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Inpatient Length of Stay in Femur Fracture Patients in Emergency Hospital, Mansoura University

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ABSTRACT

Background: One of the most urgent problems facing society nowadays is the rising cost of healthcare. Analysis of hospitalization periods following femoral fractures is an excellent model to properly evaluate hospital economic efficiency in their care of trauma cases.

Objective: To ascertain the typical hospital stay following femoral fractures admitted to the emergency department (ED) of Mansoura University Hospital.

Patients and Methods: This was a prospective observational cross-sectional study that was done at Mansoura Emergency Hospital. The study included 281 cases older than 18 years with femur fractures. Modified Frailty Index (MFI) was used for prediction of the occurrence of adverse events after different orthopaedic operations.

Results: The included patients were split into two groups: Group I included 126 patients with hospitalization period ≤ 7 days, and group II had 155 patients with longer periods. Patients in group II were significantly older than group I. The type of trauma had a significant impact on hospitalization period, as penetrating injuries were more common in group II. Patients in group II had significantly longer time intervals between the fracture and surgery. The need for mechanical ventilation increased significantly in group II. The presence of injuries was associated with longer hospitalization periods.

Conclusion: We concluded that the average hospitalization period after femur fractures was 10.4 days. Factors that increased the risk of longer hospitalization (more than one week) included older age, long time interval between injury and fixation, low GCS, high MFI, associated injuries, penetrating injuries, and need for mechanical ventilation.

Keywords: Femur fracture, Length of stay, Modified Frailty Index.

INTRODUCTION

One of the main load-bearing bones in the lower limb, the femur is the longest, strongest, and heaviest tubular bone in the humans. Adults who sustain femur fractures may experience life-threatening complications and injuries, such as blood loss, organ damage, wound infections, fat embolisms, and adult respiratory distress syndrome (ARDS) [1].

About 100 per 100,000 people experience a femur fracture each year [2]. After age of 20 years, the incidence starts to decline and then increases in the elderly. In those over 75 years, there is a significant increase. Most femur fractures happen in the proximal third of the bone [3]. High energy trauma is the most frequent etiology of femur fractures in younger adults, however low energy traumas are an increasingly significant etiology in older adults [4].

When a femur fracture is suspected, an anteroposterior (AP) and lateral x-ray of the thigh have to be taken. To rule out any associated injuries, the hip and knee should also be imaged. If ignored, a fracture neck of the femur that could happen in conjunction with a mid-shaft femoral fracture could be associated with considerable morbimortality [5]. Although there is a paucity of research to back this course of treatment, many orthopedic surgeons recommend using a skin traction device to immobilize well-aligned fractures, whether or not they have neurovascular injury (NVI). Antibiotics and tetanus prophylaxis are given to cases with open fractures, and all cases have to receive the proper analgesia. After giving analgesia, the limb should be reduced if signs of neurovascular compromise are seen [6].

Femur fracture complications are generally rare. The most frequent side effects are pain, abnormal fracture healing, and infection. Haemorrhage, NVI, compartment syndrome, repeated fractures, and hardware failure are less frequent complications. Patients with multiple trauma are more likely to experience rare but life-threatening complications, such as death, multiorgan failure, and respiratory issues, which are typically brought on by ARDS and pulmonary or fat embolisms [7].

One of the most urgent problems facing society today is the rising cost of healthcare. In particular, many inner-city hospitals are having a difficult time making ends meet while trying to treat patients who are uninsured and indigent [8].

Analysis of the hospitalization period following femoral fractures is an excellent model to evaluate hospital economic efficiency in their care of trauma cases due to the high prevalence of femoral fractures in the trauma population [9].

The current study's objective is to ascertain the typical hospital stay following femoral fractures admitted to the emergency department (ED) of Mansoura University Hospital. The length of stay was also examined, and any interventions that could hasten hospital discharge and lower both patient and hospital costs were examined.

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PATIENTS AND METHODS

This was a prospective observational cross-sectional study that was done at Emergency Hospital, Mansoura University, Egypt, over a one-year duration, from January 2022 to January 2023. The study included 281 cases older than 18 years and skeletally mature diagnosed with femur fractures who were presented to Mansoura University Emergency Hospital. Younger patients with open epiphyseal plates were excluded.

Methods

The primary survey: Primary assessment and the initial resuscitation were carried out simultaneously. When a condition that could lead to death was discovered, quick corrective action was taken, and its effects were assessed before moving on to the next stage. The "ABCDE" approach was used to conduct the initial evaluation. Airway was maintained, cervical spine was splinted, breathing and ventilation were checked, circulation was assessed, bleeding was controlled and stopped disability, neurologic assessment was done using the GCS, a rapid neurological evaluation was carried out to determine the patient's level of consciousness [10], and pupils size, symmetry and reaction and any lateralizing signs were assessed. In order to conduct a thorough examination, the patients' clothing was completely cut off. Following an inspection, heat loss was reduced using heaters, warmed blankets, etc. In order to complete the 1^{ry} survey & resuscitation we also done ECG, insertion of urine catheter if not contraindicated and application of a nasogastric tube was done, if necessary.

The secondary survey: After the initial trial at resuscitation, all patients underwent a thorough history-taking process that comprised gathering information on their age, gender, mode and onset of trauma, time of arrival, and resuscitation. AMPLE History taking included history of allergic conditions, medications currently used, previous illnesses or pregnancy, last meal and events associated with injury.

Clinical examination: The clinical examination of the patients at the trauma room included vital signs (pulse, blood pressure, respiratory rate and temperature). Local examination of the affected limbs included detection of pain, limitation of the movement, vascular and neurological integrity, assessment of wounds, abrasions, and local soft tissue condition. Complete general examination included head-to-toe examination to define other associated or occult injuries.

Calculation of Modified Frailty Index (MFI):

It is a brief comorbidity-based risk stratification modality which has been demonstrated for prediction of the development of adverse events following different orthopaedic surgeries. Each of the patient's 11 comorbidities was given one point, and the sum was divided by the 11 possible variables to produce a score between 0 and 1, which represents the patient's fragility [11]. Modified Frailty Index [12]:

1. History of DM.
2. Congestive heart failure (CHF) within one month before operation.
3. Hypertension (HTN) needing medications.
4. History of myocardial infarction (MI) within the previous six months before surgery.
5. Previous percutaneous coronary intervention, stenting, or angina.
6. Previous history of TIA; cerebrovascular accident (CVA) without neurologic deficit.
7. Stroke or cerebral vascular accident with a neurologic deficit.
8. Weakened senses.
9. History of pneumonia or chronic obstructive pulmonary disease (COPD).
10. History of ischemic rest pain or peripheral vascular disease.
11. Functional health status before surgery—not independent.

Investigations: Radiological investigations included plain X-rays of the affected side, along with involvement of other areas as necessary. When the involvement of the articular surface was suspected, a CT scan was ordered. Laboratory investigations included CBC, PT, PC, 1NR, liver enzymes, RBS, kidney functions tests, the co-morbidities of the patients dictated the ordering of additional laboratory parameters.

Surgical procedure: The procedure was done under spinal or general anaesthesia according to the anaesthesiologist preference. The type of the fixation, and its location was dependent on location of the fracture and surgical expertise. The patients were transferred to the Internal Surgical Ward after the surgery was completed, unless ICU admission was recommended by the anaesthesiologist.

Postoperative care: Postoperative analgesia was maintained by IV paracetamol (1 gm/8 hours) and IV ketorolac (30 mg/12 hours). IV opioid increment was commenced with inadequate pain relief or when the patient reported a breakthrough pain. Oral intake was allowed as early as possible, as the patient had sound abdominal examination and free from intraabdominal or bowel injuries. The patients were discharged from the hospital when they were free from complications, can tolerate oral intake, and their pain controlled with oral medications. The duration of hospitalization was calculated and recorded. Then, the patients were divided into two groups: Group I comprised patients who had hospital stay less than or equal to one week, and group II included the remaining patients with longer hospitalization periods.

Outcomes: The primary outcomes included the duration of hospitalization in patients with femur fracture while the secondary outcomes included factors affecting prolonged hospitalization after surgical management of femoral fractures.

Ethical Consideration: The study was approved by Institutional Review Board (IRB) of the Faculty of Medicine, Mansoura University. Patient confidentiality was preserved, and the collected data were used only for scientific purposes. All patients felt free to withdraw from the study at any time point, based on their request. Informed written consents were signed by all participants, or their first-degree relatives, after complete explanation of the benefits and possible complications of the surgical intervention. The Helsinki Declaration was followed throughout the study's conduction.

Statistical analysis

The collected data were analysed via the SPSS software for Windows (version 26). Numerical data were expressed as mean and SD if normally distributed, while median and range were used to express skewed data. The student t and Mann Whitney tests were used to compare the previous data types, respectively. Categorical data were expressed as numbers and percentages, and the Chi-square test was utilized to compare between the two groups. ROC curve was applied to measure the ability of the MFI score to predict longer hospitalization. P value ≤ 0.05 was considered significant.

RESULTS

A total of 327 patients presented to our ED were assessed for eligibility criteria, and 46 of them were excluded. Etiologies of exclusion were cardiac arrest at ED (17 cases), need for urgent surgical interference (10 cases), and refusal to participate in the study (19 cases). Therefore, 281 patients were finally enrolled in the current study. The age of the included patients ranged between 18 and 97 years (mean = 42.8). Women represented 56.9% of the study participants, while the remaining ratio was occupied by men (43.1%).

The included patients had a mean MFI of 0.250 (range, 0 – 0.727). The components of the index are illustrated in the following table. The included patients had a mean MFI of 0.250 (range, 0 – 0.727). FFH was the most common cause of fractures (37%), followed by assault (28.8%), and RTA (27.8%). The remaining 18 cases had pathological fractures (6.4%). As regards the type of trauma, 151 patients had blunt injuries (53.7%), while the remaining cases had penetrating ones (46.3%). The femoral shaft was the most commonly affected region (56.6%). Distal end fractures were encountered in 22.4% of cases, while proximal and neck fractures were present in 21% of cases. Associated soft tissue injuries were detected in 148 patients (52.7%), while 124 patients had concomitant skeletal fractures (44.1%) (Table 1).

Table (1): Demographic data, the components of the Modified Frailty Index (MFI), mode of trauma, type of trauma, site of fracture, and associated injuries in the cases comprised in the study

Items		**Study cases n= 281**
Age (years)	Mean ± SD	42.8 ± 16.26
	Median (min-max)	43 (18-97)
Sex		
• Males		121 (43.1%)
• Females		160 (56.9%)
Modified Frailty Index		
• History of DM		82 (292%)
• CHF within 30 d before surgery		19 (68%)
• HTN needing medications		98 (349%)
• History of MI within the previous 6 months before operation		29 (10.3%)
• Previous percutaneous coronary intervention, stenting, or angina		56 (19.9%)
• History of transient ischemic attack (TIA); CVA with no neurologic deficit		53 (18.9%)
• CVA or stroke with neurologic deficit		34 (12.1%)
• Impaired sensorium		187 (66.5%)
• History of COPD or pneumonia		59 (21%)
• History of peripheral vascular disease or ischemic rest pain		68 (24.2%)
• Functional health status before surgery—not independent		87 (31%)
Total Modified Frailty Index (MFI)	Mean ± SD	0.250 ± 0.198
	Median (min-max)	0.182 (0-0.727)
Mode of trauma		
• Road traffic accidents (RTA)		78 (27.8%)
• Falling from height (FFH)		104 (37%)
• Assault		81 (28.8%)
• Pathological fractures		18 (6.4%)
Type of trauma		
• Blunt		151 (53.7%)
• Penetrating		130 (46.3%)
Site of fracture		
• Proximal end and neck		59 (21%)
• Shaft		159 (56.6%)
• Distal end		63 (22.4%)
Associated injuries		
• Associated fractures		124 (44.1%)
• Associated non-skeletal injuries		148 (52.7%)

The time interval between the incidence of the fracture and surgical intervention ranged between 0 and 14 days (mean = 2.68). The duration of hospitalization ranged between 1 and 23 days (mean = 10.4). One could notice that 55.2% of patients had a hospitalization period longer than one week, while the remaining 44.8% of cases had shorter hospital stay. Fifty-eight patients required ICU admission (20.6%), and 43 required mechanical ventilation (Table 2).

Table (2): Duration to treatment, hospital stay, ICU admission and requirement of mechanical ventilation in the cases included in the study.

Variables	**Study cases (n= 281)**	
Fracture to fixation/surgery intervention (days)	Mean ± SD	2.68 ± 2.95
	Median (min-max)	1 (0-14)
Length of hospital stay (days)	Mean ± SD	10.4 ± 6.98
	Median (min-max)	10 (1-23)
Length of stay		
• ≤ 7 days	126 (44.8%)	
• > 7 days	155 (55.2%)	
ICU admission		
• No	223 (79.4%)	
• Yes	58 (20.6%)	
Requirement of mechanical ventilation		
• No	238 (84.7%)	
• Yes	43 (15.3%)	

The included patients were divided into two groups, according to the duration of hospitalization. Group I included 126 patients who had a hospitalization period ≤ 7 days, and group II included the remaining 155 patients who had longer hospitalization periods. Patients in group II were significantly older than group I (46 vs. 39 years, respectively, p = 0.006). However, gender distribution did not have a significant impact on the duration of hospitalization (p = 0.102). Patients in group II had lower GCS, and higher MFI compared to group I cases.

The former had median values of 9 and 8, while the latter had median values of 0.09 and 0.181 in groups I and II, respectively. The cause of trauma was statistically comparable between the two groups (p = 0.102), with FFH as the most common cause in both groups. However, the type of trauma had a significant impact on hospitalization period (p = 0.001), as penetrating injuries were more common in group II (58.7% vs. 31% in group I – p = 0.001).

The location of the fracture was statistically comparable between the two study groups (p = 0.881). The shaft was the most commonly fractures region in both groups (55.6% and 57.4% of cases in group I and II respectively). The presence of associated skeletal fractures or soft tissue injuries were associated with longer hospitalization periods. Associated fractures were present in 35.7% and 50.9%, whereas soft tissue injuries were detected in 48.4% and 56.1% of cases in groups I and II, respectively.

Patients in group II had significantly longer time intervals between the fracture and surgery (3 vs. 1 day in group I – p < 0.001). Additionally, the need for mechanical ventilation increased significantly in group II (20% vs. 9.5%, p = 0.015). On the other hand, there was no significant difference between the two groups as regards the need for ICU admission (Table 3).

Table (3): Analysis of the demographic data, GCS, MFI, site of fracture, associated fractures, associated non-skeletal injuries and analysis of the outcome in the cases based on length of stay.

Items	**Group I (≤ 7 days) n = 126**	**Group II (> 7 days) n = 155**	**p-value**
Age (years)	39 (18-86)	46 (18-97)	**0.006***
Sex			
• Male	61 (48.4%)	60 (38.7%)	**0.102**
• Female	65 (51.6%)	95 (61.3%)	
GCS	9 (6-15)	8 (3-15)	**0.001***
MFI	0.09 (0 - 0.727)	0.181 (0.09 – 0.727)	**0.013***
Mode of trauma			
• Road traffic accidents (RTA)	35 (27.8%)	43 (27.7%)	0.102
• Falling from height (FFH)	50 (39.7%)	54 (34.8%)	
• Assault	34 (27%)	47 (30.3%)	
• Pathological fractures	7 (5.6%)	11 (7.1%)	
Type of trauma			
• Blunt trauma	87 (69%)	64 (41.3%)	**0.001***
• Penetrating trauma	39 (31%)	91 (58.7%)	
Site of fracture			
• Proximal end and neck	26 (20.6%)	33 (21.3%)	**0.881**
• Shaft	70 (55.6%)	89 (57.4%)	
• Distal end	30 (23.8%)	33 (21.3%)	
Associated fractures	45 (35.7%)	79 (50.9%)	**0.005***
Associated non-skeletal injuries	61 (48.4%)	87 (56.1%)	**0.042***
Analysis of the outcome			
• Fracture to surgery/fixation interval (Days)	1 (0-2)	3 (0-14)	< **0.001***
• ICU admission	21 (16.7%)	37 (23.9%)	**0.138**
• Mechanical ventilation	12 (9.5%)	31 (20%)	**0.015***

*: Statistically significant (p ≤ 0.05).

Table (4) showed that the cut-off value of MFI was 0.576, it had a 56.8% sensitivity and a 54% specificity for predicting longer hospitalization (more than one week) in patients with femoral fractures.

Table (4): Predictive value of MFI in identifying cases with prolonged hospital admission.

	MFI
AUC	0.576
Cut off point	> 0.136
Sensitivity	56.8%
Specificity	54%
Accuracy	55.2%
P	0.028*

AUC: Area under curve, PPV: positive predictive value, NPV: Negative predictive value.

We furtherly divided the cases according to the time interval between fracture and surgery into two groups: Group A included 237 patients who had an interval ≤ 5 days, and group B included 44 patients who had longer intervals (> 5 days). Patients in group II had significantly older age compared to group I (51 vs. 40 years, respectively – $p < 0.001$). Nonetheless, gender distribution was comparable between the two groups ($p = 0.848$), as women represented 57% and 56.8% of cases in groups I and II respectively, whereas the remaining cases were men. Patients with longer intervals had lower GCS and higher MFI compared to patients with shorter intervals ($p < 0.05$). The former had median values of 10 and 8, while the latter had median values of 0.09 and 0.193 in groups I and II, respectively. The cause of trauma did not significantly differ between the two groups ($p = 0.086$), with FFH the most common cause in both groups. However, the prevalence of penetrating injuries was significantly higher in patients with longer intervals (65.9% vs. 42.6% in group I – $p < 0.01$). There was no significant difference between the two groups as regards the location of the femoral fracture ($p = 0.620$). The shaft region was the most commonly affected region in both groups. The presence of associated skeletal or soft tissue injuries increased significantly in association with longer intervals ($p = 0.001$ and 0.008, respectively). Associated fractures were present in 39.7% and 68.2% of cases, while non-skeletal injuries were present in 48.1% and 77.3% of cases in groups I and II, respectively (Table 5).

Table (5): Analysis of the demographic data, GCS, MFI, mode of trauma, type of trauma, site of fracture in the cases according to fracture to surgery/fixation interval

Items	**Group I (≤ 5 days) n = 237**	**Group II (> 5 days) n = 44**	**p-value**
Age (years)	40 (18-78)	51 (25-97)	**< 0.001***
Sex			
• Male	102 (43%)	19 (43.2%)	**0.**848
• Female	135 (57%)	25 (56.8%)	
GCS	10 (7-15)	8 (3-13)	**< 0.001***
MFI	0.09 (0 - 0.727)	0.193 (0.09 – 0.727)	**0.010***
Mode of trauma			
• Road traffic accidents (RTA)	67 (28.3%)	11 (25%)	**0.**086
• Falling from height (FFH)	89 (37.6%)	15 (34.1%)	
• Assault	71 (30%)	10 (22.7%)	
• Pathological fractures	10 (4.2%)	8 (18.2%)	
Type of trauma			
• Blunt trauma	136 (57.4%)	15 (34.1%)	**< 0.001***
• Penetrating trauma	101 (42.6%)	29 (65.9%)	
Site of fracture			
• Proximal end and neck	50 (21.1%)	9 (20.5%)	**0.**620
• Shaft	129 (54.4%)	24 (54.5%)	
• Distal end	52 (21.9%)	11 (25%)	
Associated fractures	94 (39.7%)	30 (68.2%)	**0.001***
Associated non-skeletal injuries	114 (48.1%)	34 (77.3%)	**0.008***

*: Statistically significant ($p \leq 0.05$)

DISCUSSION

Doctors who are attempting to control healthcare costs face a challenge because the length of hospital stays is a quantitative and potentially controllable component of healthcare spending. The average cost of extending a patient's stay by 1 day differs by hospital, with an estimate of $2000 per day for orthopedic surgery patients at a major level made recently (trauma center I) [13, 14]. The current study was conducted to elucidate average hospitalization period and risk factors for prolonged hospitalization in patients undergoing surgical fixation for femur fractures. We enrolled 281 patients diagnosed with femur fractures, and managed by surgical fixation. In our study, the duration of hospitalization ranged between 1 and 23 days (mean = 10.4). According to **Aizpuru *et al.*** [12], the 321 patients who were analyzed had an average hospital stay of 11.12 days (with a range of 1-76 days). In another study, **Pendleton** [9] reported that the average hospitalization period was 3.9 days (range, 1–10) for their included 102 patients with femoral fractures [9].

In the current study, old age was a significant risk factor for longer hospitalization as patients with hospital stay > 7 days had a median age of 46 years, compared to 39 years in the other group with shorter hospitalization (p = 0.006). Of course, older age is expected to be associated with medical comorbidities that increase patient frailty and leads to prolonged hospitalization. Similar to our findings, **Aizpuru *et al.*** [12] agrees with our findings as the authors noted a significant increase in patients age in the group that stayed more than six days (42.1 vs. 36.9 years in patients with shorter stay – p = 0.004). On the other hand, **Papalia and his associates** [15] reported that age had no significant impact on the duration of hospitalization in patients undergoing orthopedic hip surgery (p = 0.410). **Zhang *et al.*** reported similar findings [16].

In the current study, gender distribution didn't have a considerable impact on the duration of hospitalization (p = 0.102). Similarly, another study reported no significant impact of age on the duration of hospitalization (p > 0.05) [13]. Also, other study reported similar findings regarding gender (p = 0.236) [15]. On the other hand, **Burn and his associates** [17] reported that male sex was accompanied by significantly shorter stays for primary orthopedic approaches.

In the current study, the type of trauma had a significant impact on hospitalization period (p=0.001), as penetrating injuries were more common in patients with longer hospitalization (58.7% vs. 31% in patients with shorter hospitalization – p = 0.001). In contrast to the findings, **Aizpuru *et al.*** [12] recorded that there was a significant increase in the prevalence of blunt injuries in association with patients who stayed more than six days (92.98% vs. 68.67% of cases who had shorter hospitalization period – p < 0.001).

In the current study, the location of the fracture was statistically comparable between the two study groups (p = 0.881). The shaft was the most commonly fractures region in both groups (55.6% and 57.4% of cases in groups I and II respectively). In agreement with our findings, another study negated any significant impact of fracture location on the duration of hospitalization (p = 0.10), that involved the diaphysis in most cases in patients with short and long hospitalization period groups [12].

In the current study, there was a significant increase in the MFI in association with prolonged hospitalization (0.181 vs. 0.09 in patients with shorter hospitalization – p = 0.013). These outcomes were explained by the fact that patients with systemic comorbidities have lower overall functional status, which necessitates a longer postoperative period to fully recover their ability to walk with crutches without therapist assistance or supervision [18]. The MFI has been demonstrated in major database researches to be an efficient risk assessment tool in total knee arthroplasty (TKA) [19], and total hip arthroplasty [20]. Presurgical risk assessment has historically relied on objective rating scales for injury severity, mental condition, and vital signs in the context of orthopedic trauma, but medical co-morbidities have been taken into account in subjective terms. The MFI, a quantitative indicator of physiological drop, can be used to more precisely gauge patients' risk of unfavorable outcomes, like an extended length of stay [21, 22]. In the same context, another research recorded a significant increase in the prevalence of frailty (measured by MFI > 0.36) in patients who stayed more than six days after femur fractures (5.84% vs. 0.07% in patients with shorter hospitalization periods – p = 0.01) [12].

In addition, diabetes mellitus, HTN, heart failure, and chronic pulmonary disease were listed as risk factors for prolonged hospitalization following common orthopedic procedures by **Gholson *et al.*** (p < 0.05) [13]. All of these comorbidities are components of the MFI, which agree with our findings. Additionally, a review of the literature revealed that there is evidence linking the overall comorbidity burden to an extended length of hospitalization for patients who have had total hip arthroplasty [18].

In the current study, using a cut-off value of 0.576 for the MFI, it had a 56.8% sensitivity and a 54% specificity for predicting longer hospitalization (more than one week) in patients with femoral fractures. No previous studies have evaluated the predictability of MFI for hospitalization period in femur fracture patients. Nevertheless, there is room for intervention because it is simple to obtain a patient's MFI at admission. On the use of MFI, numerous quality improvement projects could be envisioned. The MFI could be incorporated into electronic medical reports, providing providers with immediate knowledge about the risks associated with their patients. Cases with a high MFI may be flagged for more cautious comorbidity management and enrolled in a streamlined discharge procedure that starts on the first day of admission.

In the present study, patients with longer hospitalization period had significantly higher GCS on admission compared to patients with shorter hospitalization ($p = 0.001$). Likewise, another study reported a significant decline in GCS measurements in patients who stayed more than six days after femur fractures (13.54 vs. 14.7 in patients with shorter hospitalization – $p < 0.001$) [12].

In the current study, patients with longer hospitalization had significantly longer time intervals between the fracture and surgery (3 vs. 1 day in patients with shorter hospitalization – $p < 0.001$). According to the data gathered, earlier definitive fixation can shorten hospital stays. That findings could carry some bias for our results, as the extra tie needed before surgical fixation might be needed to stabilize patient condition and improve nutritional status, or manage more serious injury. Thus, the delay could not be explained by the femur fracture only. That highlights the importance of multidisciplinary team involving members experienced in every injured anatomical region to enhance patient outcomes. Although the timing of femur fracture fixation in polytrauma cases has been considered as a matter of controversy in the past, research evidence has favored early fixation [23, 24]. It has been demonstrated that quick fracture fixation can lessen swelling at the fracture area, lessen pain and the need for narcotics, encourage early mobilization, and ultimately improve pulmonary function [25, 26]. **Aizpuru *et al.*** [12] noted a significant elongation in the time interval between injury and fixation in patients who stayed six days or more (3.27 vs. 0.82 days in patients who had shorter hospitalization period – $p < 0.001$). **Pendelton and his colleagues** [9] reported similar findings, as the hospitalization period had mean valued of 4.94 and 3.74 days in patients who presented > and < 24 hours after injury, respectively.

Our findings showed that ICU admission was statistically identical between the two groups ($p = 0.138$). Nevertheless, the need for ICU admission increased in patients with prolonged hospitalization (23.9% vs. 16.7% in patients who had shorter hospitalization). It is reasonable that ICU admission is more needed in critical cases with serious trauma or associated significant systemic comorbidity, which definitely increase patient hospitalization with any surgical intervention.

In the current study, the need for mechanical ventilation showed a significant increase in patients with longer hospitalization (20% vs. 9.5% in patients with shorter hospitalization – $p = 0.015$). Although no previous studies have evaluated that association, it is reasonable that patients requiring respiratory support will require longer hospital stay compared to patients who did not. That time is consumed in the mechanical ventilation days, and post ventilation respiratory care.

In the current study, we also divided the included patients into two groups based on how long it took from injury to fixation: Group I included patients with an interval of less than five days, while group II included patients with longer intervals. As far as we know, no prior research had made that comparison.

CONCLUSION

We concluded that the average hospitalization period after femur fractures was 10.4 days (range, 1 – 23). Factors that increase the risk of longer hospitalization (more than one week) included older age, long time interval between injury and fixation, low GCS, high MFI, associated skeletal or non-skeletal injuries, penetrating injuries, and need for mechanical ventilation.

RECOMMENDATIONS

When trying to reduce length of stay in the orthopedic patient population, trauma team members should concentrate on preoperative optimization of such predisposing factors, perioperative protocol development for management in the peri-operative period, and targeted patient education during all care phases.

LIMITATIONS: Our research has some drawbacks. It comprised a comparatively small sample size drawn from just one emergency facility. In the near future, more patients from various emergency centers should be examined.

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