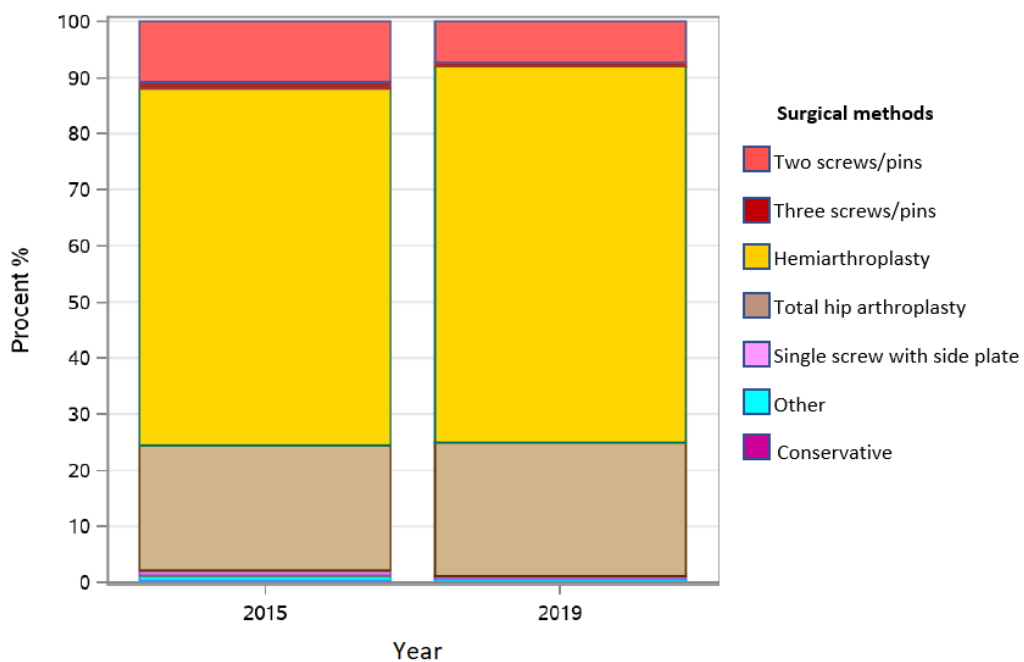
RIKSHÖFT / FRACTURE TYPE 1 AND SURGICAL METHOD 2,6,7 FOR 65+ YEARS

/ FIG. 13



The displaced femoral neck fractures were mostly operated with hemiarthroplasty or total hip arthroplasty. The share of surgeries with prosthesis increased slightly between 2015 and 2019 (fig. 14).

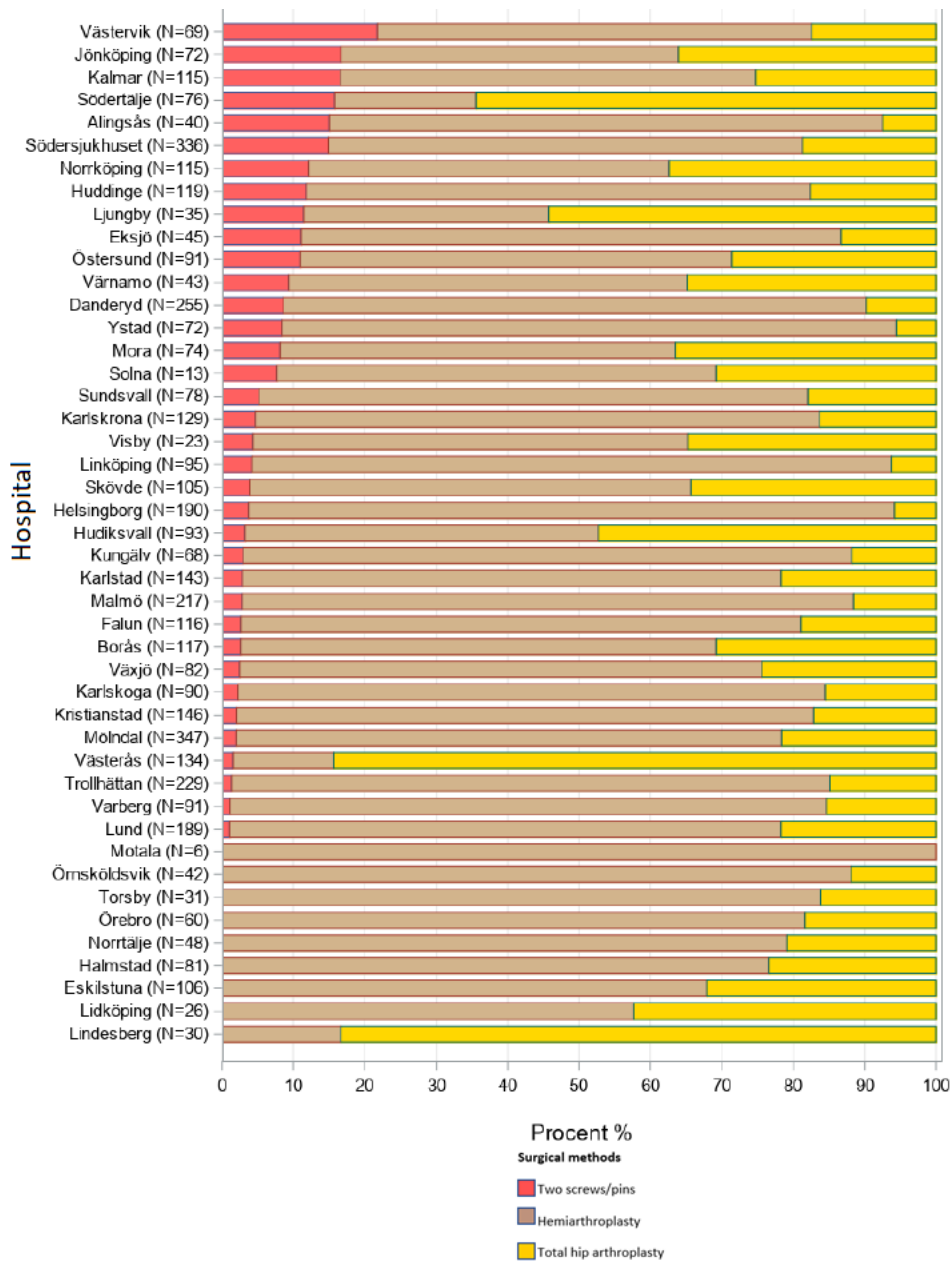
RIKSHÖFT / SURGICAL METHODS FOR FRACTURE TYPE 2 IN AGE GROUP 50+ YEARS / FIG. 14



Displaced femoral neck fractures, age 65+

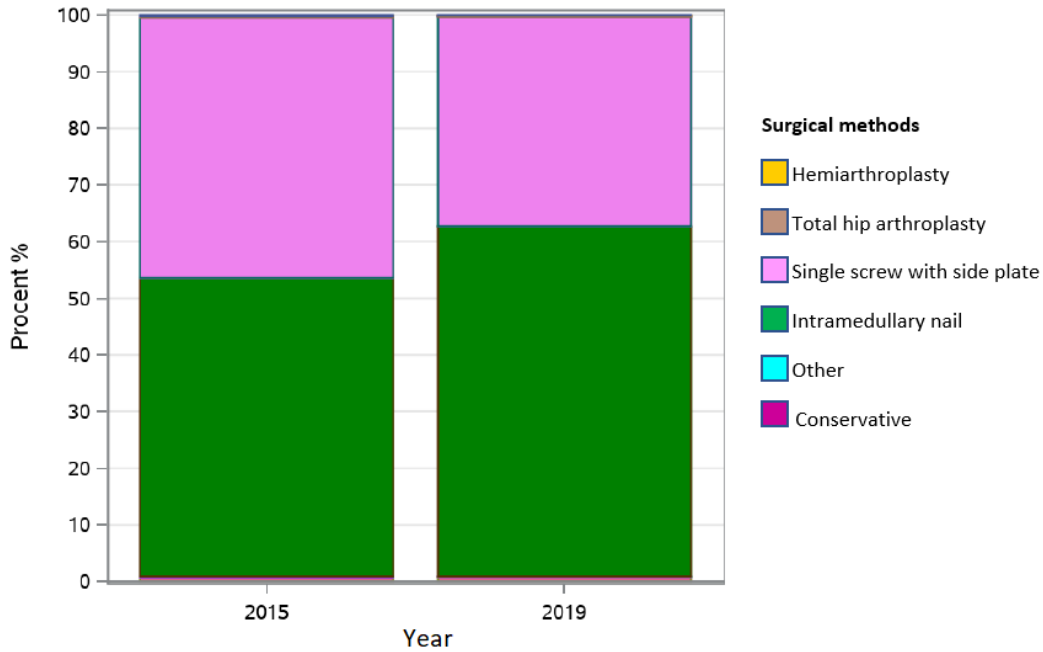
The choice of hemiarthroplasty or total hip arthroplasty differ between hospitals (fig. 15).

RIKSHÖFT / FRACTURE TYPE 2 AND SURGICAL METHOD 2,6,7 FOR 65+ YEARS / FIG. 15



The trochanteric fractures are today mostly fixated with intramedullary nails, rather than with screws and plate (>60%). The number of surgeries with intramedullary nails were higher in 2019 compared to 2015. Note that two-fragment fractures and multi-fragment fractures are both included here (fig. 16).

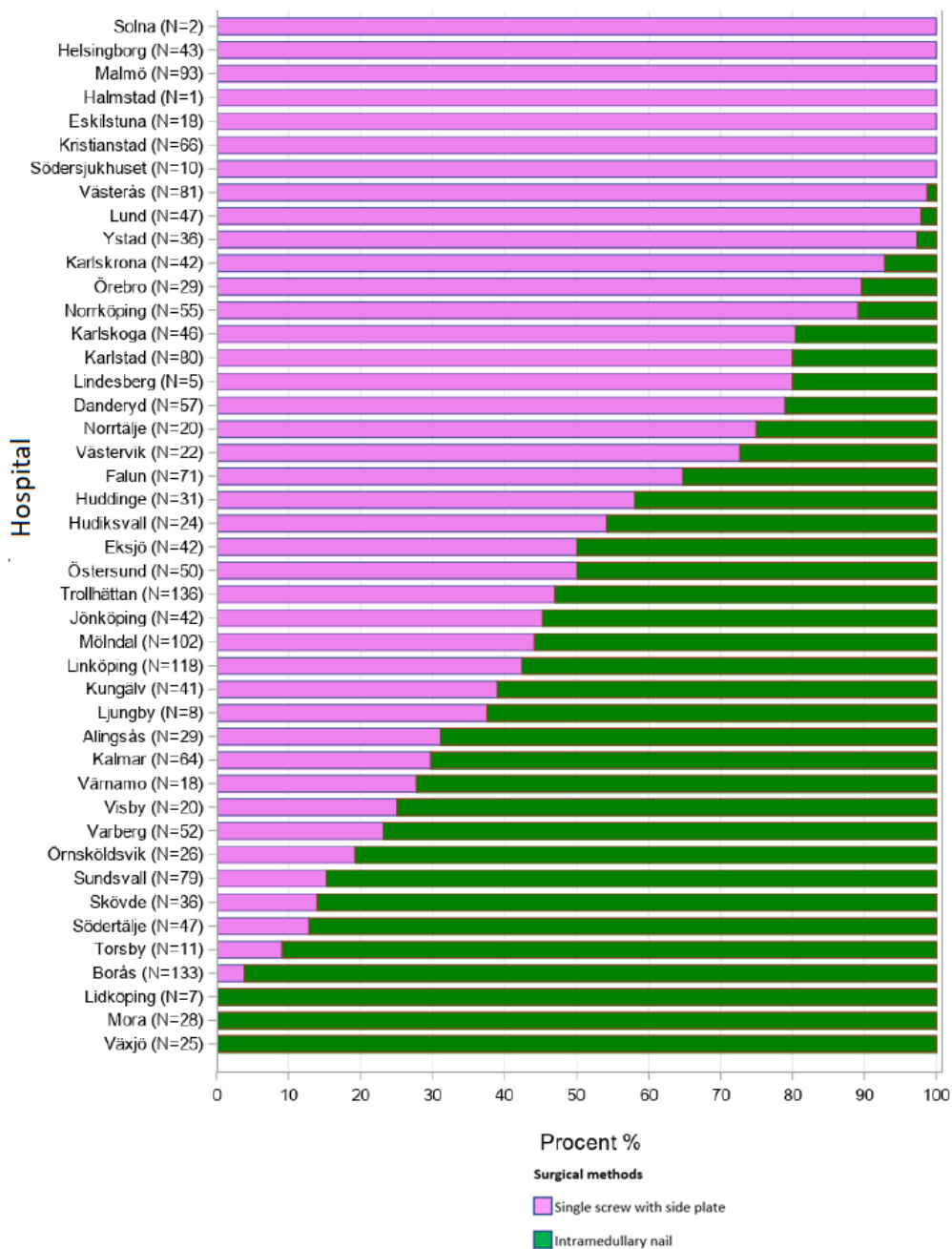
RIKSHÖFT / SURGICAL METHODS FOR FRACTURE TYPE 4&5 IN AGE GROUP 50+ YEARS/ FIG. 16

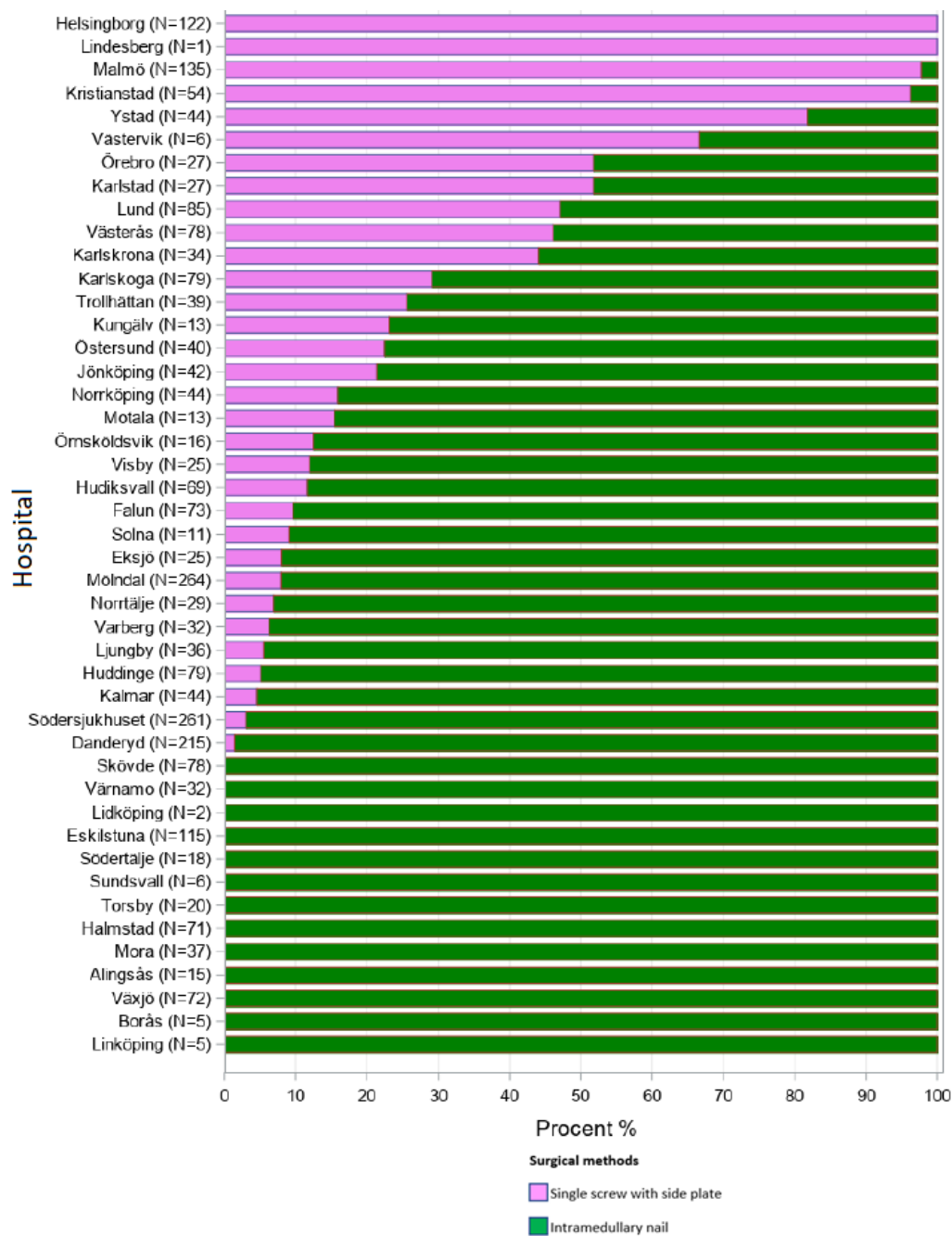


Trochanteric fractures, 65+ years

There are pronounced differences between hospitals here as well. Some hospitals use intramedullary nails as the type of internal fixation, on two-fragment fractures as well as on multi-fragment fractures (fig. 17, 18).

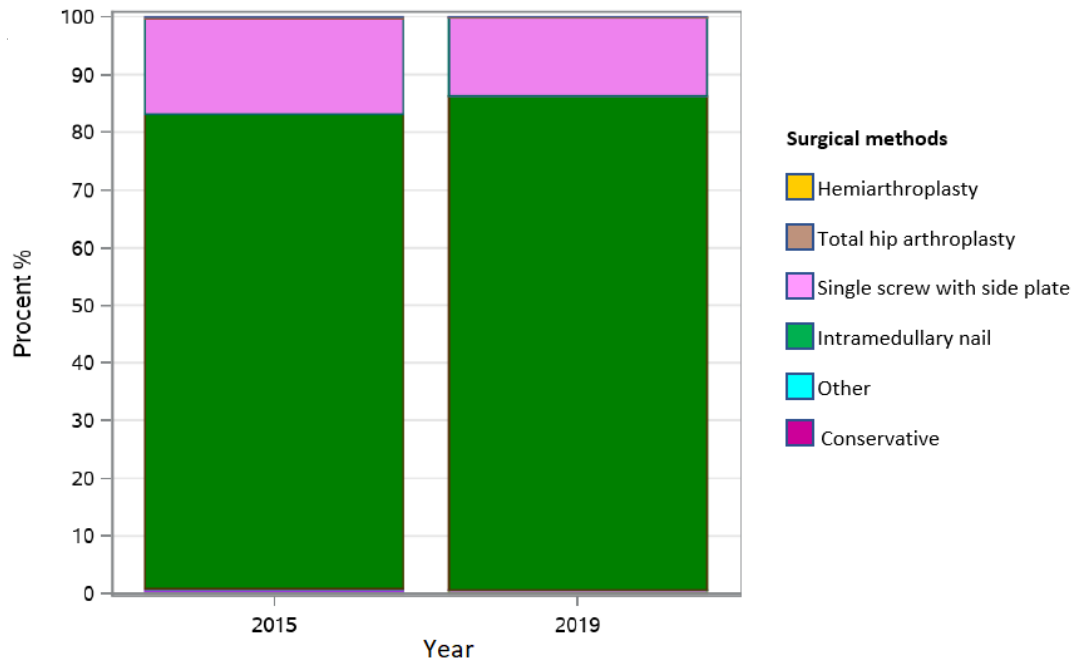
RIKSHÖFT / FRACTURE TYPE 4 AND SURGICAL METHOD 4,5 FOR 65+ YEARS / FIG. 17





The subtrochanteric fractures were almost always fixated with intramedullary nails, both in 2015 and in 2019 (fig. 19)

RIKSHÖFT / SURGICAL METHODS FOR FRACTURE TYPE 6 IN AGE GROUP 50+ YEARS

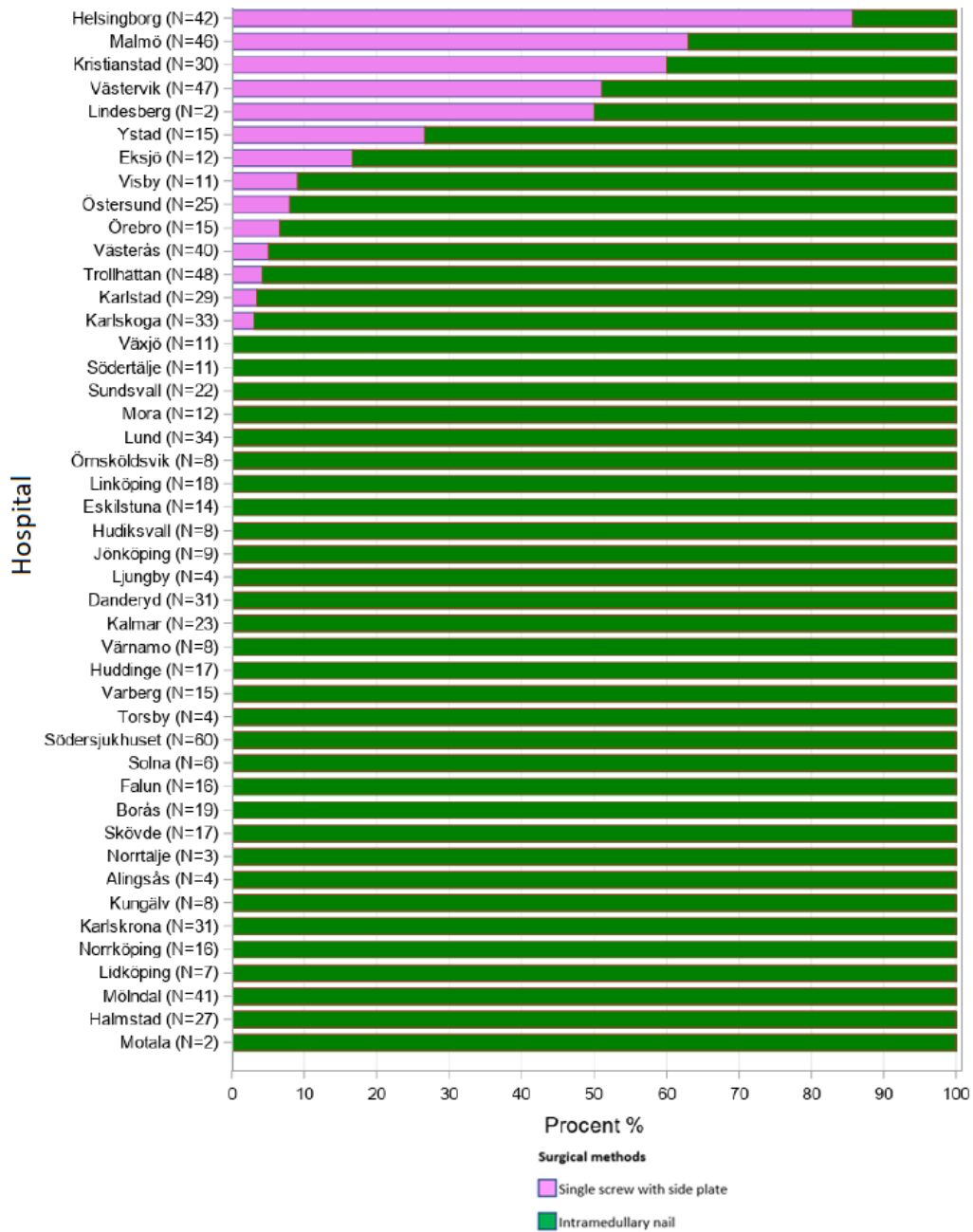


/ FIG. 19

Subtrochanteric fractures, 65+ years

But some hospitals still use internal fixation by plate in half of the cases (fig. 20).

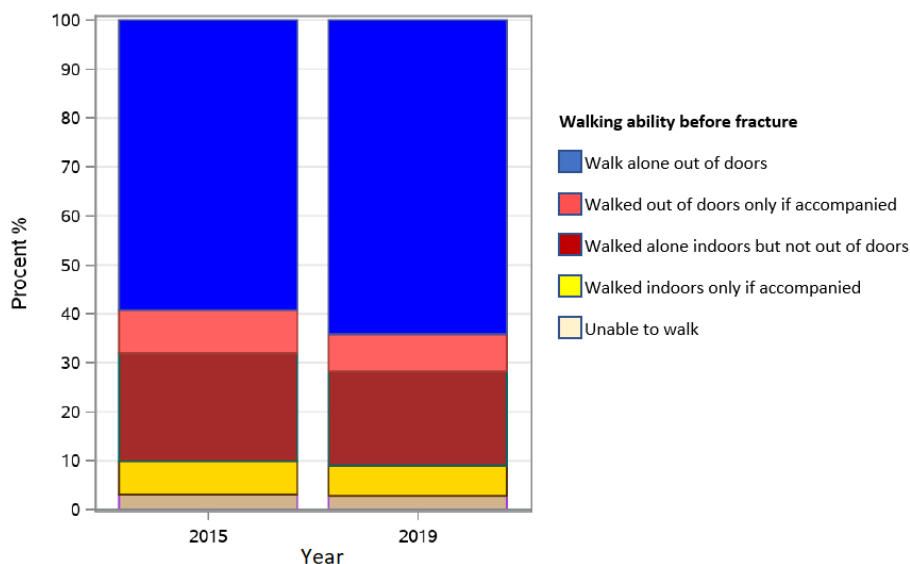
RIKSHÖFT / FRACTURE TYPE 6 AND SURGICAL METHOD 4,5 FOR 65+ YEARS / FIG. 20



WALKING ABILITY BEFORE AND 4 MONTHS AFTER HIP FRACTURE

The number of patients that could walk alone outside has increased from 59% in 2015 to 64% in 2019 (fig. 21).

RIKSHÖFT / WALKING ABILITY BEFORE FRACTURES BOTH SEXES / FIG. 21



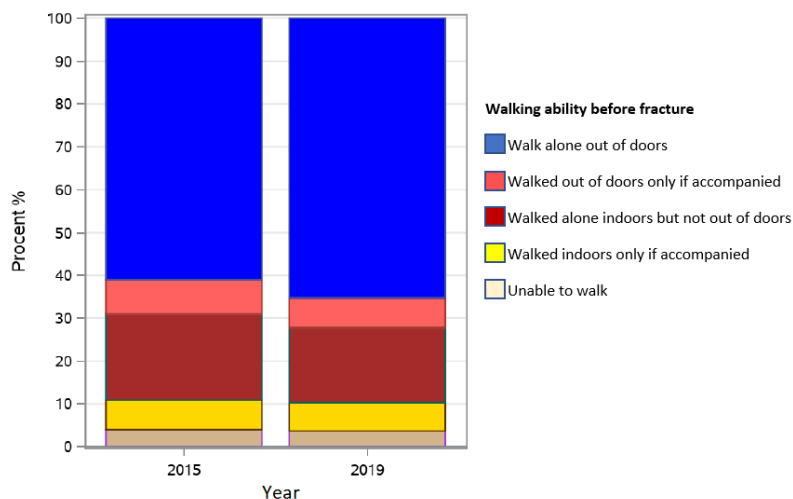
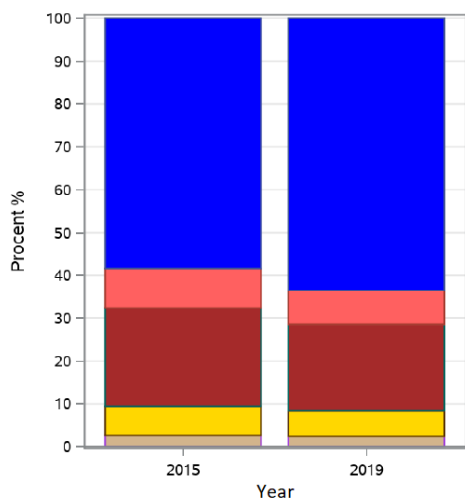
Walking ability before the fracture is shown separately for women and men below. A majority of patients could walk alone outside (fig. 22, 23).

Less than 10% were not able to walk at all, or only with living support, before the fracture.

RIKSHÖFT / WALKING ABILITY BEFORE FRACTURE

WOMEN / FIG. 22

MEN / FIG. 23

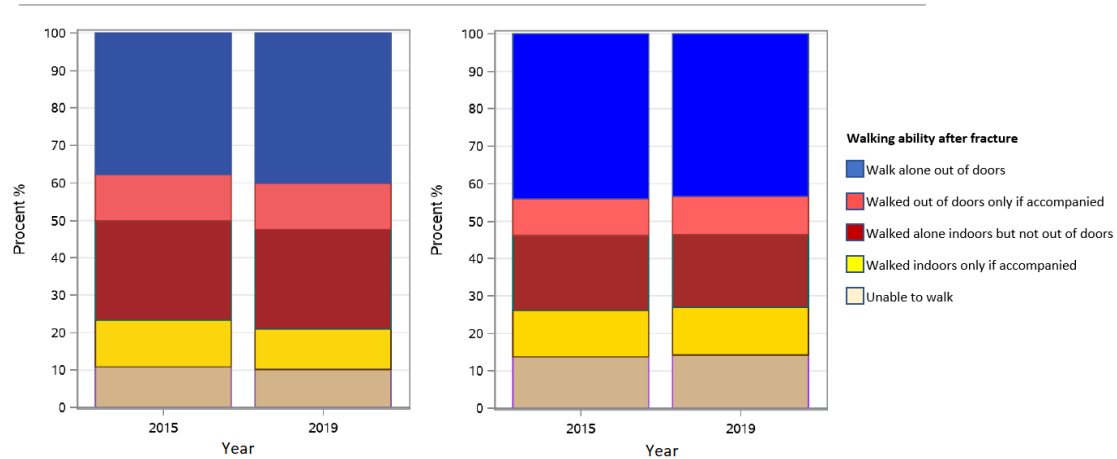


Four months after the fracture the number of people that weren't walking at all, or only with living support, had increased to 21% (women) and 27% (men). There was no large difference between 2019 and 2015 (fig. 24, 25).

RIKSHÖFT / WALKING ABILITY AFTER FRACTURE

WOMEN / FIG. 24

MEN / FIG. 25

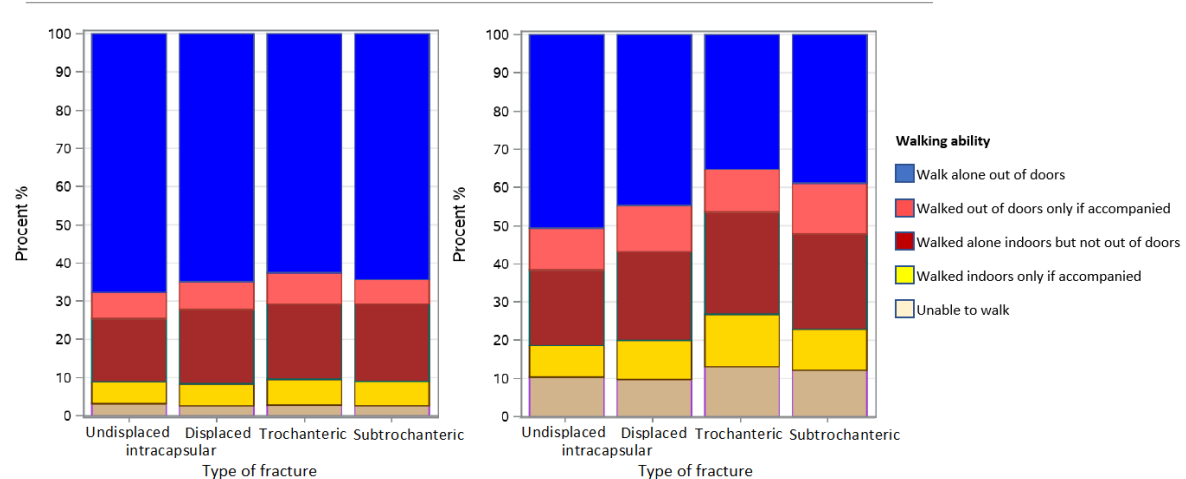


Walking ability in relation to fracture type is shown below, before and after fracture (fig. 26, 27). There are differences, but here we have not adjusted for patient traits such as age, gender and ASA classification, which show that people with an undisplaced femoral neck fracture had the best walking ability (walking by themselves outside).

RIKSHÖFT / WALKING ABILITY BEFORE AND AFTER FRACTURE PER FRACTURE TYPE

BEFORE / FIG. 26

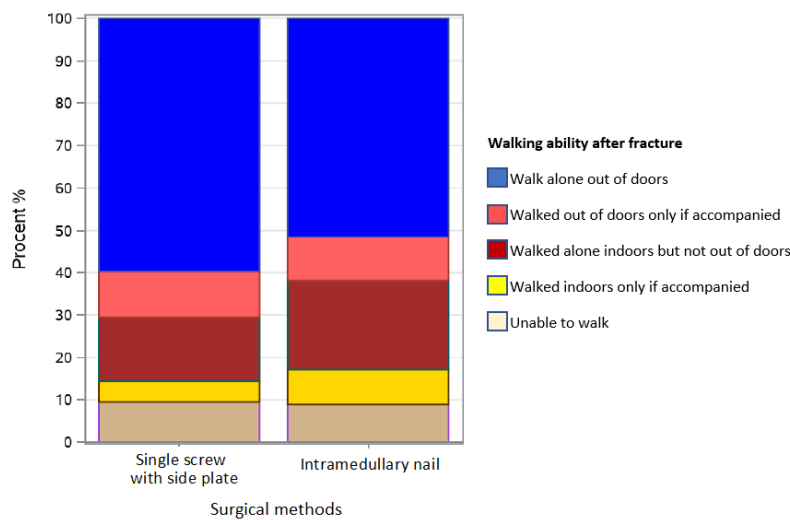
AFTER / FIG. 27



Comparison between people who have been operated upon with intramedullary nails compared to fixation by plate in response to a trochanteric fracture

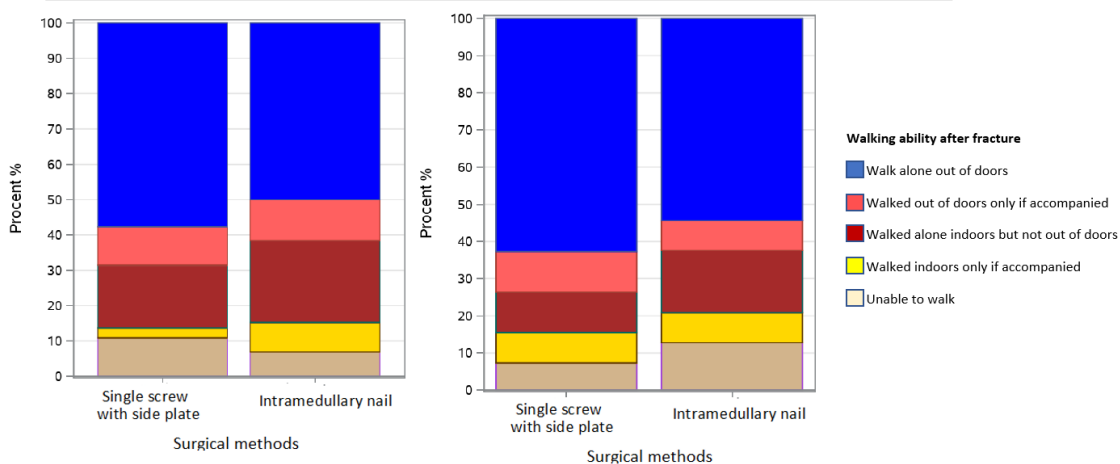
Patients between 50 and 79 years of age with trochanteric fractures (including two and multi-fragment fractures) and operated upon with fixation by plate could walk independently outside to a larger degree than the intramedullary nails' patients, 4 months after the fracture (fig. 28). Please note that this data is unadjusted in relation to degree of instability, age and ASA classification.

RIKSHÖFT / WALKING ABILITY AFTER 4&5 PER SURGICAL METHOD 4&5 FOR AGE GROUP 50-79 / FIG. 28



Walking ability was better after fixation by plate compared to intramedullary nails, for both men and women (fig. 29, 30).

RIKSHÖFT / WALKING ABILITY AFTER FRACTURE TYPE 4&5 PER SURGICAL METHOD 4&5 FOR AGE GROUP 50-79 WOMEN / FIG. 29 MEN / FIG. 30



In the age group >80 years the number of patients that could walk by themselves outside decreased by a fourth after a trochanteric fracture (fig. 31).

RIKSHÖFT / WALKING ABILITY AFTER 4&5 PER SURGICAL METHOD 4&5 FOR AGE GROUP 80+ / FIG. 31

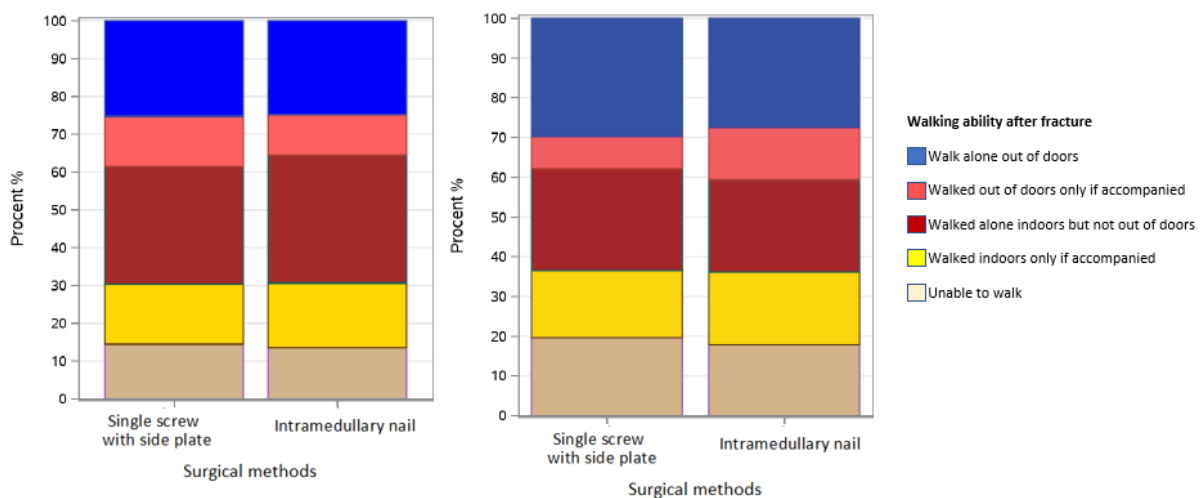


The number of men that completely lost the ability to walk after a trochanteric fracture was higher, about 20% compared to the women’s roughly 15% (fig. 32, 33).

RIKSHÖFT / WALKING ABILITY AFTER 4&5 PER SURGICAL METHOD 4&5 FOR AGE GROUP 80+

WOMEN / FIG. 32

MEN / FIG. 33



WAITING TIME TO SURGERY

In 2019 66% of patients went to surgery within 24 hours, which is unchanged compared to 2018. However, this is still a smaller part than recommended, given the increasing risk of complications – such as pressure ulcers, urinary tract infection and confusion – if the wait for surgery drags on.

In 2018 the number that went to surgery within 36 hours was 84% compared to 86% in 2019.

The average waiting time from arrival at hospital to start of surgery was 23,5 hours in 2015, compared to 23,8 hours in 2018.

The calculation of the waiting time in RIKSHÖFT is based on the arrival time at hospital until the registered surgical time (start of surgery) from the surgery journal. Even though most hospitals have so called fast tracks for patients with hip fractures, a large number of patients still have to wait in emergency rooms before being x-rayed. To start measuring waiting time from the point of the x-ray therefore produces an inaccurate time in real terms, since it precludes the waiting time at the emergency room. In figure 34 and 35 we see the different hospitals average waiting time with confidence interval, in figure 34 for 2018 and in figure 35 for 2019. Average waiting time differs significantly between hospitals. In 2018 the hospitals that lay below 20 hours were Alingsås hospital, Gävle hospital, Hudiksvall hospital, Kristianstad hospital, Kungälv hospital, Ljungby hospital, Mora hospital, and Värnamo hospital, Västerviks hospital, Ystads hospital, Östersunds hospital. All of these hospitals maintained a waiting time below 20 hours in 2019.

Gävle hospital could not register because of lack of staffing, and their waiting time can therefore not be shown. Encouragingly, many new hospitals have reported waiting times below 20 hours in 2019. These are: Eksjö hospital, Jönköpings hospital Ryhov, Norrtälje hospital, Visby hospital och Örnsköldsviks hospital.

When making comparisons it is important to look at the “casemix” (the mix of different patients). For example, Karolinska Hospital in Solna has reported a waiting time of 27 hours in 2018 and 33,5 hours in 2019, which can probably be explained by a change in what kind of patients are operated upon at the clinic. Today the hospital only has highly specialized care

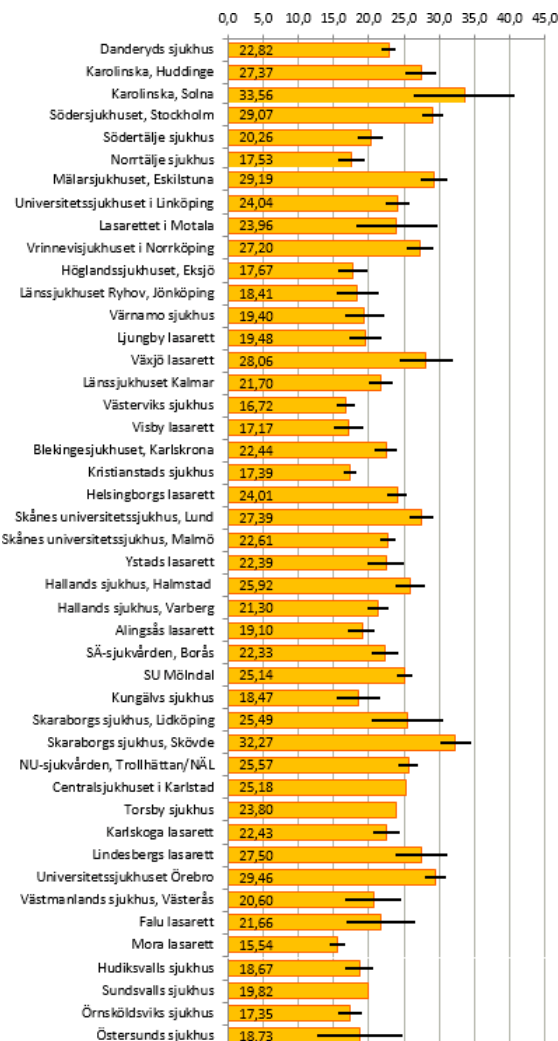
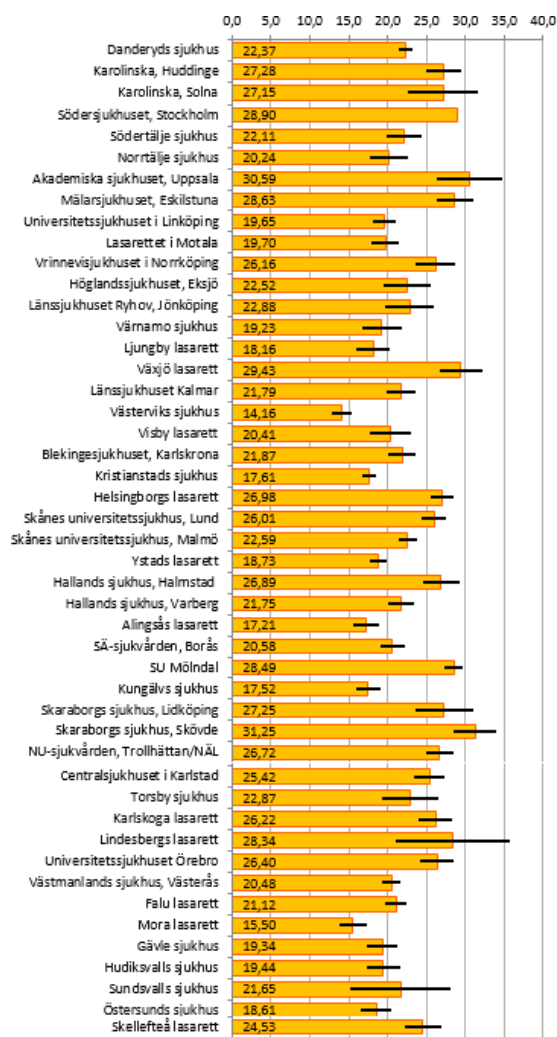


Fig.34 Above, the average wait time in 2018 is shown, from arrival at hospital to start of surgery, for every hospital.

Fig.35 Above, the average wait time in 2019 is shown, from arrival at hospital to start of surgery, for every hospital.

LENGTH OF HOSPITAL STAY

The average length of hospital stay continues to fall.

The average length of stay for a hip fracture has fallen continuously for several decades. At the end of the 1980s the average time was 19 days. Since 1996 the average care time has been about 10 days. In 2013 the average care time was 8,7 days and in 2017 it was 8,4 days, in 2018 7,5 days and in 2019 7,2 days, with a median time of 6 days for all hospitals in Sweden (Table 9, p. 41). The range lies between 4 to 12 days, to a large degree probably depending on the availability of after care or not. The average care time for each region is shown in Table 8 on page 40

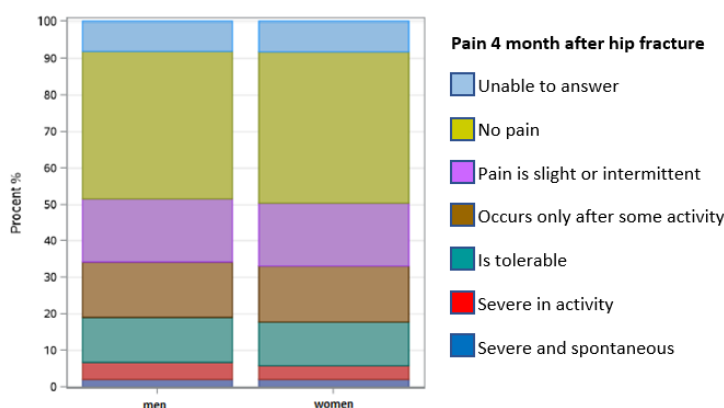
PAIN 4 MONTHS AFTER HIP FRACTURE

In last year's report data from the last 10 years had been added together to analyze the degree of pain from the hip joint after fracture. 71 008 patients were part of the analysis.

In this year's report pain after hip fracture is compared by gender and is shown on both a regional and hospital level.

About 40% (fig. 36) of patients were completely free of pain 4 months after hip surgery (for men 40% and women 41%) (fig. 36). Only 2% of patients experienced severe and constant pain, without any differences between the sexes. 4,6% of men experienced pain correlated to movement, 3,6% of women. 44% of both men and women experienced tolerable, light and activity specific correlated pain (about 8% could not answer the question).

RIKSHÖFT / PAIN 4M AFTER FRACTURE PER GENDER 2009-2018 / FIG. 36



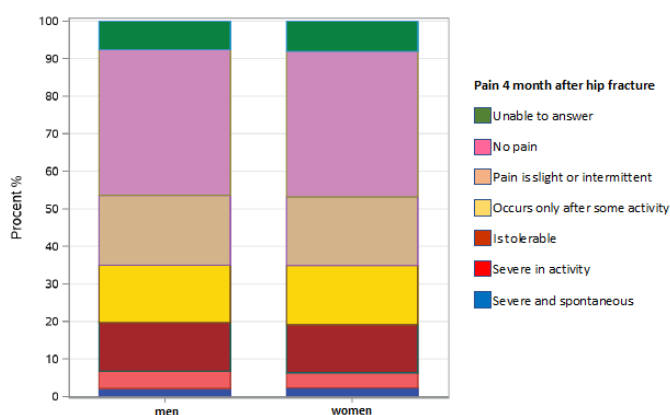
Pain on regional and hospital level is shown on page 42-50 (not in the English version).

Self-reported pain for men and women 4 months after surgery

Gender differences as regards to self-reported pain at 4 months cannot be shown (p 0.7). Data for 5 years has been added together (n=31 199) (fig. 37).

42% of all patients were completely free of pain 4 months after hip surgery, with the same number for both genders. Severe and constant pain was only experienced by 2,5% of women and 2,3% of men, severe pain in movement was experienced by 4,3% of women and 4,9% of men. 51% of the women and 50,5% of the men experienced tolerable, light and activity specific pain (fig. 37).

RIKSHÖFT / PAIN 4M AFTER FRACTURE PER GENDER 2015-2019 / FIG. 37



Difference in self-reported pain between younger and older patients

To study potential differences a division in age groups was made for the last 5 years (31 199 patients, fig. 38). It is clear that the younger patients report more pain than the older ones 4 months after hip fracture.

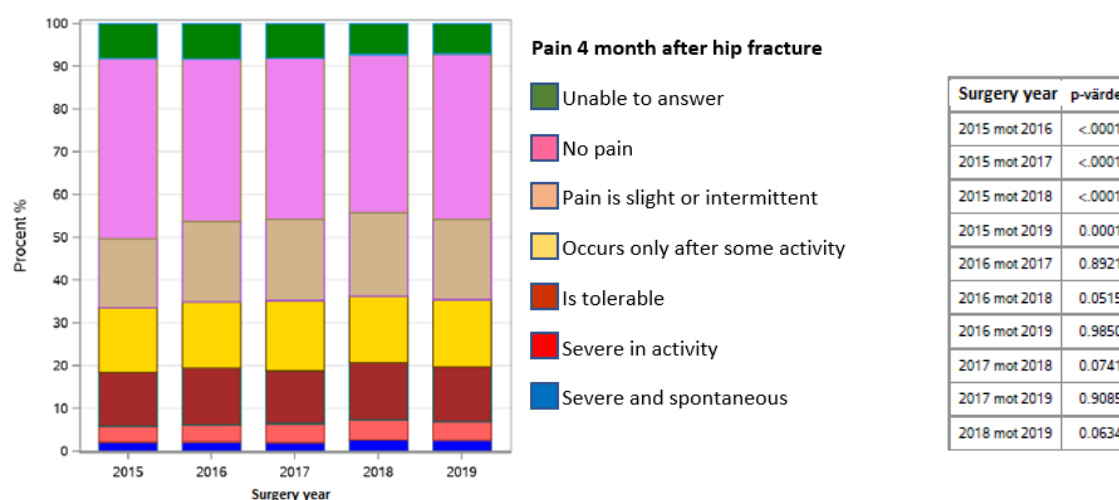
RIKSHÖFT / PAIN 4 MONTHS AFTER FRACTURE PER AGE GROUP 2015-2019 / FIG. 38



Pain over time, 2015–2019

The hypothesis was that the change/advancement of surgical methods would affect the post-surgery pain positively. But in 2015 patients had statistically significantly lower reported pain compared to the years 2016 to 2019 (fig. 39).

RIKSHÖFT / PAIN 4 MONTHS AFTER FRACTURE PER SURGERY YEAR / FIG. 39



MORTALITY

Gender differences

At the 4-month follow-up 15,1% of women had died and 20,2% of men.

Age differences

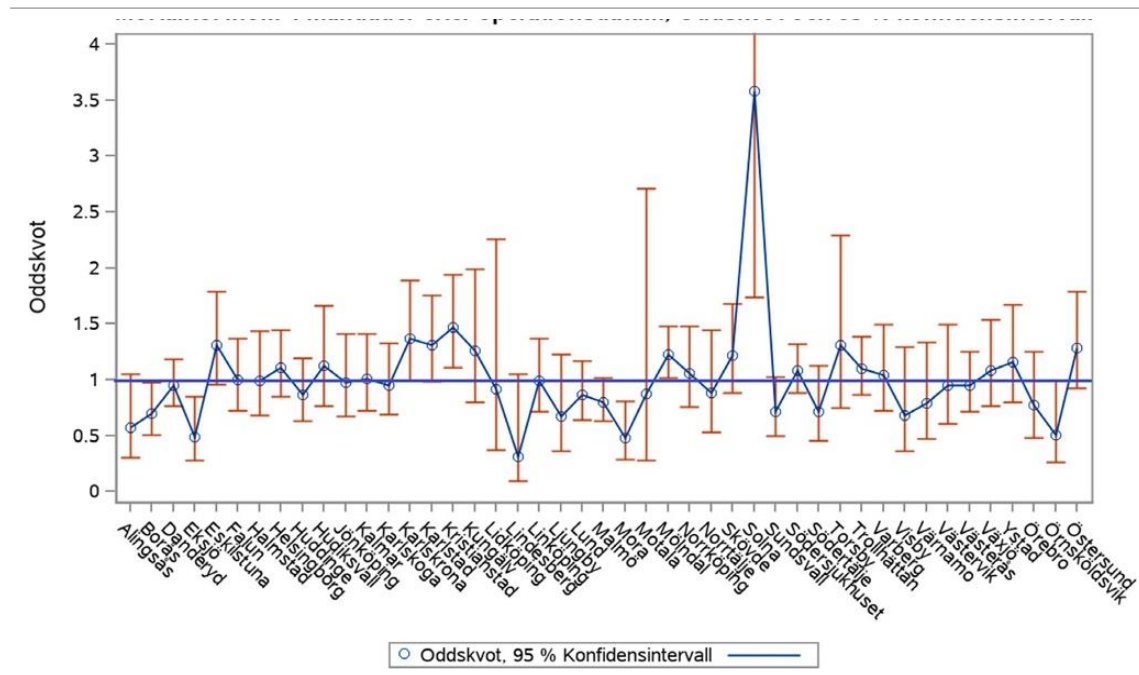
In the age group 0–59 years the mortality was 2,8%. In the age group 60-69 years 5,2%.

In the age group 70-79 years 9,1%. In the age group >80 years 22%.

Other diseases (ASA classification)

For those with ASA category 1 at surgery 1,7% had died 4 months later, for ASA category II 8%, ASA category III 19,8%, ASA category IV 40,6%, ASA category V 80%

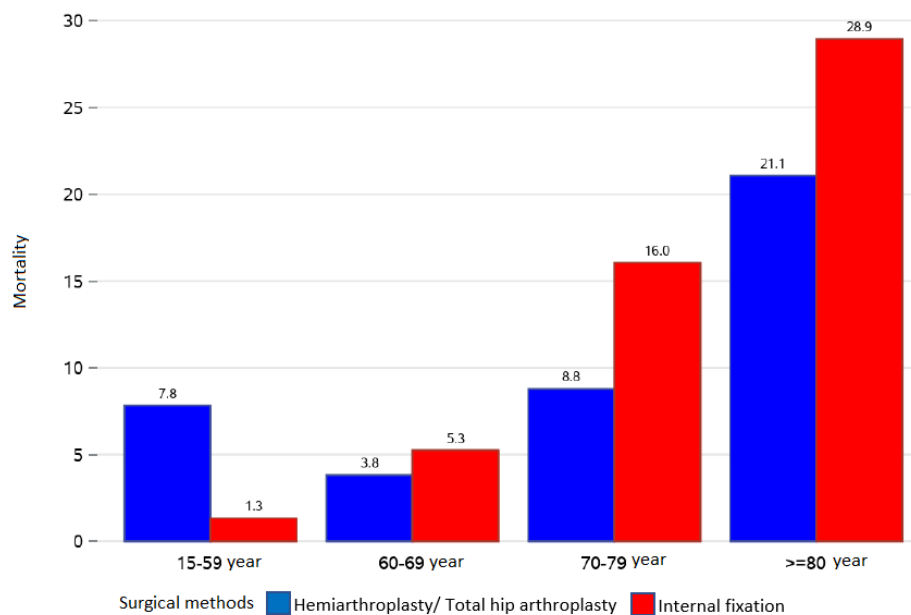
RIKSHÖFT / MORTALITY WITHIN 4 MONTHS OF SURGICAL DATE, ODDS RATIO AND 95% CONFIDENCE INTERVAL / FIG. 40



Above shows OR (CI) for mortality 4 months after surgery for a hip fracture. Some hospitals had a significantly different mortality rate (OR) compared to the others. The differences remained after adjustment for age, gender and ASA.

Mortality for patients with displaced femoral neck fracture and different surgical methods.

RIKSHÖFT / MORTALITY 4 M AFTER SURGERY PER AGE GROUP AND SURGICAL METHODS FOR THE FRACTURE GROUP DISPLACED FRACTURES / PERCENT DECEASED PATIENTS IN 1 YEAR / FIG. 41



When exclusively descriptive data is shown in the bar chart (fig. 41) a statistically significant difference in mortality can be seen between groups operated upon with different surgical methods.

When adjusted for age, sex, ASA and a diagnosis of dementia the differences between surgical methods disappeared.

DATA PER REGION

RIKSHÖFT'S national register of hip fracture patients has two aims: showing results compared to set targets, and comparing and creating high quality care throughout the country. Shown below (table 8) is an overview of number of patients registered with hip fractures, age, sex, living alone, waiting time to surgery (average) and return to original residence in different regions. Persons under 50 years of age and persons with a pathological fracture are excluded.

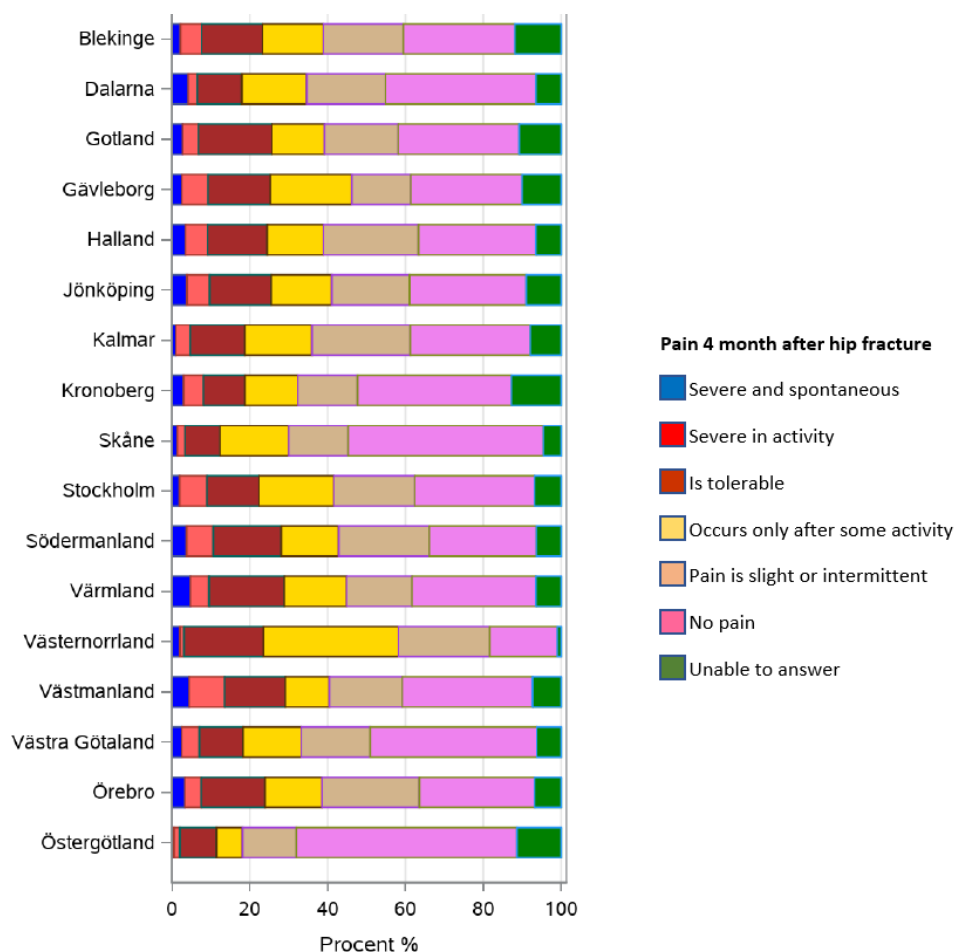
RIKSHÖFT / DATA PER REGION/ TABLE 8

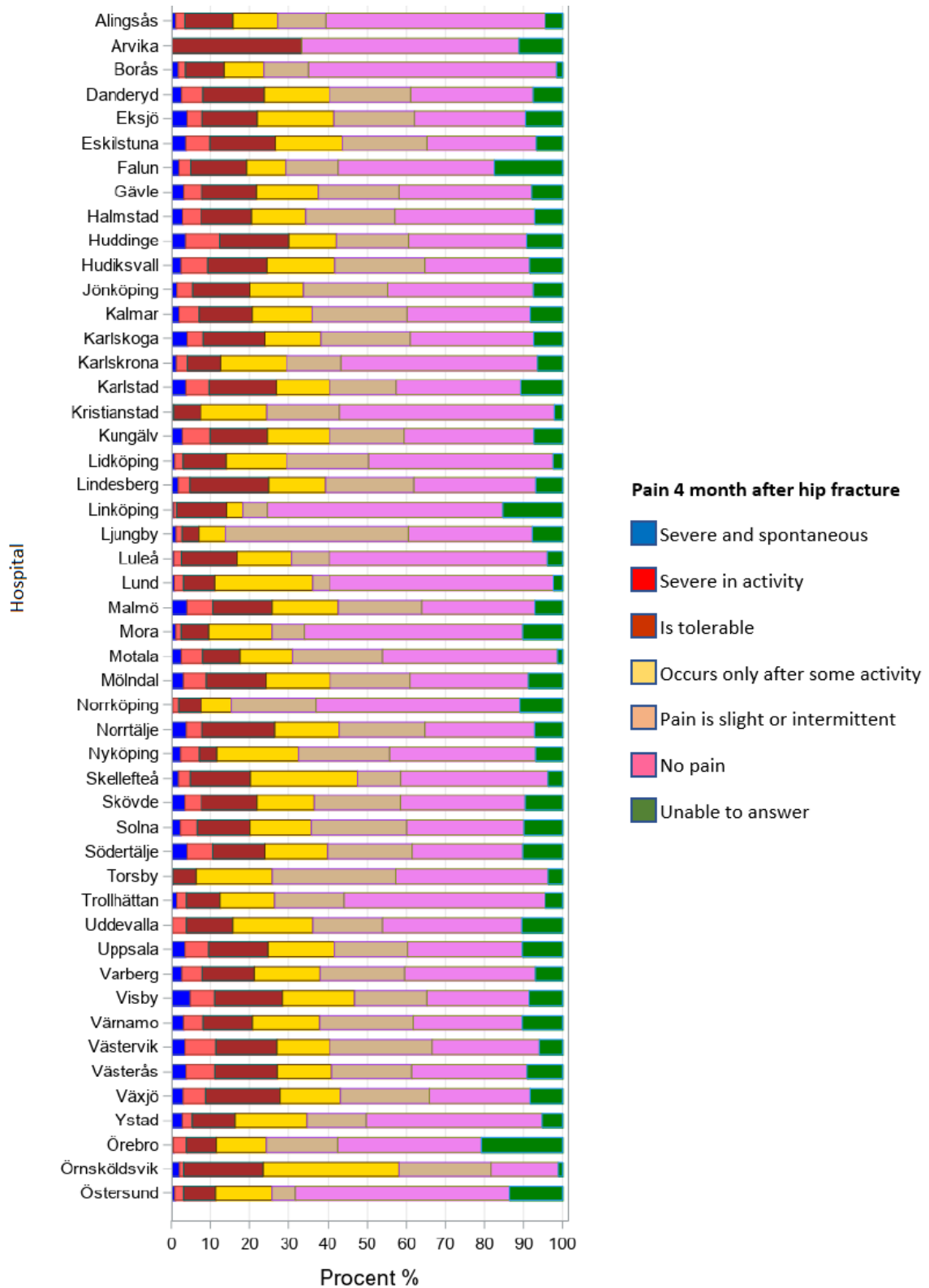
Regioner	Number	Mean Age	Women %	Living alone %	%Surgery <24h	%Surgery <36h	%Surgery <48h	Mean LOS	Return to original residence %
Blekinge	285	83	66	42	63	84	96	11	67
Dalarna	533	81	67	47	73	92	97	6	53
Gotland	105	82	73	40	83	94	99	7	66
Gävleborg	225	81	64	38	75	89	97	5	76
Halland	476	83	71	39	62	84	94	7	67
Jämtland	276	81	60	50	79	94	99	7	66
Jönköpings Län	504	82	66	42	79	92	97	6	69
Kalmar Län	474	82	65	41	73	94	98	7	69
Kronoberg	326	84	66	40	66	84	92	10	67
Skåne	2031	82	67	44	68	87	95	7	67
Stockholms Län	2242	81	65	43	67	85	93	5	30
Sörmland	324	82	65	41	49	77	90	6	59
Värmland	426	82	65	40	62	81	92	7	53
Västernorrland	367	82	69	45	71	95	98	7	68
Västra Götaland	2384	83	67	42	62	84	94	9	59
Västmanland	422	82	64	36	72	90	97	6	49
Örebro Län	522	81	66	44	58	82	94	7	57
Östergötland	626	82	66	42	56	80	92	8	64
In Sweden	12548	82	66	42	66	86	94	7	57

Pain 4 months after hip fracture, shown by region for the year 2019

In this year's report patient-reported pain is shown per region, in total 5971 patients have answered the question (fig. 42, and table 10-13). There are differences that can be explained by patient factors, for example the region's program for pain relief, but it can also depend on whether or not the 4 months follow-up has been done through phone interview or through a mailed questionnaire. In a phone interview it is emphasized that the question of pain is in regard to hip pain, which can be misunderstood if the patient is answering the questionnaire by themselves.

RIKSHÖFT / PAIN 4 MONTHS AFTER FRACTURE, AGE 50+ PER REGION / FIG. 42





DEVELOPMENTS IN SWEDEN

DEGREE OF LINKING AND COVERAGE

The structural changes in the Swedish health care system continues. Earlier mergers of units into cooperating entities have in some places been rescinded to be replaced by other organizational forms, such as hospital corporatization. Some of these have been dissolved as well and the hospitals start new collaborations. The emergency care is being centralized and concentrated in one of two collaborating hospitals, usually the larger one, with the smaller hospital performing surgeries on more select cases. For example, the central hospital in Karlstad performs surgeries on patients from other parts in Värmland on weekends, patients that otherwise would have ended up at Arvika and Torsby. These changes are now being implemented more and more, region by region. In the preceding 15-year period the number of hospitals that perform hip surgeries have therefore decreased from 90 to 53. In 2019, 45 hospitals were linked to RIKSHÖFT, the hospitals that were not part of the report this year were the hospitals in Gällivare, Gävle, Skellefteå, St Görans hospital, Sunderbyn, Umeå, Uppsala Akademiska hospital. One hospital in Sörmland, Nyköping, has not taken part due to lack of staffing, but plans to rejoin again in 2020.

In total, the number of hospitals that are linked to RIKSHÖFT in 2019 is still good, 85%. The National Board of Health and Welfare (NBHW) supplies us with information about how many patients have received the diagnosis hip fracture/year and have had surgery done, but NBHW only include one surgery per individual in their statistic. For 2019 NBHW states that there were 15 940 unique individuals, 15 years of age and older, that had surgery done. This number is our denominator when we calculate the degree of coverage. In RIKSHÖFT there are 12 900 individuals with emergency surgery primarily for hip fracture. When patients under the age of 50 and those with pathological fracture are removed, there remains 12 548 individuals.

One should be mindful that the degree of coverage can be wrong, since the data in the Swedish Patients Register (PAR) is based on individuals that have received surgery, which means that the patients that have received conservative treatment are excluded but are still included in RIKSHÖFT's registering. They numbered 52 in 2019. This is admittedly a small number, but NBHW's register also does not distinguish between the right and left side, which means that patients with fractures on both sides are registered as having a fracture on only one side. They amounted to 196 cases in 2019. This means that RIKSHÖFT has 248 registered individuals that are missing in NBHW's degree of coverage analyses. There is also the problem of a number of patients in PAR that lack a classification of the surgical procedure. Patients with temporary national identification numbers are also lacking in PAR, which explains why some hospitals have more patients in RIKSHÖFT than what is reported to PAR. Despite these shortcomings the NBHW's analyses of the degree of coverage show that RIKSHÖFT had a coverage of 83,2% in 2017, 80,7% in 2018 and 78,9% in 2019. In 2019 RIKSHÖFT's data was validated against the data from the patient register in NBHW. The result of that study is presented by Anna Meyer et al. of this year's report.

Because PAR currently cannot distinguish between reoperations and primary surgery, the reoperations in PAR have been registered as primary surgeries. This means there are more patients in PAR than in RIKSHÖFT. NBHW match at arrival date, which means that patients that fall while admitted at hospital for more than 4 days are not included in the matching.

QUALITY OF DATA AND DEGREE OF REPORTING

Since 2013 RIKSHÖFT has inbuilt logical controls in the program. This means that the registrar receives a warning when unusual combinations occur, such as fracture type vis a vis surgical method. This control of combinations was previously done manually. The person registering is now called on to make sure that the data being registered is correct. There is a built-in barrier against faulty national identification numbers, wrong

dates and unusual surgical methods for specific fracture types.

Further logical controls are under development. One is a warning that appears if the patient has achieved a higher degree of walking ability or uses less walking aids than before the surgery, since it is unusual for these older patients to achieve better walking function after surgery than they had before.

Time registrations are controlled to make sure they have a logical sequence. For example, surgery date cannot lie before arrival date at the hospital, waiting time for surgery also has built in logical barriers that warn against unrealistic time indications. Furthermore, random samples are conducted and comparisons between the register and patient's medical record are continually being made by our coordinator, with help from the registrars at the collaborating clinics. In the south part of Sweden, where direct transmission from the medical journal to the register has been implemented, the register is the master file, not the medical journal, since data in the register is quality assured by the registrars.

The degree of reporting in participating hospitals is high, the ones participating, register all of the obligatory questions in the primary surgery form and as concerns the 4 months follow-up, the degree of registering lies at about 60%. The method for registering in RIKSHÖFT is available at the register's homepage and is sent out by the coordinator to all new registrars, and the coordinator follows up on all newly joined clinics regularly.

In conjunction with our national annual meeting, we conduct a well-attended half-day workshop for registrars.

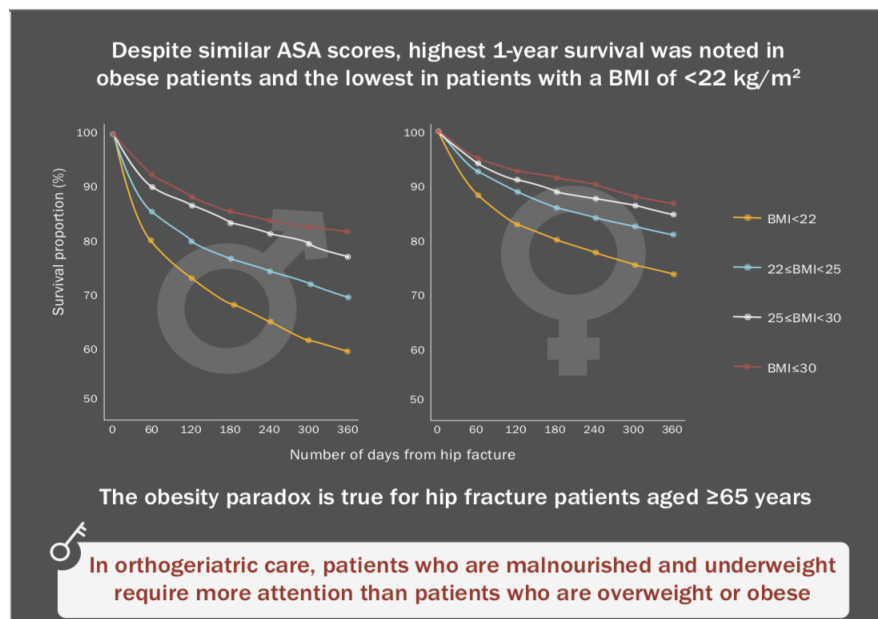
Overwhelmingly, the departments that collaborate with RIKSHÖFT register all variables. The five most important variables are shown below, with corresponding percentage for the past five years.

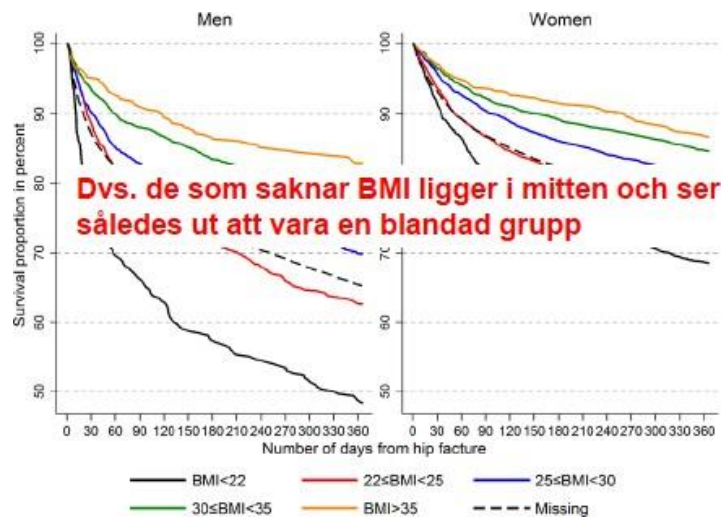
	2015	2016	2017	2018	2019
1 Time to surgery	100	100	100	100	100
2 Walking aids	97	98	97	97	98
3 Fracture type	100	100	100	100	100
4 Pre-fracture living	100	100	100	100	100
5 AS1 classification	96	98	100	100	100

In 2017 a dropout analysis was made on data from 2013-2016 for patients where BMI, which is an optional question, had not been registered. Data for BMI existed for 35% of patients, but the clinics that register BMI does so on almost everyone, while other cannot or don't have time to do it at all. The dropout analysis showed that when we coupled ASA classification to patients with and without BMI, there was no difference between the groups, not even for age. Mortality did not differ either between the groups where BMI existed or was missing, respectively.

The survival curves show that patients where BMI was missing does not deviate from those with registered BMI values.

In this study, with data from RIKSHÖFT, BMI was shown to be of importance for 1-year survival in patients with hip fractures over 65 years of age (Modig et al 2019, Fig below). Overweight and also obesitas were associated with increased survival.





OPEN DATA

Since 2005 all registering departments have been able to access different reports on their own clinic's data to compare with national data, a tool which is often used in clinical improvement work. RIKSHÖFT has since the start of *Öppna Jämförelser* (Open Comparisons), 2008, contributed with data. This is now accounted for in *Vården i Siffror* (Care in Numbers) published by the Association of County Councils in Sweden. The five measurements shown that are based on RIKSHÖFT's data are: Waiting time to surgery, walking inside without aids, walking outside after hip fracture, painlessness after hip fracture; return to original residence after hip fracture.

In 2017 open data accessibility was launched for patients, care givers, government agencies and the general public at the register's homepage under the tab Statistics, www.rikshoft.se. The parameters that are shown are part of patients operated within 24 hours, mean waiting time to surgery, length of hospital stay and return to original living arrangements at 4 months. This data can be sorted by hospital, region and sex.

DEVELOPMENT OF RELEVANT QUALITY INDICATORS AND THE REGISTERS CONTRIBUTION TO HEALTH CARE

Skeletal traction has ceased to be used

When RIKSHÖFT started in 1988 patients with hip fracture was a low priority group. Patients could spend hours at the emergency room before they came to a ward. Hip fracture patients were not prioritized for surgery and it was therefore not unusual with a waiting time to surgery for two or three days. A so-called skeletal traction was placed, which was believed to relieve pain. A randomized study in 1998 (nr 17 in the list of publications) presented evidence that skeletal traction was painful and only delayed surgery. Skeletal traction ceased to be utilized and is today only used when it is deemed necessary for the patient to wait several days for surgery.

Q-reg-99

RIKSHÖFT collaborated with five other clinics in Qreg-99, a project initiated by NBHW and the regional association of that time, with the aim of using national quality registers to improve care. Five hospitals participated: Huddinge, Örebro, Borås, Blekinge hospital and Lund University Hospital. The three variables chosen were: time to initial pain relief, waiting time to surgery from arrival to hospital and appearance of pressure ulcers. These quality indicators are still used in clinics and are presented in *Vården i siffror* (www.vardenisiffror.se), amongst others.

National guidelines

Board members in RIKSHÖFT have been active in the writing of National Guidelines. In 2003 the NBHW published guidelines that were later to be updated. This was done, but the new guidelines were deemed so established already they needed not be published anywhere else but on the Swedish Society for Orthopedics homepage. RIKSHÖFT's data is part of the SBU report (report number 7 in the list of publications) which was written by members of RIKSHÖFT's steering group, together with analysts from SBU. The report shows the need for working in inter-disciplinary teams to make sure that the care provided to patients with hip fracture is as good as possible. This is also described in two scientific articles (nr 73 and 93 in the list of publications).

There exists a national target that 80% of all patients with hip fracture should be operated upon within 24 hours of arrival at hospital. These guidelines are used by all registering departments in the country and can be followed up thanks to RIKSHÖFT's work with time registering, going back ten years. Patients with hip fractures are nowadays a prioritized patient group.

Registry for complications

RIKSHÖFT was the first quality registry that, beginning in 2001, put pressure ulcers as a complication in registering. In the Q-reg-99 project a questionnaire was added where reason for delayed surgery and registering of 15 different complications was implemented as a wider form of registering. The complications that are being registered (with yes/no) are pneumonia (that has necessitated antibiotics), acute heart failure, deep vein thrombosis, pulmonary embolism, superficial wound infection (that has necessitated antibiotics), deep wound infection (that has necessitated antibiotics), haematoma (need to be drained), urinary retention, urinary tract infection (UTI, confirmed by urine culture), acute kidney disease/insufficiency gastrointestinal bleeding, myocardial infarction, stroke and confusion.

Registering of BMI in RIKSHÖFT was implemented in 2013 and has led to several highly publicized articles where a connection between BMI and mortality has been found. The importance of nutritional status in patients with hip fractures is now well known and most departments have an increased focus on fast, nutritional status and nutritional additions.

Departments that register for RIKSHÖFT have the possibility of asking questions of their own, that only the specific department analyses. This is a well-liked tool and today there are 20 departments that use it. This tool makes it much easier for departments to initiate local quality projects. For example, some units use questions that they have taken out of the Q-reg-99 questionnaire (and as a consequence doesn't register the questionnaire). For example, the questions can focus on urinary tract infections and/or if the patient has a urinary catheter. Other departments use this tool to register which ward the patient is being treated in, to which local council the patient belongs or if the patient arrived via fast track or not.

CARE DEVELOPMENT AND RESEARCH 2019/2020

THE SWEDISH HIP FRACTURE REGISTER AND NATIONAL PATIENT REGISTER WERE VALUABLE FOR RESEARCH ON HIP FRACTURES: COMPARISON OF TWO REGISTERS

In a validation study published in *Journal of Clinical Epidemiology* (2020) we showed that both the Swedish National Patient Register (NPR) and RIKSHÖFT are valuable resources for large-scale hip fracture research. Although neither register constitutes a “gold standard” of assessing hip fractures, a comparison allowed us to examine several aspects related to their data quality and generalizability.

Background: Since hip fractures almost always require hospitalization, administrative inpatient registers such as the NPR can be used to monitor hip fracture incidence and mortality in a population. The sensitivity and validity of hip fracture diagnoses in such registers are generally considered high but recent data from Sweden is not available. Even though data quality may be high, administrative registers lack clinical information relevant for many research questions. RIKSHÖFT contains data about patients’ clinical characteristics, medical treatments, surgical procedures, and outcomes. However, registration in RIKSHÖFT is not mandatory, and it is not known whether patients who are registered in RIKSHÖFT differ from those who are not. It is hence unclear to which degree studies based on RIKSHÖFT may be generalizable to the entire hip fracture population in Sweden.

In administrative inpatient registers, distinguishing incident fractures from rehospitalizations for older hip fractures is challenging and requires specified strategies and algorithms. Researchers need to determine the diagnostic and surgical codes used as well as washout periods between two hospitalization

records. RIKSHÖFT, on the other hand, includes only incident fractures ascertained by physicians. A linkage of both registers provides an opportunity to compare strategies to measure incident fractures in the NPR.

Objectives: With this study we aimed to assess data quality and to compare patients with hip fracture in the Swedish NPR and RIKSHÖFT during 2008 to 2017. Specifically, we aimed to examine the following: (i) The coverage of hip fractures in RIKSHÖFT compared with the NPR; (ii) the agreement of fracture types and dates; (iii) the use of diagnostic codes to identify hip fractures in the NPR in comparison with RIKSHÖFT; (iv) the potential overcoverage when estimating recurrent fractures in the NPR; and (v) whether patients registered in RIKSHÖFT are representative of patients with hip fracture in the NPR.

Methods: This study is based on data from all men and women aged 60+ living in Sweden between 2008 and 2017. RIKSHÖFT, the NPR, and several other population registers containing data on covariates were linked. The proportion of matching records in RIKSHÖFT and the NPR was calculated in total, for different fracture types, and for first and recurrent fractures separately.

Hip fractures can be identified through primary diagnoses, secondary diagnoses, or surgical procedure codes in the NPR. To identify the optimal operationalization of incident hip fractures in the NPR, we compared three different definitions of hip fractures in the NPR to diagnoses in RIKSHÖFT. We further compared the coverage of RIKSHÖFT for first fractures and recurrent fractures to determine whether the NPR can be used to study the incidence of recurrent fractures.

Two patient records that occurred in both registers were considered a match if a patient had a primary hip fracture diagnosis (ICD-10: S720-2) with admission date in the NPR within ± 7 days of the date of arrival registered in RIKSHÖFT. The coverage of RIKSHÖFT was defined as the proportion of patients with hip fracture in the NPR with a matching record in RIKSHÖFT. The agreement between fracture types in RIKSHÖFT and the NPR was compared among patients with matching records.

Representativeness of RIKSHÖFT was estimated using regression models. Characteristics of patients registered in both databases were compared with characteristics of patients who were not registered in RIKSHÖFT using logistic regression. Survival was examined using Kaplan-Meier curves and Cox proportional hazard regression for the whole follow-up period, the first 30 and 365 days after hip fracture, and conditioning on survival during the first 7 and 365 days after sustaining a hip fracture.

Results: 140,724 patients with first hip fractures were identified in the NPR and 114,292 (81%) could be matched to a record in RIKSHÖFT. During the study period, the coverage of RIKSHÖFT increased from 63% in 2008 to 90% in 2014 and since declined to 81% in 2017. Additional analyses showed that the recent decline in coverage can be attributed to 5 hospitals that ceased to cooperate with RIKSHÖFT since 2014. Coverage was similar for patients with diagnoses of intracapsular and pertrochanteric fractures but somewhat lower for patients with subtrochanteric fractures. The proportion of matches in RIKSHÖFT was considerably lower for recurrent fractures. Assuming that the probability of registration in RIKSHÖFT is equal for first and recurrent fractures, these results indicate an over coverage of recurrent hip fractures of 13% in the NPR. The proportion of patients in RIKSHÖFT with a matching record in the NPR was 96%. Taking secondary diagnosis codes into account increased this proportion to 98%. Interestingly, only two-thirds of all patients additionally had a procedure code for hip fracture surgery registered in the NPR.

The agreement between fracture dates and types in both registers was excellent. 89% of hip fractures included in both registers occurred on the same day and <1% occurred more than 7 days apart. In both databases, more than 50% of fractures were classified as intracapsular, and almost 40% as pertrochanteric. Agreement was somewhat worse for subtrochanteric fractures; approximately one-fifth of subtrochanteric fractures in RIKSHÖFT were classified as pertrochanteric in the NPR.

Patients included in RIKSHÖFT were similar to patients recorded in both registers with respect to education, birth country, and the comorbidity level. However, they were more likely to be older, treated in larger hospitals, living at home as compared to nursing homes, and survived longer after sustaining their

hip fracture. Most notably, patients dying within 1 day of their hip fracture had 79% reduced odds to be registered in RIKSHÖFT. Furthermore, patients with subtrochanteric fractures were 23% less likely to be registered in RIKSHÖFT than patients with other hip fractures.

Patients registered in RIKSHÖFT had a better short-term survival than patients who were not, both in crude and adjusted regression models. During the first 30 days, patients in RIKSHÖFT experienced a 30% lower mortality risk than patients with a record in the NPR only. Nevertheless, long-term survival chances were similar.

Interpretation and implications: The high agreement between both registers overall suggests overall good data quality. Nevertheless, both registers have some limitations that may be relevant depending on the research question under study. One specific drawback of the NPR is an overestimation of the incidence of recurrent fractures due to repeated hospitalizations for a previous hip fracture. The overestimation of the number of recurrent fractures in the NPR could be addressed by a correction factor, which can be estimated based on a comparison with RIKSHÖFT. Researchers aiming to identify recurrent fractures using the NPR only may take into account surgical procedure codes, but this strategy involves a considerably reduced sensitivity as one-third of patients with hip fracture lack procedure codes in the Swedish NPR. It should be noted, however, that recurrent fractures represent only a small proportion of all hip fractures.

Even if it is not complete, RIKSHÖFT covers the majority of hip fractures occurring in Sweden and may be valuable to address many research questions. We found that a substantial part of the noncoverage is attributable to non-participation among hospitals, and that smaller clinics are less likely to report patients to RIKSHÖFT, perhaps because of suboptimal clinical routines in hip fracture management. Such noncoverage on the hospital level is partly attributable to administrative decisions and arguably less likely to induce bias in certain epidemiological studies than a selection of individual patients.

Our results indicate that patients who are registered in RIKSHÖFT are not completely

representative for the whole hip fracture population in Sweden. Most notably, patients with poor prognosis, particularly those who die shortly after hospital admission, but also patients with high comorbidity level and patients who are admitted from other clinics, are less likely to be represented in RIKSHÖFT. This is important information for studies focusing on short-term survival after hip fracture, which may be overestimated when using data from RIKSHÖFT. However, absolute differences in coverage between patient groups are small. While the odds of being registered in RIKSHÖFT are drastically reduced for patients dying within 1 day of admission, this group comprises only 1% of patients.

Summary: RIKSHÖFT covers more than 80% of hip fractures in the NPR. Patients included in both registers are overall similar with regard to their education, birth country, comorbidity level, and long-term survival chances. However, some differences between included patients may be relevant for specific research questions. Researchers estimating short-term survival in particular should consider that RIKSHÖFT does not include some of the frailest patients who die shortly after their fracture.



Anna C. Meyer, PhD student

Margareta Hedström, PhD Ass Prof

Karin Modig, PhD Ass Prof

Karolinska Institutet

PUBLICATIONS

Peer reviewed articles, reports, book chapters, and doctoral thesis from or in collaboration with RIKSHÖFT

PEER REVIEWED ARTICLES

1. Borgqvist L, Nordell E, Lindelöw G, Wingstrand H, Thorngren K-G. Outcome after hip fracture in different health care districts. Rehabilitation of 837 consecutive patients in primary care 1986-88. *Scand J Prim Health Care* 1991; 9:244–25
2. Thorngren K-G. En ortopeds synpunkter på vårdköerna: Struktur-rationalisering ger effektivisering. *Läkartidningen* 1991; vol 88, nr 46:3892–3894. (Swedish)
3. Borgqvist L, Nilsson L T, Lindelöw G, Wiklund I, Thorngren K-G. Perceived health in hip fracture patients: a prospective follow-up of 100 patients. *Age and Ageing* 1992; 21:109-116.
4. Jalovaara P, Berglund-Rödén M, Wingstrand H, Thorngren K-G. Treatment of hip fracture in Finland and Sweden. Prospective comparison of 788 cases in three hospitals. *Acta Orthop Scand* 1992;63(5)531-535.
5. Jarnlo G-B, Thorngren K-G. Background factors to hip fractures. *Clin Orthop Rel Res* 1993; 287:41–49.
6. Nilsson LT, Strömqvist B, Lidgren L, Thorngren K-G. Deep infection following femoral neck fracture osteosynthesis. *Orthop Traumatol* 1993; 3:313–315.
7. Berglund-Rödén M, Swierstra B, Wingstrand H, Thorngren K-G. Prospective comparison of hip fracture treatment, 856 cases followed for 4 months in the Netherlands and Sweden. *Acta Orthop Scand*, 1994;65:287–294.
8. Fornander P, Thorngren K-G, Törnqvist H, Ahrengart L, Lindgren U. Swedish experience with the Gamma nail versus sliding hip screw in 209 randomised cases. *Int J Orthop Trauma* 1994; 4:118–122.
9. Swierstra B, Berglund-Rödén M, Wingstrand H, Thorngren K-G. Resultaten van Behandeling van Heuptfracturen in Nederland (Rotterdam) en Zweden (Sundsvall en Lund). *Ned Tijdschr Geneeskd* 1994; 238:1814–1818.
10. Thorngren K-G. Fractures in older persons. *Disability and Rehabilitation*, 1994;16:119-126.

11. Borgqvist L, Thorngren K-G. The financial cost of hip fractures. *Acta Orthop Belg* 1994; vol 60 Suppl 1:102-105.
12. Thorngren K-G, Berglund-Rödén M, Swierstra B, Wingstrand H. Functional and economic outcome after osteosynthesis or hemiarthroplasty for hip fracture – A prospective comparison. *American Academy of Orthopedic Surgeons* 1995.
13. Thorngren K-G. Fractures in the elderly. *Acta Orthop Scand (Suppl 266)* 1995; 66:208-210.
14. Thorngren K-G. Full treatment spectrum for hip fractures. Operation and rehabilitation. *Acta Orthop Scand* 1997;68(1):1-2.
15. Thorngren K-G. Standardisation of hip fracture audit in Europe. *J Bone Joint Surg* 1998;80-B, suppl 1:22.
16. Kitamura S, Hasegawa Y, Suzuki S, Ryuichiro S, Iwata H, Wingstrand H, Thorngren K-G. Functional Outcome after Hip Fracture in Japan. *Clin Orthop Rel Res* 1998; 348:29-36.
17. Resch S, Thorngren K-G. Preoperative traction for hip fracture: A randomized comparison between skin and skeletal traction in 78 patients. *Acta Orthop Scand* 1998;69(3):277-279.
18. Parker M.J., Currie C.T., Mountain J.A., Thorngren K-G. Standardised audit of hip fracture in Europe (SAHFE). *Hip International* 1998; 8:10- 15.
19. Thorngren K-G. Hip fractures in the geriatric patient. Natural history, therapeutic approach and rehabilitation potential. *SIROT 97 Scientific Proceedings*. Ed. H Stein, 161-170. Freund Publ House Ltd, 1999.
20. Tolo E T, Bostrom M P G, Simic P M, Lyden J P, Cornell C M, Thorngren K-G. The short-term outcome of elderly patients with hip fractures. *Int Orthop (SICOT)* 1999; 23:279-282.
21. Nordell E, Jarnlo G-B, Jetsén C, Nordström L, Thorngren K-G. Accidental falls and related fractures in 65–74 year olds. A retrospective study of 332 patients. *Acta Orthop Scand* 2000;71(2):175-179.
22. Lunsjö K, Ceder L, Thorngren K-G, Skytting B, Tidermark J, Berntson P-O, Allvin I, Norberg S, Hjalmar K, Larsson S, Knebel R, Hauggaard A, Stigsson L. Extramedullary fixation of 569 unstable intertrochanteric fractures. A randomized multicenter trial of the Medoff sliding plate versus three other screw-plate systems. *Acta Orthop Scand* 2001;72(2): 133-140.

23. Heikkinen T, Wingstrand H, Partanen J, Thorngren KG, Jalovaara P. Hemiarthroplasty or osteosynthesis in cervical hip fractures: matched-pair analysis in 892 patients. *Arch Orthop Trauma Surg* 2002;122(3):143-7.
24. Ahrengart L, Törnkvist H, Fornander P, Thorngren K-G, Pasanen L, Wahlström P, Honkonen S, Lindgren U. A randomized study of the compression hip screw and gamma nail in 426 fractures. *Clin Orthop Rel Res* 2002; 401:209-222.
25. Cserhati P, Fekete K, Berglund-Rödén M, Wingstrand H, Thorngren K-G. Hip fractures in Hungary and Sweden – differences in treatment and rehabilitation. *Int Orthop (SICOT)* 2002; 26(4):222-8.
26. Thorngren KG, Hommel A, Norrman PO, Thorngren J, Wingstrand H. Epidemiology of femoral neck fractures. *Injury* 2002;33 Suppl 3:C1-7.
27. Partanen J, Saarenpää I, Heikkinen T, Wingstrand H, Thorngren K-G, Jalovaara P. Functional outcome after displaced femoral neck fractures treated with osteosynthesis or hemiarthroplasty: a matched-pair study of 714 patients. *Acta Orthop Scand* 2002;73(5):496-501.
28. Hommel A, Ulander K, Thorngren K-G. Improvements in pain relief, handling time and pressure ulcers through internal audits of hip fracture patients. *Scand J Caring Sci* 2003; 17:78-83
29. Hasserijs R, Johnell O, Nilsson BE, Thorngren K-G, Jonsson K, Mellström D, Redlund-Johnell I, Karlsson MK. Hip fracture patients have more vertebral deformities than subjects in population-based studies. *Bone* 2003; 32:180-184.
30. Lykke N, Lerud K, Strömsöe K, Thorngren K-G. Fixation of fractures of the femoral neck. A prospective randomized trial of three Ullevaal hip screws versus two Hansson hook-pins. *J Bone Joint Surg (Br)* 2003;85- B:426-30.
31. Eneroth M, Olsson U-B, Thorngren K-G. Insufficient fluid, and energy intake in hospitalised patients with hip fracture. A prospective randomised study of 80 patients. *Clin Nutrition* 2005; 24:297-303.
32. Hommel A, Jarnlo G-B, Nordell E, Thorngren K-G & Åstrand J. Fall, fragilitet och frakturer. *Ortopediskt magasin* 2. 2005. (Swedish).
33. Resch S, Bjärnetoft B, Thorngren K-G. Preoperative skin traction or pillow nursing in hip fractures: a prospective and randomized study in 123 patients. *Disability and Rehabilitation* 2005;27(18-19):1191-95.

34. Thorngren KG, Norrman PO, Hommel A, Cedervall M, Thorngren J, Wingstrand H. Influence of age, sex, fracture type and pre-fracture living on rehabilitation pattern after hip fracture in the elderly. *Disability and Rehabilitation* 2005;27(18-19):1091-97.
35. Borgström F, Zethraeus N, Johnell O, Lidgren L, Ponzer S, Svensson O, Abdou P, Ornstein E, Lundsjö K, Thorngren K-G, Sernbo I, Rehnberg C, Jönsson B. Costs and quality of life associated with osteoporosis-related fractures in Sweden. *Osteoporos Int* 2006 May;17(5):637-50.
37. Mjörud J, Skaro O, Solhaug JH, Thorngren K-G. A randomized study in all cervical hip fractures. Osteosynthesis with Hansson hook-pins versus AO-screws in 199 consecutive patients followed for two years. *Injury* 2006 Aug;37(8):768-77.
38. Åstrand J, Thorngren K-G, Tägil M. One fracture is enough. Experience with a prospective and consecutive osteoporosis screening program with 239 fracture patients. *Acta Orthop Scand* 2006;77(1):3-8.
39. Eneroth M, Olsson U-B, Thorngren K-G. Nutritional Supplementation Decrease Fracture-related Complications. *Clin Orthop Rel Res* 2006; 451:212-217
40. Svensson O, Thorngren K-G. Benskörhetsfrakturer. En nationell handlingsplan behövs. [Osteoporosis fractures. A national plan of action required]. *Läkartidningen* 2006;103(40):2955. (Swedish)
41. Thorngren K-G. Höftfrakturer – Ett enormt folkhälsoproblem. [Hip fractures – an enormous public health problem]. *Läkartidningen* 2006;103(40):2990–92. (Swedish)
42. Hommel A & Olofsson B. Särskilt vårdprogram för patienter med höftfraktur [Special care program for patients with hip fractures]. *Läkartidningen* 2006;40;3000–3001. (Swedish) Wrong spelling in PubMed Home!
43. Tsuboi M, Hasegawa Y, Suzuki S, Wingstrand H, Thorngren KG. Mortality and mobility after hip fracture in Japan: A Ten-Year Follow-Up. *J Bone Joint Surg Br* 2007 Apr;89(4):461-6
44. Hommel A, Björkelund KB, Thorngren KG, Ulander K. Nutritional status among patients with hip fracture in relation to pressure ulcers. *Clin Nutr* 2007; 26:589-96.
45. Holmer H, Svensson J, Rylander L, Johannsson G, Rosén T, Bengtsson BA, Thorén M, Höybye C, Degerblad M, Brammert M, Hägg E, Engström BE, Ekman B, Thorngren KG, Hagmar L, Erfurth EM. Fracture incidence in GH-Deficient Patients on Complete Hormone Replacement Including GH. *J Bone Miner Res* 2007 Dec;22(12):1842-50.

46. Hommel A, Björkelund KB, Thorngren K-G, Ulander K. A study of a pathway to reduce pressure ulcers for patients with a hip fracture. *J Orthop Nursing* 2007; 11:151-59
47. Ström O, Borgström F, Zethraeus N, Johnell O, Lidgren L, Ponzer S, Svensson O, Abdon P, Ornstein E, Ceder L, Thorngren K-G, Sernbro I, Jönsson B. Long-term cost, and effect on quality of life of osteoporosis-related fractures in Sweden. *Acta Orthop* 2008;79(2):269-280.
48. Åstrand J, Thorngren KG, Tägil M, Åkesson K. 3-year follow-up of 215 fracture patients from a prospective and consecutive osteoporosis screening program. Fracture patients care! *Acta Orthop* 2008;79(3):404-9.
49. Hommel A, Ulander K, Björkelund K, Norrman P-O, Wingstrand H, Thorngren KG. Influence of optimised treatment of people with hip fracture on time to operation, length of hospital stay, reoperations and mortality within 1 year. *Injury* 2008; 39:1164-1174.
50. Hommel A, Björkelund KB, Thorngren KG, Ulander K. Differences in complications and length of stay between patients with a hip fracture treated at an orthopaedic department and patients treated at other hospital. *J Orthop Nursing* 2008; 12, 13-25.
51. Thorngren K-G. National registration of hip fractures. *Acta Orthop* 2008;79(5):580-82
52. Al-Ani AN, Samuelsson B, Tidermark J, Norling A, Ekström W, Cederholm T, Hedström M. Early operation on patients with a hip fracture improved the ability to return to independent living. A prospective study of 850 patients. *J Bone Joint Surg Am.* 2008 Jul;90(7):1436-42.
53. Ekström W, Miedel R, Ponzer S, Hedström M, Samnegård E, Tidermark J. Quality of life after a stable trochanteric fracture. A Prospective cohort study on 148 patients. *J of Orthop Trauma* 2009; 1: 39-44.
54. Björkelund KB, Hommel A, Thorngren KG, Lundberg D, Larsson S. Factors at admission associated with 4 months outcome in elderly patients with hip fracture. *AANA J* 2009 Feb;77(1):49-58
55. Samuelsson B, Hedström M, Ponzer S, Söderqvist A, Samnegård E, Thorngren KG, Cederholm T, Säaf M, Dalén N. Gender differences and cognitive aspects on functional outcome after hip fracture – a 2 years' follow-up of 2,134 patients. *Age Ageing* 2009 Nov;38(6):686-92.
56. Nordell E, Andreasson M, Gall K, Thorngren KG. Evaluating the Swedish version of the Falls Efficacy Scale-International (FES-I). *Advances in Physiotherapy* 2009;11(2):81-87

57. Söderqvist A, Ekström W, Ponzer S, Pettersson H, Cederholm T, Dalén N, Hedström M, Tidermark J; Stockholm Hip Fracture Group. Prediction of mortality in elderly patients with hip fractures: a two-year prospective study of 1,944 patients. *Gerontology*. 2009;55(5):496- 504.
58. Valavičienė R, Smailys A, Macijauskienė J, Hommel A. Factors affecting health related quality of life femoral neck fracture patients. *Medicina (Kaunas)* 2010;46(12):801-5.
59. Björkelund KB, Hommel A, Thorngren KG, Gustafson L, Larsson S, Lundberg D. Reducing delirium in elderly patients with hip fracture: a multi-factorial intervention study. *Acta Anaesthesiol Scand* 2010 Jul;54(6):678-88.
60. Al-Ani AN, Flodin L, Söderqvist A, Ackermann P, Samnegård E, Dalén N, Säaf M, Cederholm T, Hedström M. Does rehabilitation matter in patients with femoral neck fracture and cognitive impairment? A prospective study of 246 patients. *Arch Phys Med Rehabil*. 2010 Jan;91(1):51-7.
61. Björkelund K, Hommel A, Thorngren K-G, Lundberg D, Larsson S. The influence of perioperative care and treatment on the 4-month outcome in elderly patients with hip fracture. *AANA J* 2011;79(1):51-61.
62. Valavicienė R, Macijauskienė, Hommel A. Femoral neck fractures in Lithuania. The one year audit results. *International Journal of Orthopaedic and Trauma Nursing*. 2011;15,76-81.
63. Valavicienė R , Smailys A, Jurate Macijauskiene J, Hommel A. The comparison of hip fractures care in Lithuania and Sweden. *International Journal of Orthopaedic and Trauma Nursing*. 2012;16 (1) , 47-52 .
64. Valavicienė R , Macijauskiene J, Tarasevicius S, Smailys A, Dobožinskas P, Hommel A. Femoral neck fractures in Lithuania and Sweden. The differences in care and outcome. *International Orthopaedics* DOI: 10.1007/ s00264-012-1531-8
65. Hommel A Kock ML, Persson J, Werntoft E. The patient's view of nursing care after hip fracture *ISRN Nurs*. 2012; 2012:863291. Epub 2012 Jul 3.
66. Turesson E., Ivarsson K, Ekelund U. Hommel A. The implementation of a fast-track care pathway for hip fracture patients.
67. Bartha E, Davidsson T, Thorngren KG, E Bartha, Hommel A, Carlsson P, Kalman S, Cost-effectiveness analysis of goal-directed hemodynamic treatment of elderly hip fracture patients—before clinical research starts. *Anesthesiology*. 2012 Sep;117(3):519-530.

68. Maher AB, Meehan A, Hertz K, Hommel A, MacDonald V, O'Sullivan MP, Specht K, Taylor A. Acute nursing care of the older adult with fragility hip fracture: An international perspective (Part 1). 2012;16, 177–194.
69. Maher AB, Meehan A, Hertz K, Hommel A, MacDonald V, O'Sullivan MP, Specht K, Taylor A. Acute nursing care of the older adult with fragility hip fracture: An international perspective (Part 2) *International Journal of Orthopaedic and Trauma Nursing*. 2013;17 (1) 4-18.
70. Sjöstrand, D., Hommel, A. & Johansson, A. Causes of Surgical Delay and Demographic Characteristics in Patients with Hip Fracture. A one year Register Study of 484 patients *Open Journal of Orthopaedics* 2013, 3,193-198.
71. Leonardsson O, Rolfson O, Hommel A, Garellick G, Åkesson K, Rogmark C. Patient-Reported Outcome after Displaced Femoral Neck Fracture. A National Survey of 4,467 patients. *JBJS* (2013) | Vol. 95. Issue 18 E-publ September 18.
72. Al-Ani A, Neander G, Samuelsson B, Blomfeldt R, Ekström W, Hedström M. Risk factors for osteoporosis are common in young and middle-aged patients with femoral neck fractures regardless of trauma mechanism. *ACTA Orthop* 2013; 84: 1; 54-59.
73. Nordström P, Mickaelsson K, Hommel A, Norrman PO, Thorngren KG, Nordström A. Geriatric Rehabilitation and Discharge Location After Hip Fracture in Relation to the Risks of Death and Readmission. *J Am Med Dir Assoc*. 2015 Aug 18. pii: S1525-8610(15)00451-X. doi: 10.1016/j.jamda.2015.07.004. PMID:26297621
74. Dobožinska P, Valavičienė R, Hommel A. Changes In Care Management After “Fast Track” Protocol Introduction For Hip Fracture Patients. *Health Sciences* 2015 (5) 5 DOI: 10.5200/sm-hs.2015.099.
75. Al-Ani A, Cederholm T, Saaf M, Neander G, Blomfeldt R, Ekstrom W, Hedstrom M. Low bone mineral density and fat-free mass in younger patients with a femoral neck fracture. *Eur J Clin Invest* 2015: Aug;45 (8): 800-6.
76. Ekström W, Samuelsson B, Ponzer S, Cederholm T, Thorngren KG, Hedström M. Sex effects on short-term complications after hip fracture: a prospective cohort study. *Clin Interv Aging*. 2015 Aug 5; 10:1259-66. doi: 10.2147/CIA.S80100. eCollection 2015. PMID: 26347328
77. Hommel A, Bååth C. A national quality registers as a tool to audit items of the fundamentals of care to older patients with hip fractures. *Int J Older People Nurs*. 2016 Jun;11(2):85-93. doi: 10.1111/opn.12101. Epub 2015 Dec 17.

78. Gesar B, Hommel A, Hedin H, Bååth C. Older patients' perception of their own capacity to regain pre-fracture function after hip fracture surgery-an explorative quality study. *International Journal of Orthopaedic and Trauma Nursing*, 2016 May 3. pii: S1878-1241(16)30028-4. doi: 10.1016/j.ijotn.2016.04.005.
79. Gesar B, Bååth C, Hedin H, Hommel A. Hip fracture, an interruption that four months later has consequences on everyday personal life. *International Journal of Orthopedic and Trauma Nursing*. 2017, 3(26),43-48.
80. Nordström P, Toots A, Gustafsson Y, Thorngren KG, Hommel A, Nordström A. Bisphosphonate use after hip fracture in older adults: a nationwide retrospective cohort study. *JAMDA*, 2017 Jun 1;18(6):515- 521. doi: 10.1016/j.jamda.2016.12.083. Epub 2017 Feb 24. PMID: 28238673
81. Honkavaara N, Al-Ani AN, Campenfeldt P, Ekström W, Hedström M. Good responsiveness with EuroQol 5-Dimension questionnaire and Short Form (36) Health Survey in 20-69 years old patients with a femoral neck fracture: A 2-year prospective follow-up study in 182 patients. *Injury*. 2016 Aug;47(8):1692-7. doi: 10.1016/j.injury.2016.05.021. Epub 2016 May 17.
82. Lindberg L, Ekström W, Hedström M, Flodin L, Löfgren S, Ryd L. Changing caring behaviours in rehabilitation after a hip fracture – A tool for empowerment? *Psychol Health Med*. 2017 Jul;22(6):663-672. doi: 10.1080/13548506.2016.1211294. Epub 2016 Jul 29. PMID: 27472378.
83. Hälleberg Nyman M, Forsman H, Ostaszkiwicz J, Hommel A, Eldh AC. Urinary incontinence and its management in patients aged 65 and older in orthopaedic care – what nursing and rehabilitation staff know and do. *J Clin Nurs*. 2016 Dec 16. doi: 10.1111/jocn.13686. PMID: 27982485
84. Hellström PM, Samuelsson B, Al-Ani AN, Hedström M. Normal gastric emptying time of a carbohydrate-rich drink in elderly patients with acute hip fracture: a pilot study. *BMC Anesthesiol*. 2017 Feb 15;17(1):23. doi: 10.1186/s12871-016-0299-6. PMID: 26681169
85. Hakopian N, Ehne J & Hedström M. 2017, ABC om Höftfrakturer. *Läkartidningen* 2017;114:EDHE
86. Johansen A, Golding D, Louise Brent L, Jacqueline Close J, Gjertsen JE, Holt G, Hommel A, Pedersen A B, Rock ND, Thorngren KG. Using national hip fracture registries and audit databases to develop an international perspective. *Injury*. 2017 Oct;48(10):2174-2179

87. MacDonald V, Maher AB, Mainz H, Meehan AJ, Brent L, Hommel A, Hertz K, Taylor A, Sheehan KJ. Developing and Testing an International Audit of Nursing Quality Indicators for Older Adults With Fragility Hip Fracture. *Orthop Nurs*. 2018 Mar/Apr;37(2):115-121.
88. Titman S, Hommel A, Dobrydnjov I et al. The efficacy of high volume of local infiltration analgesia for postoperative pain relief after total hip arthroplasty under general anaesthesia – a randomised controlled trial. *Int J Orthop Trauma Nurs*. 2018 Feb; 28:16-21. doi: 10.1016/j.ijotn.2017.10.003. Epub 2017 Oct 31
89. Hälleberg Nyman M, Forsman H, Wallin L et al. Promoting evidence-based urinary incontinence practice in acute nursing and rehabilitation care – experience of a pilot study in the orthopedic context. *J Eval Clin Pract*. 2018 Feb 7. doi: 10.1111/jep.12879
90. Gesar B, Bååth C, Hedin H et al. Patient reported outcomes at acute hospital stay and four months after hip fracture surgery. A register and questionnaire study, *European Journal for Person Centered Healthcare* 218 (6), 1 DOI: <http://dx.doi.org/10.5750/ejpch.v6i1>
91. Jonsson MJ, Bentzer P, Turkiewicz A et al. Accuracy of the POSSUM score and the Nottingham risk score in hip fracture patients in Sweden – a prospective observational study. *Acta Anaesthesiol Scand*. 2018 Apr 23. doi: 10.1111/aas.13131. PubMed PMID: 29687439
92. Nordström P, Thorngren KG, Hommel A et al. Effects of Geriatric Team Rehabilitation after Hip Fracture: Meta-Analysis of Randomized Controlled Trials. *J Am Med Dir Assoc*. 2018 19(10) 840-845. Jun 26. pii: S1525-8610(18)30262-7. doi: 10.1016/j.jamda.2018.05.008.
93. Ivarsson B, Hommel A, Sandberg M et al. The experiences of pre- and in hospital care in patients with hip fractures – A study based on Critical incidents *Int J Orthop Trauma Nurs*. 2018 Aug;30:8-13. doi: 10.1016/j.ijotn.2018.05.003.
94. Brent L, Hommel A, Maher B A et al. Nursing care of fragility fracture patients. *Injury*. 2018 Jun 22. pii: S0020-1383(18)30346-2. doi: 10.1016/j.injury.2018.06.036.
95. Sheehan KJ, Smith TO, Martin FC et al. Conceptual framework for an episode of rehabilitation care. *Phys Ther*. 2019 Mar 1;99(3):276-285. doi: 10.1093/ptj/pzy145.
96. Jonsson MH, Hommel A, Turkiewicz A et al. Plasma lactate at admission does not predict mortality and complications in hip fracture patients: a prospective observational study. *Scand J Clin Lab Invest*. 2018 Oct 1:1- 7. doi: 10.1080/00365513.2018.1514650.

97. Turesson E, Ivarsson K, Thorngren KG, et al. Hip fractures – Treatment and functional outcome. The development over 25 years. *Injury*. 2018 Dec;49(12):2209-2215. doi:10.1016/j.injury.2018.10.010. Epub 2018 Oct 13.
98. Meehan AJ, Maher AB, Brent L et al. The International Collaboration of Orthopaedic Nursing (ICON): Best practice nursing care standards for older adults with fragility hip fracture. *J Orthop Trauma Nurs*. 2018 doi. org/10.1016/j.ijotn.2018.11.001.
99. Hokopian N, Ehne J, Hedstrom M. ABC om höftfraktur nr 15–16, 2016 *Läkartidningen*. Campenfeldt P, Al-Ani A, Hedström M et al. Low BMD and high alcohol conception predicts a major re-operation in patients younger than 70 years of age with a displaced femoral neck fracture- A two-year follow up study in 120 patients. *Injury* 218, Nov 49(11), 2042-2046.
100. Magnéli M, Unbeck M, Rogmark C, et al. Validation of adverse events after hip arthroplasty: a Swedish multi-centre cohort study. *BMJ Open*. 2019 Mar 7;9(3): e023773. doi: 10.1136/bmjopen-2018-023773.
101. Bergman J, Nordström A, Hommel A et al. Bisphosphonates and Mortality: Confounding in Observational Studies? *Osteoporosis International* (2019) 30: 1973-1982. Doi 10.1007/s00198-019-05097-1
102. Modig K, Erdefelt A, Mellner C, Cederholm T, Talbäck M, Hedstrom M. Obesity paradox holds true for hip fracture patients– a prospective register-based cohort study. *J Bone Joint Surg Am*. 2019 May 15;101(10):888- 895.
103. Turesson E, Ivarsson K, Thorngren KG, Hommel A. The impact of care process development and comorbidity on time to surgery, mortality rate and functional outcome for hip fracture patients: a retrospective analysis over 19 years with data from the Swedish National Registry for hip fracture patients, RIKSHÖFT. *BMC Musculoskeletal Disorders* (2019) Vol 20, Iss 1, 1-8.
104. Hommel A, Magnelli M, Samuelsson B, Schildmeijer K, Göransson K, Sjöstrand D, Unbeck M. Exploring the incidence and nature of nursing-sensitive orthopaedic adverse events: a multicentre cohort study using Global Trigger Tool. *International Journal of Nursing Studies* (2020) 102: Feb, 103473 <https://doi.org/10.1016/j.ijnurstu.2019.103473>.
105. Jonsson MH, Hommel A, Todorova L, Melader O, Bentzer P. Novel bio- markers for prediction of outcome in hip fracture patients-an exploratory study. *Acta Anaesthesiologica Scandinavica*, (2020) 64(7):920-927 DOI: 10.1111/aas.13581.

106. Mellner C, Hedstrom M, Hommel A, Sköldenberg O, Eisler T Muk- ka S. The Sernbo score as a predictor of 1-year mortality after hip frac- ture. A registry study on 55,716 patients. *European Journal of Trauma and Emergency Surgery*, (2020) April 10th <https://doi.org/10.1007/s00068-020-01375-4>.
107. Mathiessen J, Ivarsson B & Johansson A. One-year follow-up of hip fracture complications. and patient-reported measures: A mixed meth- ods cross sectional study. *J Orthop Trauma Nurs*. 2020 (38) 1878-1241 <https://doi.org/10.1016/j.ijotn.2020.100767>.
108. Greve K, Modig K, Talbäck M, Bartha E, Hedstrom M. No association between waiting time to surgery and mortality forhealthier patients with hip fracture: a nationwide Swedish cohort of 59,675 patients. *ACTA Orthop* Apr 2020.
109. Meyer A, Hedström M, Modig K. The Swedish Hip Fracture and National Patient Register were valuable for research on hip fractures – comparison of two registers. *J Clin Epidemiol* Jun 2020.
110. Campenfeldt P, Ekström W, Al-Ani A, Hedström M. Health related quality of life and mortality 10 years after a femoral neck fracture in pa- tients younger than 70 years. *Injury* Jun 2020.
111. Loodin Å, Hommel A. The effects of preoperative oral carbohydrate drinks on energy intake and postoperative complications after hip fracture surgery: A pilot study. *Int J Orthop Trauma Nurs* 2020:100834.
112. Greve KG. Modig KM, Talbäck MT, Bartha EB, Hedström M. Trends in incidence, recurrence, and survival in hip fractures by education and comorbidity: A nationwide register-based study of the total Swedish population 1998-2017
113. Forssten, M. P., Mohammad Ismail, A., Sjölin, G., Ahl, R., Wretenberg, P., Borg, T. & Mohseni, S. (2020). The association between the Revised Cardiac Risk Index and short-term mortality after hip fracture surgery. *Eur J Trauma Emerg Surg* (2020). doi.org/10.1007/s00068-020-01488-w
114. Mohammad Ismail A, Borg T, Sjölin G, Purlotfi A, Holm S, Cao, Yang, Wretenberg P, Ahl R, Mohensi Sβ-adrenergic blockade is associated with a reduced risk of 90-day mortality after surgery for hip fractures. *Trauma Surg Acute Care Open* 2020;5:e000533. [doi:10.1136/tsaco-2020-000533](https://doi.org/10.1136/tsaco-2020-000533)

REPORTS

1. Thorngren, K-G. Rikshöft. I Spri-rapport 289. Kvalitetssäkring i kirurgi och anesthesiologi, 1990.(Swedish)
2. Thorngren, K-G. Rikshöft, register över höftfrakturer. I Spri-rapport 308, Dagmar-50. Ortopedi, 1991. (Swedish)
3. Thorngren K-G, Berglund-Rödén M, Wingstrand H. Utvärdering av Ädelreformen via Rikshöftprojektet. Socialstyrelsen. Ädelutvärderingen 1994; 94:18. (Swedish).
4. Thorngren K-G. State of the Art. Höftfrakturer. Medicinsk faktadatabas, MARS. Ett svenskt program för resultatuppföljning, 1995;4:3–29. (Swedish).
5. Thorngren K-G, Herberts P, Johnell O, Lidgren L, Nachemson A. Rörelseorganens sjukdomar. I: Sjukvården i Sverige 1995. SOS-rapport 1995; 25:180–199. (Swedish)
6. Thorngren K-G. Rikshöft. I "Nationella kvalitetsregister inom hälso- och sjukvården 96/97. Landstingsförbundet/Socialstyrelsen, Stockholm 1997. ISBN 91-71888-374-6 pp 29–31. (Swedish)
7. Thorngren KG, Hommel A, Nordström P Ziden L. SBU rapportnr 235, 2015 Rehabilitering efter höftfraktur-interdisciplinära team. (Swedish)

BOOK CHAPTERS

1. Thorngren K-G, Berglund-Rödén M, Dalén T, Wingstrand H. Multicenter hipfracture study. In: Proximal Femoral Fractures. Operative Techniques and Complications. Eds. Marti R.K. and Dunki Jakobs P.B. Medical Press Ltd, London, 1993. Vol 1, 47-56.
2. Thorngren K-G. Experience from Sweden. In: Medical audit. Rationale and practicalities. Cambridge University Press, 1993;365-375.
3. Thorngren K-G. Epidemiology of fractures of the proximal femur. In European Instructional course lectures. Ed. by J Kenwright, J Duparc and P Fulford 1997;3:144-153.
4. Thorngren KG. Femoral neck fractures. In: Oxford Textbook of Orthopedics and Trauma. Ed by C Bulstrode, J Buckwalter, A Carr, L Marsh, J Fairbank, J Wilson-MacDonald and G Bowden. Oxford University Press 2002; Volume 3:2216-2227.
5. Schmidt AH, Asnis SE, Haidukewych G, Koval KJ, Thorngren K-G. Femoral neck fractures. In Instructional Course Lectures 2005; 54:417-445. Ed by V Pellegrini and J Kernan. Published by the American Academy of Orthopaedic Surgeons (AAOS).

6. Thorngren K-G. Förbättrad behandling av höftfrakturer. I: En människa i rörelse. Forskning om skelett, leder och muskulatur i Region Skåne och Södra Sjukvårdsregionen. Forsknings- och utvecklingsenheten 2005;(3):127-139. (Swedish).
7. Thorngren KG. National Registration of Hip Fractures in Sweden. In European Instructional Course Lectures 2009 Vol. 9:11-18. Ed. By G Bentley (UK).
8. Hommel A. 2010 Kvalitetsarbete vid vård av patienter med höftfraktur. I Höftfraktur hos äldre, att bevara patientens förmåga. Ed by Olsson LE, Karlsson J, Waern E Liber. ISBN 47 09 339 700. (Swedish)
9. Hommel A. Kvalitetsregister. In Ortopedisk vård och rehabilitering, Ed by Hommel A & Bååth C. 2013. Studentlitteratur ISBN 978-91-44- 06059-0. (Swedish).
10. Hommel A & Bååth C. 2013. Osteoporos. Ortopedisk vård och rehabilitering Ed by Hommel A & Bååth C, Studentlitteratur ISBN 978-91-44-06059-0(Swedish).
11. Meehan A, Hommel A, Hertz K, MacDonald V, Maher A, Care of the older adult with fragility hip fracture, In Evidence based geriatric nurse protocols for best practice. 5th edition. Editor Boltz M. Springer. 2016
12. Hommel A 2017. Kvalitetsregister i klinisk praxis, forskning och utbildning. In Kvalitetsarbete för bättre och säkrare vård. Ed by Nordström G & Wilde B. Studentlitteratur. (Swedish). ISBN: 978-91-44-11618-1
12. Hokopian N, Ehne J, Hedstrom M. ABC om höftfraktur LT förlag 2017.

DOCTORAL THESIS

1. MD Lars Borgquist, 1991 Hip fracture patients in primary health care, rehabilitation, outcome and costs. Med. Fak. Lunds universitet, Sverige.
2. RN, Ami Hommel, 2007. Improved safety and quality of care for patients with a hip fracture-Intervention audited by the National Quality Register RIKSHÖFT Department of Health Sciences, Faculty of Medicine, Lund University, Sweden, 2007<http://www.lu.se/lup/publication/548642>
3. RN Karin Björkman Björkelund, 2007 Acute Confusional State in Elderly Patients with Hip Fracture. Identification of risk factors and intervention using a prehospital and perioperative management program. Department of Health Sciences, Faculty of Medicine, Lund University, Sweden, 2007.
<http://www.science.lu.se/o.o.i.s?id=12713&postid=1057226>
5. RN Rasa Valavičienė, 2012. Factors Affecting Care Outcome in Older Persons with Hip Fractures Department of Orthopedics, Kaunas & Kaunas Medical University of Medicine, Lithuania
5. RN Berit Gesar, 2018. The recovery process after a hip fracture of healthy patients, 65 years and older – perceptions, abilities, and strategies. Department of Clinical Sciences/Lund, Faculty of Medicine, Lund University, Sweden
6. MD Emma Turesson Department of Clinical Sciences/Lund, Faculty of Medicine, Lund University, Sweden, 2019. A 30-year journey in hip fracture care. An evaluation of how care process development affect lead-times and outcome.
7. RN Glenn Larsson, 2019. Prehospitalt omhändertagande av patienter med misstänkt höftfraktur. Vårdprocess med direkt transport till röntgen eller akutmottagning. Department of Clinical Sciences/Lund, Faculty of Medicine, Lund University, Sweden, 2019. (in Swedish)
8. MD Magnus Hjaltalin Johnsson.2020. Identification of the high-risk hip fracture patient Department of Clinical Sciences/Lund, Faculty of Medicine, Lund University, Sweden,
9. MD Pierre Campenfeldt, Fracture healing, functional outcome and health related quality of life in younger patients with a femoral neck fracture. 2021 Karolinska Institutet. ISBN 978-91-7831-884-1

CHAIRMEN OF THE SWEDISH NATIONAL HIP FRACTURE REGISTRY, RIKSHÖFT

Ami Hommel,

RN, Professor Department of Orthopaedics Skåne University hospital and Malmö University. Research field is mainly in nursing care of patient with a hip fracture, nutrition and pressure ulcer.



Margareta Hedström,

Professor and Senior Consultant Karolinska Institutet, Department of Orthopaedics, Karolinska Hospital. Research field is mainly about hip fracture treatments and joint replacement surgery.



ADDRESS

RIKSHÖFT

Ortopediska kliniken

Skånes Universitetssjukhus

Lund 221 85 Lund Sweden

ADDRESS

RIKSHÖFT

Ortopediska kliniken

Skånes Universitetssjukhus

Lund 221 85 Lund

TELEPHONE

046-17 71 18 (Lena Jönsson)

E-mail

rikshoft@skane.se

Webpage www.rikshoft.se