Outcome, severity of injury and length of sick leave after an ankle fracture: an observational register study

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There is a lack in understanding the reasons for different lengths of sick leave in patients who sustain ankle fractures. The aim of this study is to examine variations in the length of sick leave in ankle fracture patients and how treatment, type of ankle fracture and the patient-reported outcome are associated with the length of sick leave. In this study were data from the Swedish Social Insurance Agency (SSIA) and the Swedish Fracture Register (SFR), combined. Patients who sustained an ankle fracture were identified and the length of the sick leave calculated. Variables associated to the length of the sick leave were analysed. Fifty-three percent of the patients were on sick leave for an average of 88 days. Factors that were associated with the length of sick leave were an open fracture, operative treatment, multiple treatments, AO/OTA classification, and previous sick leave. Patients on sick leave for 22 weeks or more scored 15 points (CI 95% 12-18) worse on the dysfunction index of the Short Musculoskeletal Function Assessment in the 1-year follow-up compared to the pre-injury survey. This can be compared to 3 points (CI 95% 2-5) lower in patients with the shortest sick leave. There is an association between the severity of the injury and the length of sick leave following an ankle fracture, as well as between the patient-reported outcome after one year and the length of the sick leave.

Keywords : ankle fracture, outcome, Swedish Fracture Register, sick leave.

INTRODUCTION

Ankle fractures are among the most common orthopaedic injuries, and it include a heterogeneous group of fractures ranging from stable isolated fibula fractures below the level of the syndesmosis to highly unstable types as the Maisonneuve fracture.

Patients who sustain an ankle fracture often report a good outcome with only a minor disability a year or more after the injury[1,2,3,4]. However, there are still a substantial number of patients who experience pain and functional impairment. Egol et al. reported that 12 percent of patients with operatively treated ankle fractures had moderate or severe pain one year after injury and Ponzer et al. reported that nearly half of the patients were reporting work related limitations after two years[4,5].

An ankle fracture, sustained by a patient of working age, will in many cases require a period of sick leave for healing and rehabilitation. About a third of the cost in the Swedish social insurance system is related to musculoskeletal disorders. Fractures of the lower leg and ankle usually renders longer spells of sick leave than fractures of the upper extremities[6,7,8]. Høiness et al. assessed the total cost of an operatively treated ankle fracture in Norway to 12,500 euros. Forty percent derived from the cost of the sick leave and about the same from hospitalization[9].

There is a lack of understanding about how fracture-related factors affect the variations in length of sick leave, despite its importance. The aim of this study is to examine the variations in length of sick leave in patients who have sustained an ankle fracture and how treatment, different types of ankle fracture and the patient-reported outcome are associated with the length of sick leave.

MATERIALS AND METHODS

We conducted a retrospective cohort study on adult patients with an ankle fracture using data from the SFR and the SSIA.

Data on all adult patients between the age of 20 and 65 who sustained an ankle fracture and was registered in the SFR between January 2012 and June 2016 was extracted. Data was crosslinked to data on sick

leave in the SSIA, using the patients' unique personal identification number. Patients with multiple fractures for the same injury occasion registered in the SFR or/ and patients with ongoing sick leave at the time of the injury were excluded from the analysis.

The SFR started collecting data on fractures in 2011 and has been registering ankle fractures since 2012. The SFR is a non-mandatory national quality register that achieved a 100% coverage of orthopaedic and trauma departments in Sweden in 2021. The SFR prospectively collects data on injury mechanism, fracture type and treatment by the treating physician using a web-based interface[10]. The coverage and completeness of registrations in the SFR rose during the study period from initially being meagre to more comprehensive as more departments started contributing data. By 2018 the completeness of the participating departments was on average 70%[11]. Patient-reported outcomes in the SFR are reported with the use of EQ-5D (3L to 2019 and 5L thereafter) and the Short Musculoskeletal Function Assessment (SMFA). The first questionnaire was filled out shortly after the fracture with a recall technique for the functional status before the injury, referred to here as the pre-injury survey. It is followed up with the same survey one year later. Validity studies of both the classification of ankle fractures and response rates for PROMs in the SFR have been published[12,13].

Residents in Sweden are insured through the SSIA and receive benefits if they are unable to work due to injury or sickness. The first day that sickness is reported is a qualifying day where no compensation is provided. The 13 days that follow are compensated by the employer. Following this, benefits are paid by the SSIA. Other groups, such as the unemployed, receive benefits from the SSIA from day 2. From day 8 a doctor's certificate is required[7].

The data in our study regarding sick leave was obtained from the MiDAS database (MicroData for Analysis of the Social Insurance System). The MiDAS database contains information on payment of sickness benefits from the SSIA. Data on all spells of sick leave for all the patients during the study period was obtained regardless of diagnosis. The ICD-10 diagnosis of the injury or sickness which causes the inability to work, the date of the first day of the sick leave and the number of days compensated were used for analyses.

From the SFR data on sex and age, injury mechanism (high or low energy), fracture (AO/OTA type and group) and treatment (surgical or non-surgical) was retrieved. The modality of the treatment was defined from the first registered treatment in the SFR. Multiple treatments were also used as a variable and defined

as more than one treatment registered after an ankle fracture, regardless which type of treatment.

We used data from the SMFA part of the patient-reported outcome registered in the SFR. The SMFA questionnaire consists of 46 questions and the results are summarised in a bother index and a dysfunction index. The dysfunction index can be further divided into four sub-indices[14]. In this study we analysed both the bother index as well as all the dysfunction sub-indices.

We chose to use two of the single questions in the SMFA to further evaluate ankle fractures. These questions were: "How often do you walk with a limp?" and "How difficult it is to walk?" The questions in the SMFA can be answered in five grades. For example, questions concerning if one experiences problems can be answered with none/little/some/most/all of the time. We dichotomized it to none and little of the time in one group and some/most and all of the time in one group in the question on "How often do you walk with a limp?" Regarding the second question, we classified the answers "not at all difficult" and "a little difficult" into one group and moderately/very difficult and unable to do into another group.

In the study we needed to determine whether the sick leave in each case was related to the ankle fracture or not. We used both the time in accordance with the injury and the registered ICD-10 codes from the SSIA for the definition. Sick leave related to the ankle fracture was defined as sick leave with the first day of the leave within the period from 14 days before the, in the SFR registered, date of the injury, to 30 days after. It also needed to have, in the dataset from the SSIA, an ICD-10 diagnosis of injuries of the lower leg (S80.00-S89.91). Furthermore, the number of days of sick leave were counted as the days from the first day to the last day of sick pay from the SSIA. Consequently, weekends and days with partial sick leave were also included. Cases of more than one period of sick leave within the first year after the injury related to the ankle fracture were combined and all of the days reported. The number of days of the sick leave related to the ankle fracture was then used as an outcome.

Sick leave due to a diagnosis unrelated to the ankle fracture was included in the dataset and was used as an independent variable. Patients with ongoing sick leave with another diagnosis at the time of the injury were excluded since the length of sick leave related to the injury could not be assessed.

Since the first 14 days of sick leave is paid for by the employer, this were not included in our data. Hence patients who had not been on sick leave or on sick

leave for 14 days or less were grouped into the same subgroup in the analysis: 0-2 weeks of sick leave.

We calculated both the proportion of patients receiving benefits from the SSAI (15 days or more of sick leave) and the mean time in days of the sick leave for the patients receiving benefits. This was then compared between different groups of ankle fracture patients.

We further calculated the difference between the SMFA score of the pre-injury and the 1-year follow-up survey as a value on how the injury had affected the function of the patient. According to the length of the sick leave, patients were placed into groups of four weeks in the analysis and then compared to the mean score of the difference in the SMFA. We also compared the dichotomized answers of the walking and limping questions of both the pre-injury and the 1-year follow-up survey to the length of the sick leave.

IBM SPSS version 26 was used for the statistical calculations. 95% confidence interval was calculated in the custom table module in SPSS.

RESULTS

Of the 15,266 patients with an ankle fracture registered in the SFR 8,671 patients were eligible and included in the study (Figure 1). The mean age was 46 years, 54% were female and 51% were treated surgically. Slightly more than half of the patients had a period of sick leave of 15 days or more and received benefits from the SSIA.

Of the 4,679 patients that received benefits from SSIA, the average period of sick leave was 88 days. The most common duration was 8-9 weeks and then it declined rapidly (Figure 2). When including all the 8,671 eligible patients, 24% were on sick leave for more than two months, 12% longer than three months and 3% longer than six months.

Patients on sick leave for 15 days or more were more likely to have been treated surgically and had a higher proportion of AO/OTA type B and C fractures than patients who had had a shorter period of sick leave or no sick leave (Table I).

Among surgically treated patients, 63% received sick pay from the SSIA. When comparing the mean length of sick leave, it was almost four weeks longer than among the non-operatively treated patients. In both groups, sick leave was longer with increasing level in the AO/OTA classification. Open fracture and multiple treatments also extended the sick leave period (Table II).

There was only a slight difference when comparing sick leave between different age groups, with longer
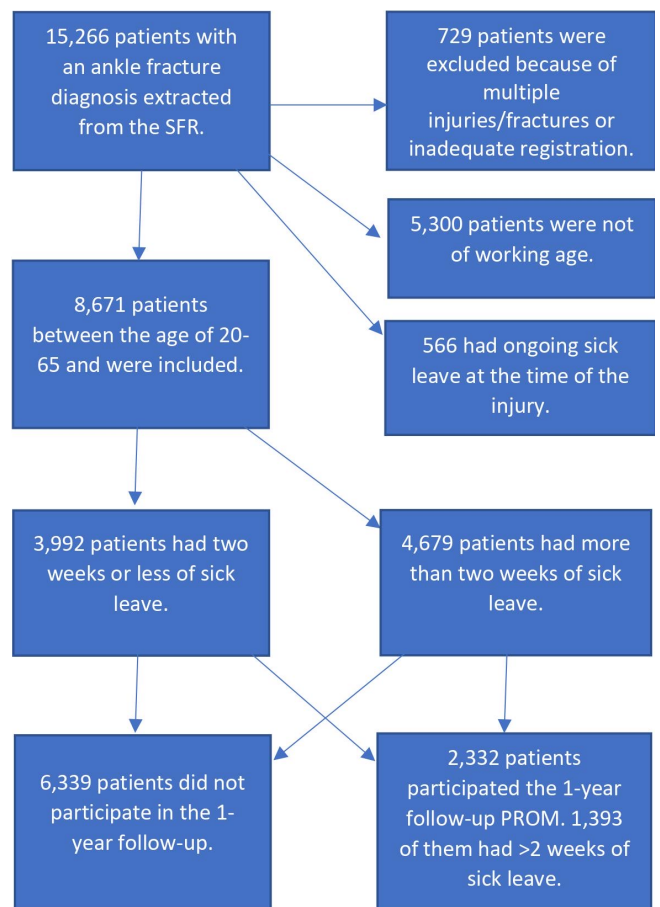

Figure 1. — Flow chart of the patients that were included in the study.
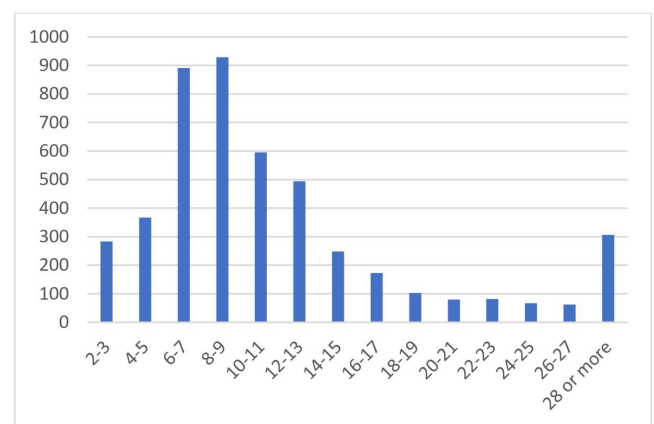

Figure 2. — Number of patients and length of the sick leave (weeks) following an ankle fracture. Patients with sick leave shorter than two weeks are not included.

periods of sick leave among the older patients. Men and women were on sick leave to about the same extent, but the period of the sick leave in both non-operatively and operatively treated ankle fractures was longer among women (Table II).

About one fifth of the patients in the study had one or more periods of sick leave during the 5-year study

Table I. — Demography of patients and fractures included in the study. Values are presented as proportions in percent with 95% Confidence Intervals unless otherwise stated.

	Patients of working age included in the study	Patients with 0-14 days of sick leave	Patients with 15 days sick leave or more	Patients participated in the follow up PROM	Patients not participated in the follow up PROM
	n=8,671	n=3,992	n=4,679	n=2,332	n=6,339
Age, mean in years (95% CI)	46 (46-46)	47 (46-47)	46 (45-46)	49 (49-50)	45 (45-45)
Women (95% CI)	54 (53-55)	54 (52-55)	55 (53-56)	61 (59-63)	52 (51-53)
AO/OTA-type (95% CI)					
A	24 (23-25)	31 (29-32)	18 (17-20)	23 (22-25)	24 (23-25)
B	62 (61-63)	58 (57-60)	65 (64-67)	63 (61-65)	61 (60-63)
C	13 (12-14)	10 (9-11)	16 (15-17)	13 (11-14)	13 (13-14)
Treatment (95% CI)					
Operatively	51 (50-52)	41 (39-42)	59 (58-61)	54 (52-56)	50 (48-51)
Non-operatively	47 (46-48)	57 (55-58)	38 (37-39)	45 (43-47)	47 (46-48)
Unknown	3 (2-3)	3 (2-3)	3 (3-4)	2 (1-2)	3 (3-4)

period because of a diagnosis unrelated to the ankle fracture. These ankle fracture patients had to a much higher extent need for sick leave than patients who had not been on sick leave earlier. The period of the sick leave among these patients was also about three weeks longer (Table II).

There was a clear correlation in the comparison between the length of the sick leave and patient-reported outcome. In patients on sick leave for a shorter period, a worse mean outcome of 3-6 points was reported in the 1-year follow-up survey than in the pre-injury survey in nearly every sub-index of the SMFA. This difference increases significantly with the length of the sick leave and rose in the dysfunction index from 4 to 15 points, for example (Table III). The arm and hand sub-index differed from the others and showed low score in all groups.

The differences were more pronounced for the single questions on difficulties walking and how often the patients limped. With the exception of the group with an episode of sick leave of two weeks or less, there were only 1-3% who reported moderate/very difficult or unable to walk at the time before the injury. In the 1-year follow-up survey this rose to 4 % in the patients on sick leave for 2-5 weeks and to 28% in the patients on sick leave for 22 weeks or more. Similarities were seen in how often the patients limped, 4-8% reported limping some/most or all of the time in the pre-injury survey. This rose to 24% among patients with an episode of sick leave for 2-5 weeks and 64% among the patients on sick leave for 22 weeks or more (Table

IV). One group differed from this. Patients who had not been on sick leave or had two weeks or less of sick leave reported worse results on both issues in the pre-injury survey than all the other length of sick leave. In this group, 8% more patients reported difficulties walking and 19% more reported limping in the 1-year follow-up survey (Table IV).

In the logistic regression model were fracture and treatment related variables as well as if the patient has had an earlier sick leave on another diagnosis associated with a longer sick leave after the ankle fracture (Table V).

DISCUSSION

In this study we examined the patterns of sick leave following an ankle fracture by combining data from the Swedish Social Insurance Agency and the Swedish Fracture Register. We saw a correlation that a more severe ankle fracture was associated with a longer sick leave and that patients with longer sick leaves report significantly worse outcome.

Among patients in our study with surgically treated fractures, 63% received sick pay from the SSIA for a mean period of 100 days. Høiness et al. showed that 54% of surgically treated patients in Norway with ankle fractures received sick pay, but for a shorter period of sick leave (53 days)[9]. In non-operatively treated patients in the study, only 44% received sick pay and the mean time was shorter (73 days). Both Port et al. and Ryd et al. demonstrated an average period

Table II. — Number of patients with sick leave for more than 14 days and among them the mean time of the sick leave in days. Grouped according to treatment, gender, age of the patient, fracture classification, any earlier sick leave, open fracture, and multiple treatments.

	Non-surgical treatment				Surgical treatment			
	>14 days (%)	95% CI	Mean	95% CI	>14 days (%)	95% CI	Mean	95% CI
All	44	42-45	73	70-77	63	62-64	104	101-108
Gender								
Male	43	41-45	68	64-73	61	59-64	98	93-103
Female	45	42-47	77	72-82	64	62-66	110	104-116
Age								
20-35 years	43	40-47	65	59-71	61	58-63	91	84-97
36-50 years	47	44-50	77	71-84	69	67-72	105	98-112
51 years or older	42	40-45	75	70-81	60	58-63	112	106-119
AO/OTA-classification								
A	37	34-39	68	60-75	62	57-67	84	74-94
A1	36	33-38	64	56-72	65	54-75	73	64-82
A2	43	36-49	83	62-105	62	56-68	85	70-99
A3	40	29-52	67	48-87	59	45-72	101	81-121
B	49	47-52	76	72-80	62	60-64	104	99-109
B1	50	48-52	75	71-79	63	60-66	91	85-96
B2	44	33-55	102	68-135	60	57-64	103	95-112
B3	41	25-60	97	40-155	62	59-65	123	113-134
C	40	31-49	87	66-107	67	64-70	112	103-120
C1	34	24-45	76	52-101	67	62-72	103	92-114
C2	44	17-75	127	0-283	69	63-74	125	105-145
C3	53	36-70	94	52-135	65	60-70	111	96-126
Earlier sick leave on other diagnosis								
No	39	38-41	67	63-70	58	57-60	99	94-103
Yes	59	56-62	88	80-96	81	78-83	119	111-127
Open fracture								
No	44	42-46	73	70-77	63	62-65	103	100-107
Yes	50	26-74	60	26-93	54	43-64	170	113-227
Multiple treatments								
No	43	42-45	72	68-76	63	61-64	99	95-103
Yes*	61	53-70	108	89-127	65	61-69	143	126-160

*The first registered treatment defining non-operative or operative treatment. Multiple treatments in non-operative treated patients were in 71% meaning that non-operative treatment was abandoned early for operative treatment and in 15% late operative treatment of non-union. In operative-treated patients meaning operative treatment at least two times.

of sick leave of six weeks for non-operatively treated isolated lateral malleolus fractures[15,16]. Our data does not contain information on sick leave for the first two weeks as that period of sick leave is paid for by the employer and not the SSIA. However, it is reasonable to assume that with adjustments for this, our sick leave data would be very close to the data reported by Port et al. and Ryd et al.

Table III. — Difference in mean score between pre-injury and 1-year follow up survey of the SMFA grouped by the length of the sick leave in weeks

Weeks of sick leave	Count	Bother index		Dysfunction index	
		Mean	CI 95%	Mean	CI 95%
0-1	939	5	3-6	4	3-5
2-5	196	3	2-5	3	2-4
6-9	533	6	4-7	5	4-5
10-13	361	9	8-11	7	6-8
14-17	135	12	9-15	10	8-12
18-21	51	12	7-18	12	8-15
22 or more	117	18	15-22	15	12-18

There are a couple of reasons why a higher proportion of patients with surgically treated ankle fractures received sick pay and the mean length of sick leave was longer than for patients with non-surgically treated fractures. Both the functional result after the injury and the period of immobilisation could affect the length of sick leave. Unstable fractures with more severe displacements and incongruity of the ankle joint and consequently less favourable prognosis are more likely to be treated surgically. Stable ankles, on the other hand, are most often treated non-surgically with in many cases a shorter period of immobilisation. This is especially the case among A1 fractures, which are more comparable with an ankle sprain. The non-operatively treated group of fractures constituted nearly 90% of the cases of a stable AO/OTA unimalleolar type A1 or B1 fracture.

The proportion of patients on sick leave decreased rapidly after two months. After three months only twelve per cent of patients were still receiving sick pay. In a study from Finland of both operatively and non-operatively treated ankle fractures, the average period of sick leave was eleven weeks. A rapid decrease was seen after two months and proximately 90% were back at work within four months from the fracture injury[17].

We also found an association between the severity of the fracture and the length of the sick leave. Among the surgically treated patients, there was an increasing period of sick leave with increasing severity of the fracture type (A-C). As expected within the A- and B-groups, we could further see an increasing period of sick leave with bi- and trimalleolar fracture patterns, as compared to unimalleolar fractures. In type C fractures, the simple type C1 fracture correspondingly renders a shorter sick leave need than the multi-fragmented C2 fracture. Patients with open surgical-treated ankle fractures has considerably longer sick leave than patients with closed fractures. This is also expected due to the more severe nature of the injury. We can only find limited data in earlier studies on the severity of the ankle fracture relating to the length of the sick leave. Tunturi et al. could not see any significant difference in the duration of sick leave after an ankle fracture by radiological end-result, patients' age, fracture type or form of treatment. In contrast, Karladani et al. showed in a study on tibia fractures a 60% longer period of sick leave in open fractures compared with closed ones[17,18].

When evaluating the result of the SMFA, there was a clear correlation in the length of sick leave. As expected, the arm and hand sub index remained unaffected by the injury. However, in the rest of the

Table IV. — Proportion of patients stating, on the SMFA question of how difficult it is to walk, "moderate", "very difficult" or "unable to". The proportion on the question of how often the patient limb answering, "some of the time", "most of the time" or "all of the time". The proportion stated in percent of both the preinjury and the 1-year PROM with 95% confidence interval divided by the length of sick leave.

Number of weeks of sick leave	Difficulties Walking				Often Limp			
	Pre-injury PROM	CI 95%	1-year PROM	CI 95%	Pre-injury PROM	CI 95%	1-year PROM	CI 95%
0-1	8	6-10	16	13-18	14	12-17	33	30-36
2-5	2	1-5	4	2-7	4	2-8	24	19-31
6-9	2	1-4	6	5-9	7	5-9	31	28-36
10-13	3	1-5	10	7-14	5	3-8	39	34-45
14-17	1	0-4	17	11-24	8	4-13	53	45-62
18-21	0	-	24	14-26	6	2-15	53	39-66
22 or more	1	0-4	28	20-36	8	4-15	64	55-72

dysfunction subindices, as well as in the bother index relationships were strong. It is of course reasonable that a less favourable outcome of the injury will lead to a longer period of sick leave. Egund et al. showed in a study on sick leave after distal radius fracture a similar result and interestingly that this relationship could be seen early. They concluded that self-reported measurements as early as one-week post-fracture are among the strongest predictors of length of sick leave, regardless of treatment[19].

For the respondents of the 1-year SMFA-questionnaire, 13% reported at least moderate difficulties walking and 36% reported that they limped some/most or all of the time. This is comparable with the findings of Tunturi where 27% reported trouble walking in a study on both operative and non-operatively treated ankle fractures[17]. However, this finding was also strongly correlated to the length of the sick leave. There was a near linear relationship between the number of weeks of sick leave and the difficulties reported for walking, with one exception. Patients not on sick pay scored worse than patients with a short sick leave spell. Besides a worse 1-year outcome, they also reported a lower pre-injury PROM. In this group of patients, 8% reported moderate or more difficulties in walking pre-injury and 16% post-injury. On average, in the whole patient cohort, only 1% reported pre-injury and 10% post-injury difficulties in walking. The impact of the injury is the same, but they have a lower initial function. Our explanation for this is that the group of patients not on sick pay is more heterogeneous. It consists of a larger number of unemployed, students, and most importantly for the results, also people already receiving disability pensions.

In this study women received sick pay as often as men, but the duration of sick leave was longer. This difference has been well established in earlier studies[20,21,22,23].

The length of the sick leave on an individual level is much more of a complicated issue than just a reflection of the severity of the injury. Weimert et al. found an association between symptoms of adjustment disorder, such as preoccupations at four weeks post-operative on patients with ankle or lower leg fractures and the functional outcome one year after injury[24]. In a study on public employees in Britain and France, there was a clear association between the employment grade and the amount of long sick leave spells[20]. In the present study we found that if the patients had a previous sick leave period due to another diagnosis, the need for sick leave following the ankle fracture was much higher, and the length of sick leave is also longer. The predisposition of

Table V. — The logistic regression model with variables associated with an increasing odds of a sick leave longer than the mean of 93 days. Non-significant variables in the model were: gender, month of the injury and side of the injured ankle.

	OR	95% CI
Increasing age (per year)	1.02	1.01-1.02
Sick leave other diagnosis	1.91	1.66-2.20
Open fracture	2.21	1.24-3.92
AO type		
A1	0.67	0.51-0.89
A2	0.92	0.67-1.28
A3	1.46	0.82-2.62
B1	ref	ref
B2	1.52	1.20-1.93
B3	1.85	1.51-2.29
C1	1.45	1.10-1.93
C2	2.28	1.66-3.15
C3	1.51	1.12-2.02
Not classifiable	1.64	0.82-3.26
Non-operative treatment	ref	ref
Operative treatment	1.94	1.62-2.32
Unknown treatment	2.03	1.37-3.02
Single treatment	ref	ref
Multiple treatment	2.42	1.96-2.99

longer sick leave spells among patients with a history of earlier sick leave can both reflect the physical and psychological requirement of the patient's work itself but also the patient's vulnerability and response to illness and injury.

We see some limitations of this study. The response rate to the 1-year follow-up survey and the PROM is fairly low. Older women were the best responders and younger men were less likely to respond to the questionnaires. However, an earlier validation study has shown that there were no signs of different results in patients who did not participate in the 1-year follow up[13]. A major obstacle in the study is the lack of data from the first two weeks of sick leave. The reason for this is that this period is paid for by the employer and thus the data was not available in a central register. Both the coverage and completeness of the data is somewhat meagre as the data in this study was from the first years of the SFR. We believe that the large number and vast spread of both geographic locations and size of the contributing departments compensate for this and

therefore it is less likely to lead to bias. Furthermore, we did not have any data on the employment and the type of work, which likely is associated to the length of the sick leave.

When analysing sick leave after injury in patients with longer periods of sick leave, the question arises for the treating doctor if the length of the sick leave is a result from the vulnerability of the patient or from a less favourable result after the ankle fracture. Here we show that there is at least an obvious association between the severity of the fracture, how the patients grade the function after one year and the length of sick leave.

CONCLUSION

There is an association between the severity of the injury and the length of sick leave following an ankle fracture, as well as between the patient-reported outcome after one year and the length of the sick leave.

Abbreviations

AO/OTA - Arbeitsgemeinschaft für Osteosynthesefragen/Orthopeadic Trauma Association
MiDAS - MicroData for Analysis of the Social Insurance System
PROM - Patient Reported Outcome Measures
SFR - Swedish Fracture Register
SMFA - Short Musculoskeletal Function Assessment
SSIA - Swedish Social Insurance Agency

Authors' contributions: HJ designed the study, did the raw data processing, the statistical calculations and wrote the first version of the manuscript. MH designed the study, took part in the raw data processing and the statistical calculations. MM designed the study and took an active part in the revision of the manuscript. PM designed the study and took an active part in the revision of the manuscript. All authors approved the final version of the manuscript.

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