

Delay to Surgery of Less Than 12 Hours Is Associated With Improved Short- and Long-Term Survival in Moderate- to High-Risk Hip Fracture Patients

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Abstract

Introduction: The effect of delays before surgery of 24 hours, 48 hours, and 72 hours on short- and long-term survival has been investigated comprehensively in hip fracture patients, but with controversial results. However, there is only limited evidence for how a threshold of 12-hour delay before hip fracture surgery affects survival. **Materials and Methods:** A prospective observational study of 884 consecutive hip fracture patients (age ≥ 65 years) undergoing surgery was carried out in terms of 30- and 365-day survival. A Cox hazard regression survival model was constructed for 724 patients with American Society of Anesthesiologists score ≥ 3 with adjustments of age, gender, cognition, number of medications on admission, hip fracture type, and prior living arrangements. **Results:** Patients who underwent surgery within 12 hours had better chances of survival than did those with 12 to 24 hours (hazard ratio [HR]: 8.30; 95% confidence interval [CI]: 1.13-61.4), 24 to 48 hours (HR: 7.21; 95% CI: 0.98-52.9), and >48 hours (HR: 11.75; 95% CI: 1.53-90.2) delay before surgery. Long-term survival was more influenced by non-adjustable patient features, but the adverse effect of >48 hours delay before surgery was noticed with HR: 2.02; 95% CI: 1.08-3.80. Increased age and male gender were significantly associated with worse short- and long-term survival. **Discussion/Conclusions:** Early hip fracture surgery within 12 hours of admission is associated with improved 30-day survival among patients with ASA score ≥ 3 . Delay to surgery of more than 48 hours has an adverse effect on 365-day survival, but factors related to patients' comorbidities have a great influence on long-term survival.

Keywords

trauma surgery, geriatric trauma, delay to surgery, hip fracture, hip fracture, and survival

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Introduction

Hip fracture is a common serious injury among elderly people leading to disability, increased mortality, and institutionalization, resulting in a heavy financial burden on the public health-care system.^{1,2} During the first year after hip fracture, excess mortality has been reported to range from 8.4% to 36% and patients are at increased risk for premature death for many years after hip fracture.³

Several risk factors for increased 1-year mortality after hip fracture have previously been reported, of which the most notable are increased age, male gender, higher ASA grade, cognitive impairment, prefracture mobility level, and institutionalized living arrangements prior to the fracture.⁴ The

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effect of surgical delay on short- and long-term mortality has been examined in numerous observational studies with controversial results.⁵⁻¹⁰ Acquiring level 1 evidence from randomized controlled trials has never been attempted due to the inherent ethical problems. Large register-based studies offer a massive study population, but the validation of data and identification of existing comorbidities are limited. High-quality prospective cohort studies taking account of existing comorbidities currently seem to represent the best method for studying outcomes with delayed surgery among hip fracture patients.

Mounting evidence shows that a delay before surgery may have a negative influence on the morbidity and mortality of hip fracture patients. The most often used watersheds for investigating delay before hip fracture surgery are 24 hours, 36 hours, 48 hours, 60 hours, and 72 hours.¹¹⁻¹⁸ Further, in register-based studies, delay before surgery is defined according to the day of admission and the day of the surgical intervention. A limited amount of evidence suggests that delay over 12 hours before surgery may increase in-hospital or short-term (30-day) mortality in patients sustaining hip fracture.⁵⁻⁷ To the best of our knowledge, the few studies on the effect of early (<12 hours) surgery after hip fracture on mortality have yielded contradictory findings.⁵⁻¹⁰

The aim of the present prospective observational study was to examine the impact of early timing (<12 hours) of hip fracture surgery on short- and long-term survival. In particular, we focused on examining the effect of early surgery on mortality in moderate- to high-risk patients as classified by ASA scores.

Materials and Methods

The study was performed according to the 1964 Helsinki Declaration and its later amendments and approved by the ethics committee of the Hospital District of Southern Ostrobothnia. Informed consent was obtained from the participants or their caregivers.

This retrospective study on a prospective controlled cohort covers 884 consecutive hip fracture patients aged ≥ 65 years operated on at Seinäjoki Central Hospital during the study period from January 1, 2012, to May 31, 2016. Only the first hip fracture in each patient during the follow-up period was included. Pathologic ($n = 1$) and periprosthetic fractures were excluded from the study population. Inconsistent data were revealed in 24 patients. The Hospital District of South Ostrobothnia, Finland, represented the referral area constituting 196 578 patients in 2016. All patients who sustained a hip fracture inside the referral area were admitted and underwent surgery at Seinäjoki Central Hospital. Data on deaths were obtained from the Official Cause of Death Statistics of Finland, which covers fundamentally 100% of deaths in Finland.

Patient information was collected during hospitalization by specially trained research nurses. If the patient was unable to provide the information, we used proxy respondents. Relatives, friends, and nurses from an institution who were aware of the patient's health condition served as proxies.

The primary outcome variables were short- and long-term survival, which were considered to represent 30-day and 365-

day survival, respectively. For the purpose of the study, we analyzed several patient variables as presented in Table 1. Surgical delay to a precision of minutes was defined as time elapsing from admission to the emergency department to the time of surgery and categorized as follows: <12 hours, 12 to 24 hours, 24 to 48 hours, and >48 hours. Need for mobility aids was categorized into 2 groups: mobile without an aid and mobile with an aid or unable to ambulate. Mobility level was classified as full or limited community, full or limited mobility indoors, and unable to move. We also registered the need for blood transfusion during hospitalization. As there is inconsistent evidence on an optimal cutoff value of hemoglobin for red blood cell transfusions, a cutoff value under 90 g/L was chosen in each patient. This lies between the most commonly used cutoff values found in the literature for restrictive (under 80 g/L) and liberal (under 100 g/L) red blood cell transfusion practices. Patients with an ASA score of 1 or 2 were combined into one group because there were only 2 patients with ASA 1. Likewise, patients with an ASA score of 4 to 5 were combined because of the small number of patients with ASA grade 5. Initial analysis showed that patients with ASA score 1 to 2 ($n = 135$) were operated on sooner ($P = .05$) and 30-day mortality was only 1.5% and 365-day mortality was 5.9%. To minimize the confounding effect of low ASA on the final results and marked low short- and long-term mortality among patients with ASA score 1 to 2, the final analysis was only performed for patients with higher ASA score 3 to 5, which constituted the final population ($n = 724$, 84.3%) of the study.

All patients were treated with a standardized hip fracture protocol during hospitalization. A comprehensive orthogeriatric rehabilitation program was initiated immediately after admission to emergency department, taking account of pain management, supporting mobility, nutrition and optimization of medications, renal function, fluid therapy, and so on.¹⁹ Surgery was performed as soon as possible, depending on system- or patient-related reasons. Patients with a femoral neck fracture were operated on with hemiarthroplasty ($n = 374$, 87.6%), total hip replacement ($n = 30$, 7.0%), or closed reduction and internal fixation with a fixed-angle sliding hip screw or cannulated screws ($n = 23$, 5.4%). Internal fixation was used only in stable Garden I and II fractures with relatively healthy patients who were fully mobile without mobility aids before the injury and when there were no radiological signs of osteoarthritis. Total hip replacement was implemented for community-dwelling physiologically "young" patients who were active and had a high functional demand. Pertrochanteric fractures were treated by an intramedullary hip nail or fixed-angle sliding hip screw. Subtrochanteric fractures were treated using long intramedullary nail. Low-molecular heparin was initiated 6 to 8 hours after surgery to prevent thromboembolic complications. Practically, all patients were allowed immediate mobility with full weight-bearing. In very rare cases, partial weight-bearing was recommended, but if this led to immobility or the use of a wheelchair due to a limited cooperation, full weight-bearing was allowed.

Table 1. Patient Demographics Classified by Delay to Surgery.

Variable	All Patients, N = 724	<12 Hours, n = 66	12-24 Hours, n = 241	24-48 Hours, n = 312	>48 Hours, n = 105	P
	n (%)	n (%)	n (%)	n (%)	n (%)	
Age						.024
65-74	74 (10.2)	3 (4.5)	26 (10.8)	29 (9.3)	16 (10.2)	
75-85	268 (37.0)	30 (45.5)	79 (32.8)	111 (35.6)	48 (37.0)	
>85	382 (52.8)	33 (50.0)	136 (56.4)	172 (55.1)	41 (39.0)	
Mean (SD)	84.1 (7.1)	85.3 (6.0)	84.7 (7.5)	84.2 (6.7)	81.6 (7.4)	.003
Gender						.204
Female	514 (71.0)	45 (68.2)	175 (72.6)	228 (73.1)	66 (62.9)	
Male	210 (29.0)	21 (31.8)	66 (27.4)	84 (26.9)	39 (37.1)	
Living with somebody						.947
Yes	468 (64.6)	44 (66.7)	153 (63.5)	204 (65.4)	67 (63.8)	
No	256 (35.4)	22 (33.3)	88 (36.5)	108 (34.6)	38 (36.2)	
Previous living arrangements						.064
Own home	273 (37.7)	22 (33.3)	103 (42.7)	106 (34.0)	42 (40.0)	
Own home with organized home care	227 (31.4)	24 (36.4)	62 (25.7)	104 (33.3)	37 (35.2)	
Assisted living accommodation	65 (9.0)	9 (13.6)	17 (7.1)	27 (8.7)	12 (11.4)	
Institutionalized	159 (22.0)	11 (16.7)	59 (24.5)	75 (24.0)	14 (13.3)	
Mobility aids before hip fracture						.965
Mobile without an aid	250 (34.7)	24 (37.5)	83 (34.6)	108 (34.6)	35 (33.7)	
Mobile with an aid or aids	470 (65.3)	40 (62.5)	157 (65.4)	204 (65.4)	69 (66.3)	
Information missing	4					
Mobility level before fracture						.272
Full or limited community	365 (49.4)	29 (45.3)	125 (52.1)	154 (49.4)	48 (46.2)	
Full or limited mobility indoors	352 (48.9)	32 (50.0)	110 (45.8)	154 (49.4)	56 (53.8)	
Unable to move	12 (1.7)	3 (4.7)	5 (2.1)	4 (1.2)	0	
Missing information	4					
Previous diagnosis of memory disorder						.010
Yes	237 (32.7)	24 (36.4)	79 (32.8)	114 (36.5)	20 (19.0)	
No	487 (67.3)	42 (63.6)	162 (67.2)	198 (63.5)	85 (81.0)	
Medications on admission						.290
<4	86 (11.9)	10 (15.1)	30 (12.4)	34 (10.9)	12 (11.4)	
4-10	467 (64.5)	45 (68.2)	158 (65.6)	205 (65.7)	59 (56.2)	
>10	171 (23.6)	11 (16.7)	53 (22.0)	73 (23.4)	34 (32.4)	
Hip fracture type						.589
Femoral neck fracture	427 (59.0)	36 (54.5)	141 (58.5)	179 (57.4)	71 (67.6)	
Petrochanteric fracture	249 (34.4)	25 (37.9)	84 (34.9)	113 (36.5)	27 (25.7)	
Subtrochanteric fracture	48 (6.6)	5 (7.6)	16 (6.6)	20 (6.4)	7 (6.7)	
Need for blood transfusion						.457
No	418 (57.7)	37 (56.1)	130 (53.9)	189 (60.6)	62 (59.0)	
Yes	306 (42.3)	29 (43.9)	111 (46.1)	123 (39.4)	43 (41.0)	
Duration of surgery (minutes, SD)	80.4 (35.7)	79.5 (38.4)	79.5 (38.9)	78.8 (32.8)	87.8 (34.6)	.052

Patient characteristics grouped by surgical delay were compared using Kruskal-Wallis test for continuous variables not normally distributed and Pearson χ^2 test for categorical variables. A P value $\leq .05$ was considered statistically significant.

Cox regression models, where variables were entered simultaneously into the models, were built to investigate hazard ratios (HRs) for death 30 days and 365 days after hip fracture. Time to surgery, age, gender, living with somebody, previous living arrangements, previous diagnosis of memory disorder, number of regularly taken medications (both prescribed and over-the-counter medications) on admission, and hip fracture morphology represented covariates in the final model. Need for mobility aids before hip fracture and mobility level was not

included because of a statistically significant association with prior living arrangements ($P < .05$). All statistical analyses were performed using IBM SPSS Statistics version 23.

Results

From the study population of 724, 514 (71%) were women and mean patient age was 84.1 (standard deviation: 7.1). In all, 427 (59%) patients had a femoral neck fracture, 249 (34%) had a petrochanteric fracture, and 48 (7%) a subtrochanteric fracture. Mean timing of surgery was 32.3 hours (25%-75% percentile: 19.4-42.2) and 66 (9.1%) patients were operated on within 12 hours of admission, 241 (33.3%) at 12 to 24 hours,

Table 2. Multivariate Cox hazard Regression Model Stratified by 30- and 365-Day Survival.

	30-Day Survival			365-Day Survival		
	HR	(95% CI)	P	HR	(95% CI)	P
Age (years)	1.07	(1.03-1.11)	<.001	1.05	(1.03-1.08)	<.001
Sex						
Female	1.00			1.00		
Male	1.79	(1.11-2.88)	.017	1.57	(1.17-2.10)	.002
Delay to operation						
<12 hours	1.00			1.00		
12-24 hours	8.30	(1.13-61.14)	.038	1.75	(0.98-3.11)	.057
24-48 hours	7.21	(0.98-52.91)	.052	1.49	(0.84-2.63)	.169
>48 hours	11.75	(1.53-90.24)	.018	2.02	(1.08-3.80)	.029
Previous diagnosis of memory disorder						
No	1.00			1.00		
Yes	1.15	(.70-1.91)	.577	1.00	(.74-1.36)	.982
Medications on admission						
<4	1.00			1.00		
4-10	0.98	(0.43-2.21)	.960	2.17	(1.13-4.15)	.020
>10	1.42	(0.59-3.39)	.435	3.12	(1.58-6.17)	.001
Previous living arrangements						
Own home	1.00			1.00		
Own home with organized home care	0.88	(0.45-1.73)	.708	1.22	(0.82-1.80)	.329
Assisted living accommodation	1.68	(0.75-3.78)	.209	2.18	(1.35-3.51)	.001
Institutionalized	1.84	(0.94-3.62)	.076	2.16	(1.43-3.26)	<.001
Hip fracture type						
Femoral neck fracture	1.00			1.00		
Pertrochanteric fracture	1.15	(0.71-1.85)	.574	1.04	(0.78-1.39)	.804
Subtrochanteric fracture	0.78	(0.28-2.21)	.645	0.95	(0.54-1.66)	.848

Abbreviations: CI, confidence interval; HR, hazard ratio.

315 (43.1%) at 24 to 48 hours, and 105 (14.5%) after at least 48 hours.

Details of baseline patient characteristics and comparison of patients stratified by delay before surgery are shown in Table 1. Patient age and previous diagnosis of memory disorder differed across the surgical delay groups. Patients operated on later than 48 hours after admission were younger than the mean age ($P = .003$) and had fewer diagnoses of memory disorder ($P = .010$).

Overall mortality was 29.1% ($n = 211$) at 365 days, of whom 76 (36.0%) died within 30 days and 175 (82.9%) within 180 days. Thirty- and 180-day mortality were 10.5% and 24.2%, respectively. A Cox regression model indicated statistically significant worse 30-day survival in patients operated on with a surgical delay of 12 to 24 hours (HR: 8.30; 95% CI: 1.13-61.4) and ≥ 48 hours (HR: 11.75; 95% CI: 1.53-90.2) compared to <12 hours surgical delay, whereas surgical delay of 24 to 48 hours (HR: 7.21; 95% CI: 0.98-52.9) showed a trend toward worse survival. The 30-day mortality for men was HR: 1.79 (95% CI: 1.11-2.88) compared to women, and mortality increased with every additional year of life (HR: 1.07; 95% CI: 1.03-1.11). Institutionalized living arrangements showed a trend toward worse 30-day survival (HR: 1.84; 95% CI: 0.94-3.62; Table 2 and Figure 1).

In the Cox hazard regression model describing 365-day survival, surgical delay of >48 hours (HR: 2.02; 95% CI: 1.08-3.80), age (HR: 1.05; 95% CI: 1.03-1.08), male gender (HR:

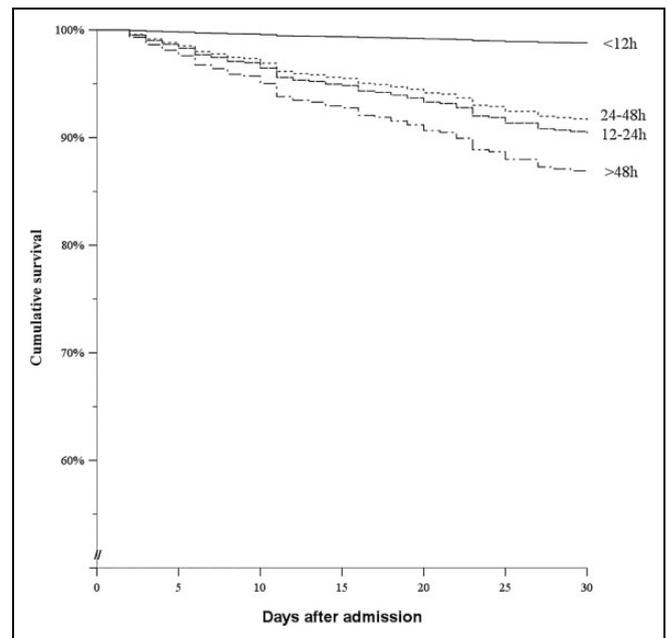


Figure 1. Cumulative 30-day survival stratified by the time delay to surgery.

1.57; 95% CI: 1.17-2.10), 4 to 10 drugs on admission (HR: 2.17; 95% CI: 1.13-4.15) or ≥ 10 drugs on admission (HR: 3.12; 95% CI: 1.58-6.17) and impaired previous living

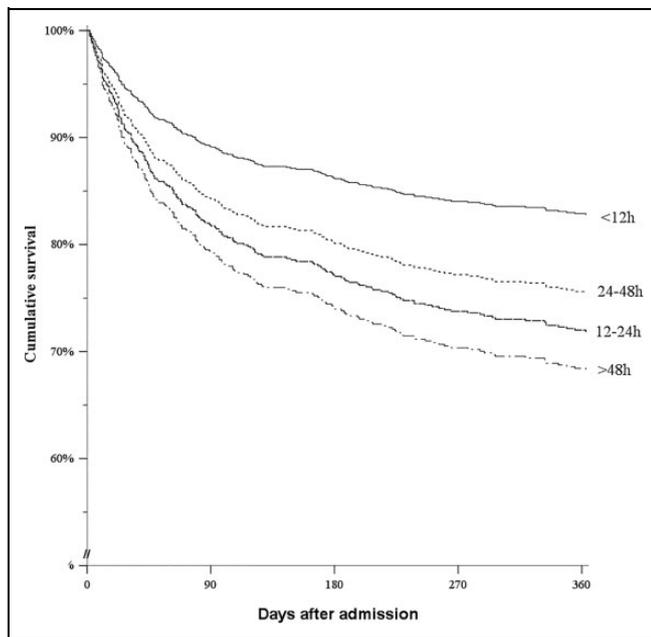


Figure 2. Cumulative 365-day survival stratified by the time delay to surgery.

arrangements were shown to represent independently significant factors for worse outcome (Table 2 and Figure 2).

We conducted another Cox hazard regression model including patients with ASA score 1 to 5, containing 859 patients. Increased risk for impaired 30-day survival was noticed in patients with surgical delay of 12 to 24 hours (HR: 7.95; 95% CI: 1.08-58.5) and ≥ 48 hours (HR: 10.7; 95% CI: 1.39-82.2), ASA score 4 to 5 (HR: 5.67; 95% CI: 1.29-25.0), male gender (HR: 1.78; 95% CI: 1.11-2.84), and every additional year of life (HR: 1.06; 95% CI: 1.02-1.10). Factors exacerbating worse 365-day survival included ASA score 3 (HR: 2.40; 95% CI: 1.16-4.98), ASA score 4 to 5 (HR: 4.31; 95% CI: 2.02-9.16), prior assisted living accommodation (HR: 2.04; 95% CI: 1.27-3.28), prior institutionalization (HR: 2.11; 95% CI: 1.41-3.16), 4 to 10 (HR: 2.50; 95% CI: 1.30-4.82) or >10 (HR: 3.35; 95% CI: 1.68-6.69) medications on admission, male gender (HR: 1.56; 95% CI: 1.17-2.07), and every additional year of life (HR: 1.04; 95% CI: 1.02-1.07).

Discussion

The main finding of the present study is that moderate- to high-risk hip fracture patients undergoing surgery within 12 hours of admission to the emergency department survived significantly better at 30 and 365 days. The effect of delay before surgery of more than 12 hours was the strongest factor affecting 30-day survival, and the impact of the timing of surgical treatment was even more significant than institutionalization prior to the injury. Furthermore, surgical delay also had an impact on long-term survival, although other factors, such as previous living arrangements and the number of medications taken before hip fracture, also had a more adverse effect on survival.

The present study provides evidence corroborating previously reported controversial results concerning the effect of early surgery within 12 hours on survival.⁵⁻¹⁰

The favourable effect of early surgery on short-term survival may have to do with avoiding acute complications related to waiting for surgery. These include thromboembolic events, pressure sores, pneumonia, stroke, myocardial infarction, cardiac arrest, and sepsis.^{11,15,20} Longer delay to surgery increases the risk of delirium, a common and serious complication among older hip fracture patients, especially among those with prefracture impaired cognition, with a potentially poor prognosis.^{21,22} Conversely, delayed surgery after hip fracture may be advantageous for patients needing comprehensive stabilisation prior to anaesthesia. We assume that if patients survive the first month after hip fracture without acute complications, non-modifiable factors such as severe comorbidities will have more impact on long-term survival. This is supported by our findings that greater number of medications on admission and impaired living arrangements prior to injury have a more marked effect on worse long-term survival than surgical delay.

A Danish fracture database study including 3517 hip fracture patients concluded that surgical delay >12 hours significantly increased 30-day mortality and >24 hours delay increased the risk of 90-day mortality.⁷ In that study, ASA score was the only factor describing comorbidity, and initially ASA grades 1 and 2 were detected more often in patients operated on within 12 hours. Bretherton and Parker published a prospective observation study on 6638 hip fracture patients and included ASA, mobility score, and Mini Mental Test score to describe patient comorbidity.⁵ The conclusion was that patients undergoing surgery after 12 hours are 59% more likely to die within 30 days than are patients undergoing surgery within 12 hours. Interestingly, other thresholds they examined were not statistically significant, but earlier surgery was found to be beneficial. A third study supporting early surgery within 12 hours was conducted by Uzoigwe et al.⁶ They studied the effect of surgical delay on in-hospital mortality in retrospective review from prospectively collected data of 1944 femoral neck fracture patients. ASA and patient's residence prior to the hip fracture described disease severity. The conclusion was that surgery within 12 hours significantly reduces risk of in-hospital mortality.

A register-based study on 3777 femoral neck fracture patients indicated that early surgery (<12 hours) was associated with a lower rate of mortality than in other patient groups, although the differences were not statistically significant.⁹ It is noteworthy that detailed diseases or validated morbidity index were not reported. Smektala et al conducted a multicentre prospective observational study on 2916 patients aged 65 or more to research the effect of surgical timing on survival and postoperative complications.¹⁰ Initially, patient demographics differed between surgical timing groups in terms of ASA classification, age, type of admission, and fracture type. More frequent postoperative complications were found in the group with more than 36 hours to surgery, but time to surgery did not affect mortality. A recent retrospective review of

prospectively collected data included 1913 patients aged 60 or more indicated every hour of surgical delay increased the risk for 30-day mortality. However, when the analysis was conducted in 12-hour blocks, surgical delay of more than 24 hours was statistically significant in increasing 30-day mortality.

The higher ASA score from 3 to 5 is a very powerful indicator for impaired survival after hip fracture surgery. In our study, only 1.5% of 30-day mortality was seen in patients with ASA score 1 to 2 compared to 10.5% of 30-day mortality in patient with ASA score 3 to 5. Further, there may be a tendency to operate earlier on patients with a low ASA score because patients with at least one severe systemic disease (ASA score ≥ 3) may need more attention to medical optimization for anesthesia. This may markedly distort the final results when studying the effect of surgical delay on survival and other outcomes. Further, higher ASA score may have interactions with covariates in regression models, which may yield a corrupted model. Therefore, we suggest that excluding from the statistical analysis the healthiest (ASA 1-2) patients, whose short-term mortality is very low, may result in more reliable results overall.

An interesting finding of our study was that surgical intervention lasted longer in patients undergoing surgery >48 hours after admission. This may indicate that patients with complex hip fractures or in need of special instrumentation are less likely to be operated on outside office hours and the intervention may proceed later the next day. Moreover, patients needing oral anticoagulation prior to admission are exposed to longer delays before surgery, especially those receiving direct oral anticoagulants (DOACs).²³ In our study, hip fracture surgery was not conducted until 48 hours after the last administration of DOACs. In this study, no difference was shown in the need for blood transfusion during hospitalization between time delay groups. However, oral anticoagulants may have an unfavourable influence on bleeding. This may increase the duration of surgery.

Early surgery has a clear positive impact on several outcomes among hip fracture patients. Postoperatively less pain, shorter hospital stay, and fewer pressure ulcers have been reported in hip fracture patients undergoing surgery within 24 hours.^{11,24} Shorter delay to surgery enables earlier mobilization, which in turn is likely to reduce the risk of developing delirium and pneumonia.²⁵ Surgical delay of more than 36 hours predisposes to diminished ability to return to independent living.¹¹ Further, more than 48 hours' surgical delay exposes hip fracture patients to the risk of pneumonia, stroke, myocardial infarction, sepsis, and septic shock.²⁰ However, controversial results and limited evidence are available on whether early surgery confers a survival benefit due to the nature of retrospective cohort or register studies.^{5,9,10,13,24,26-28} Our study supports the benefit of early surgery within 12 hours of admission for short- and long-term survival.

This study has several limitations. First, patients who were operated on within 12 hours constituted a relatively small patient group compared to those subjected to other delays leading to large confidence intervals in the analyses. Second, at the

beginning of the study, patients differed with regard to age and previous diagnosis of memory disorder. Patients who were operated on within 12 hours were older and had more prior diagnoses of memory disorder than did patients operated on 12 to 24 hours and >48 hours after admission, thus suggesting that patients in the reference group (operated on within 12 hours) were initially at greater risk for worse survival. On the other hand, this discrepancy in fact only strengthens our findings emphasizing the benefits of early surgery in these high-risk patients. Third, patients with ASA grade 1 or 2 were excluded from the study, which may affect generalizability to all hip fracture patients. However, it is noteworthy that our subanalysis containing patients with ASA score 1 to 5 did not indicate significantly different results. Finally, the reasons for delayed surgery such as the use of various anticoagulants were not registered, which may have caused bias in surgical timing. A major strength of this study was that initially there were no parameters favoring better survival for hip fracture patients operated on within 12 hours. Further, this study concerns all hip fracture types.

Conclusions

A delay in hip fracture surgery for more than 12 hours after admission is the most significant factor associated with impaired 30-day survival among patients with severe systemic disease (ASA ≥ 3). A delay before surgery of more than 48 hours has an adverse impact on 365-day survival, although unmodifiable patient-related factors are more important. In the future, a 12-hour threshold for surgical delay is recommended to include in studies exploring the effect of surgical delay on hip fracture patients. We suggest that hip fracture patients are operated on the same day or within 1 day of admission depending on modifiable patient risk factors. Even if the beneficial effects on survival are distinguishable, longer waiting before surgery exposes patients to prolonged pain and increased risk of acute complications.

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Declaration of Conflicting Interests

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