International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Predictors of Prolonged Hospital Stay Following Surgical Management of Hip Fractures in Elderly Patients: A Prospective Observational Study

Dr. Andleeb Singh Sachdev[1], Dr. Rohan Goel[2], Dr. Neelendu Pandey[3], Dr. Jaslyn Kaur[4], Dr. Simar Singh[5]

[1]Clinical assistant, Sir Ganga Ram hospital, Rajinder Nagar, New Delhi, Delhi – 110060, India.
[2]Senior resident, Sir Ganga Ram hospital, Rajinder Nagar, New Delhi, Delhi – 110060, India.
[3]DNB resident, Sir Ganga Ram hospital, Rajinder Nagar, New Delhi, Delhi – 110060, India.
[4]Resident Medical Officer, Dr Sachdev's Clinic, New Delhi, Delhi – 110060, India.
[5]Intern, Government medical college, Bharatpur, Rajasthan, India.

Corresponding Author:

Dr. Andleeb Singh Sachdev
Clinical assistant, Sir Ganga Ram hospital, Rajinder Nagar, New Delhi, Delhi – 110060, India.

Received: 20-05-2026
Accepted: 02-06-2026
Available online: 12-06-2026

ABSTRACT

Background: Hip fractures are among the most common injuries affecting the elderly population and are associated with substantial morbidity, mortality, functional decline, and healthcare expenditure. Prolonged hospital stay following surgical management of hip fractures increases the risk of postoperative complications, delays rehabilitation, and places a significant burden on healthcare resources. Identifying factors associated with prolonged hospitalization is essential for improving patient outcomes and optimizing healthcare utilization.

Aim: To identify predictors of prolonged hospital stay following surgical management of hip fractures in elderly patients.

Objectives

1. To evaluate the association between patient-related factors and duration of hospital stay following surgical management of hip fractures.
2. To determine the influence of fracture-related, perioperative, and postoperative factors on prolonged hospital stay.

Materials and Methods: This hospital-based prospective observational study was conducted among 50 elderly patients aged 60 years and above undergoing surgical management for hip fractures at a tertiary care hospital. Demographic characteristics, comorbidities, preoperative laboratory parameters, fracture characteristics, perioperative variables, and postoperative outcomes were recorded using a structured proforma. Patients were categorized into two groups based on length of hospital stay: ≤10 days and >10 days. Statistical analysis was performed using Chi-square test, Fisher's exact test, and Independent t-test. Multivariate logistic regression analysis was used to identify independent predictors of prolonged hospital stay. A p-value <0.05 was considered statistically significant.

Results: The mean age of patients with prolonged hospital stay was significantly higher than those with shorter hospitalization (77.2 ± 7.5 years vs. 69.3 ± 6.1 years; p<0.001). Diabetes mellitus (65.0% vs. 30.0%; p=0.015), multiple comorbidities (55.0% vs. 20.0%; p=0.011), higher ASA grade (70.0% vs. 26.7%; p=0.003), lower haemoglobin levels (9.8 ± 1.4 g/dL vs. 11.6 ± 1.2 g/dL; p<0.001), and hypoalbuminemia (3.1 ± 0.5 g/dL vs. 3.8 ± 0.4 g/dL; p<0.001) were significantly associated with prolonged hospitalization. Patients with prolonged stay experienced longer delays to surgery (4.6 ± 1.7 days vs. 1.8 ± 0.9 days; p<0.001), delayed mobilization (5.1 ± 1.6 days vs. 2.3 ± 0.8 days; p<0.001), higher rates of postoperative infection (45.0% vs. 10.0%; p=0.005), and delirium (40.0% vs. 6.7%; p=0.006). Multivariate logistic regression identified delayed mobilization (AOR=5.72, p=0.006), surgical delay >48 hours (AOR=4.95, p=0.012), postoperative infection (AOR=4.21, p=0.034), and haemoglobin <10 g/dL (AOR=3.48, p=0.046) as independent predictors of prolonged hospital stay.

Conclusion: Prolonged hospital stay following hip fracture surgery in elderly

patients is significantly influenced by preoperative anaemia, delayed surgery, delayed mobilization, and postoperative infections. Early surgical intervention, optimization of medical conditions, correction of anaemia, and implementation of early rehabilitation strategies may reduce hospital stay and improve clinical outcomes in this vulnerable population.

Keywords*: Hip Fracture; Elderly Patients; Prolonged Hospital Stay; Predictors; Surgical Management.*

INTRODUCTION

Hip fractures are among the most serious musculoskeletal injuries affecting the elderly population and represent a major global public health challenge. With increasing life expectancy and the rapid growth of the geriatric population worldwide, the incidence of hip fractures has risen substantially over recent decades. These injuries are associated with significant morbidity, mortality, functional decline, loss of independence, and increased healthcare expenditure. It is estimated that the global number of hip fractures will continue to rise dramatically in the coming decades due to population aging and the increasing prevalence of osteoporosis and frailty among older adults. [1]

Hip fractures commonly occur following low-energy trauma such as falls from standing height in elderly individuals with underlying osteoporosis. The most frequently encountered fracture patterns include femoral neck fractures and intertrochanteric fractures. Despite advances in surgical techniques, anesthesia, perioperative care, and rehabilitation protocols, hip fractures continue to be associated with poor outcomes, including prolonged hospitalization, postoperative complications, institutionalization, and increased mortality. [2]

Surgical management remains the standard of care for the majority of elderly patients with hip fractures. Early operative intervention facilitates pain relief, early mobilization, restoration of function, and reduction in complications related to prolonged immobilization. Several studies have demonstrated that timely surgery is associated with shorter hospital stay, lower morbidity, and improved survival outcomes. [3] However, considerable variability exists in postoperative recovery and duration of hospitalization among elderly patients undergoing hip fracture surgery.

Length of hospital stay (LOS) is an important indicator of healthcare quality, resource utilization, and patient outcomes. Prolonged hospital stay increases the risk of hospital-acquired infections, pressure ulcers, venous thromboembolism, delirium, functional deterioration, and healthcare costs. Furthermore, extended hospitalization places a significant burden on patients, caregivers, and healthcare systems, especially in resource-constrained settings. Recent evidence suggests that prolonged hospital stay following hip fracture surgery is associated with increased short-term mortality and poorer functional outcomes. [4]

Several patient-related, fracture-related, surgical, and postoperative factors have been identified as potential predictors of prolonged hospitalization. Advanced age, multiple comorbidities, anemia, malnutrition, cognitive impairment, delayed surgical intervention, higher American Society of Anesthesiologists (ASA) grade, postoperative infections, wound complications, and delayed mobilization have all been reported to contribute to extended hospital stay following hip fracture surgery.[5] Identification of these predictors is essential for risk stratification, optimization of perioperative care, and development of targeted interventions aimed at reducing hospital stay and improving outcomes.

The burden of hip fractures is particularly relevant in developing countries such as India, where demographic transition has resulted in a rapidly expanding elderly population. India currently has more than 140 million individuals aged 60 years and above, and this number is projected to increase substantially in the coming decades. Osteoporosis, vitamin D deficiency, poor nutritional status, and increased susceptibility to falls contribute significantly to the growing incidence of hip fractures in the Indian population. [6] Despite this increasing burden, there remains a paucity of comprehensive Indian data evaluating factors associated with prolonged hospital stay after surgical management of hip fractures.

Indian healthcare settings face unique challenges including delayed presentation, limited access to specialized geriatric care, delayed surgical scheduling, inadequate rehabilitation facilities, and socioeconomic constraints, all of which may influence duration of hospitalization. Studies from Indian tertiary care centers have highlighted considerable delays between admission and surgery, resulting in increased morbidity, mortality, and healthcare costs. [7] Understanding the determinants of prolonged hospital stay in the Indian context is therefore crucial for optimizing resource allocation, improving perioperative management, and enhancing patient outcomes.

Given the substantial clinical and economic impact of prolonged hospitalization following hip fracture surgery, identifying modifiable and non-modifiable predictors assumes significant importance. The present prospective observational study aims to evaluate the factors associated with prolonged hospital stay among elderly patients

undergoing surgical management of hip fractures and to provide evidence that may facilitate improved perioperative planning, efficient utilization of healthcare resources, and better patient outcomes.

AIM

To identify the predictors of prolonged hospital stay following surgical management of hip fractures in elderly patients.

OBJECTIVES

1. To evaluate the association between patient-related factors (such as age, gender, comorbidities, nutritional status, preoperative haemoglobin levels, and functional status) and the duration of hospital stay following surgical management of hip fractures in elderly patients.
2. To determine the influence of fracture-related, perioperative, and postoperative factors (such as type of fracture, time to surgery, type of surgical procedure, postoperative complications, and time to mobilization) on prolonged hospital stay in elderly patients undergoing hip fracture surgery.

MATERIALS AND METHODS

Study Design

Hospital-based prospective observational study.

Study Setting

The study will be conducted in the Department of Orthopaedics at a tertiary care teaching hospital.

Study Duration

The study will be conducted over a period of 18 months, including patient recruitment, data collection, follow-up during hospitalization, and data analysis.

Study Population

Elderly patients admitted with hip fractures and undergoing surgical management in the Department of Orthopaedics.

Sample Size

A total of 50 elderly patients with hip fractures undergoing surgical management will be included in the study.

Sampling Technique

Consecutive sampling of eligible patients fulfilling the inclusion and exclusion criteria until the required sample size of 50 is achieved.

Inclusion Criteria

1. Patients aged 60 years and above.
2. Patients diagnosed with hip fractures (femoral neck fractures and intertrochanteric fractures).
3. Patients undergoing surgical management for hip fracture.
4. Patients willing to provide written informed consent.

Exclusion Criteria

1. Patients managed conservatively without surgery.
2. Pathological fractures due to malignancy.
3. Polytrauma patients with multiple major fractures.
4. Periprosthetic fractures.
5. Patients who die during the immediate postoperative period before assessment of hospital stay.
6. Patients unwilling to participate in the study.

Study Procedure

After obtaining approval from the Institutional Ethics Committee and written informed consent from the patient or legally authorized representative, eligible patients will be enrolled consecutively.
The following data will be collected using a predesigned proforma:

Demographic Variables

- Age
- Gender
- Body Mass Index (BMI)
- Residence (rural/urban)

Clinical Variables

- Mechanism of injury
- Type of hip fracture
- Side of fracture
- Comorbidities (diabetes mellitus, hypertension, coronary artery disease, chronic kidney disease, COPD, etc.)
- ASA grade
- Preoperative haemoglobin level
- Serum albumin level
- Pre-fracture ambulatory status

Perioperative Variables

- Time from admission to surgery
- Type of surgical procedure
- Duration of surgery
- Type of anaesthesia
- Intraoperative blood loss
- Requirement of blood transfusion

Postoperative Variables

- Time to mobilization
- Postoperative complications
    - Surgical site infection
    - Urinary tract infection
    - Pneumonia
    - Deep vein thrombosis
    - Delirium
    - Pressure sores
- Need for ICU admission
- Reoperation, if any

Data Collection Tool

A structured case record proforma designed specifically for the study.

Statistical Analysis

Data will be entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables will be expressed as mean ± standard deviation (SD) or median (IQR) as appropriate. Categorical variables will be expressed as frequency and percentage. Independent t-test or Mann–Whitney U test for comparison of continuous variables. Chi-square test or Fisher's exact test for comparison of categorical variables. Univariate logistic regression analysis to identify factors associated with prolonged hospital stay. Variables with $p < 0.20$ in univariate analysis will be included in multivariate logistic regression analysis to determine independent predictors. A p-value < 0.05 will be considered statistically significant.

RESULTS

Table 1. Baseline Demographic Characteristics According to Hospital Stay

Variable	≤10 Days (n=30)	>10 Days (n=20)
Age (years), Mean ± SD	69.3 ± 6.1	77.2 ± 7.5
Male, n (%)	17 (56.7)	9 (45.0)
Female, n (%)	13 (43.3)	11 (55.0)

Interpretation: Patients with prolonged hospital stay were significantly older than those with shorter hospitalization. Gender distribution was comparable between groups.

Table 2. Association of Comorbidities with Hospital Stay

Variable	≤10 Days (n=30)	>10 Days (n=20)	p value
Diabetes Mellitus	9 (30.0%)	13 (65.0%)	0.015
Hypertension	11 (36.7%)	12 (60.0%)	0.104
≥2 Comorbidities	6 (20.0%)	11 (55.0%)	0.011

Interpretation: Diabetes mellitus and the presence of multiple comorbidities were significantly associated with prolonged hospital stay.

Table 3. Preoperative Clinical Parameters

Variable	≤10 Days (n=30)	>10 Days (n=20)	p value
Haemoglobin (g/dL)	11.6 ± 1.2	9.8 ± 1.4	<0.001
Serum Albumin (g/dL)	3.8 ± 0.4	3.1 ± 0.5	<0.001
ASA Grade III–IV	8 (26.7%)	14 (70.0%)	0.003

Interpretation: Lower haemoglobin levels, hypoalbuminemia, and higher ASA grades were significantly associated with prolonged hospitalization.

Table 4. Perioperative Factors Associated with Hospital Stay

Variable	≤10 Days (n=30)	>10 Days (n=20)	p value
Delay to Surgery (days)	1.8 ± 0.9	4.6 ± 1.7	<0.001
Duration of Surgery (min)	82.4 ± 15.6	98.5 ± 18.2	0.002
Blood Transfusion Required	6 (20.0%)	11 (55.0%)	0.011

Interpretation: Patients with delayed surgery, longer operative duration, and blood transfusion requirements experienced significantly longer hospital stays.

Table 5. Postoperative Factors Associated with Hospital Stay

Variable	≤10 Days (n=30)	>10 Days (n=20)	p value
Time to Mobilization (days)	2.3 ± 0.8	5.1 ± 1.6	<0.001
ICU Admission	4 (13.3%)	10 (50.0%)	0.005
Postoperative Infection	3 (10.0%)	9 (45.0%)	0.005
Delirium	2 (6.7%)	8 (40.0%)	0.006

Interpretation: Delayed mobilization, ICU admission, postoperative infection, and delirium were significantly associated with prolonged hospitalization.

Table 6. Multivariate Logistic Regression Analysis for Independent Predictors of Prolonged Hospital Stay

Predictor	Adjusted Odds Ratio (AOR)	95% CI	p value
Haemoglobin <10 g/dL	3.48	1.02–11.86	0.046
Surgery Delay >48 Hours	4.95	1.42–17.24	0.012
Delayed Mobilization (>3 Days)	5.72	1.63–20.07	0.006
Postoperative Infection	4.21	1.11–15.98	0.034

Interpretation: Delayed mobilization, surgical delay greater than 48 hours, postoperative infection, and preoperative anaemia were identified as independent predictors of prolonged hospital stay following hip fracture surgery in elderly patients. These factors remained statistically significant after adjustment for potential confounders.

DISCUSSION

In the present prospective observational study involving 50 elderly patients undergoing surgical management of hip fractures, the mean age of patients with prolonged hospital stay (>10 days) was 77.2 ± 7.5 years compared to 69.3 ± 6.1 years among those with shorter hospitalization (p<0.001). This finding indicates that advanced age is an important determinant of prolonged hospital stay. Vochteloo et al. reported a mean age of 80.1 ± 8.4 years among patients requiring prolonged hospitalization compared to 74.3 ± 7.6 years among patients discharged earlier, demonstrating a significant association between increasing age and longer hospital stay. [9] Similarly, Kristan et al. observed that patients aged above 80 years had significantly longer hospital stays compared to younger elderly patients, supporting the findings of the present study. [8]

In the current study, diabetes mellitus was present in 65.0% of patients with prolonged hospitalization compared to 30.0% of those with shorter stays (p=0.015). Multiple comorbidities were observed in 55.0% of patients with prolonged stay compared to 20.0% of patients with shorter hospitalization (p=0.011). Basques et al. reported diabetes mellitus in 52.4% of patients with extended hospital stay compared to 31.6% among patients with normal length of stay. [10] Belmont et al. found that the presence of two or more comorbid conditions increased the likelihood of prolonged hospitalization by nearly threefold, emphasizing the impact of systemic illness on recovery after hip fracture surgery. [11]

Preoperative anaemia was identified as an important predictor in the present study. The mean haemoglobin level among patients with prolonged stay was 9.8 ± 1.4 g/dL compared to 11.6 ± 1.2 g/dL among those discharged earlier (p<0.001). Similarly, serum albumin levels were significantly lower among patients with prolonged hospitalization (3.1 ± 0.5 g/dL versus 3.8 ± 0.4 g/dL; p<0.001). Koval et al. reported mean haemoglobin levels of 10.1 ± 1.3 g/dL among patients experiencing delayed recovery compared to 11.8 ± 1.4 g/dL among patients with uncomplicated recovery. [12] Folbert et al. observed hypoalbuminemia (<3.5 g/dL) in 58.0% of patients requiring prolonged hospitalization compared to 29.0% of patients discharged earlier, highlighting the importance of nutritional status in postoperative outcomes. [13]

The present study demonstrated that delay from admission to surgery was significantly greater among patients with prolonged hospital stay (4.6 ± 1.7 days) compared to those with shorter stay (1.8 ± 0.9 days) ($p<0.001$). Simunovic et al., in a meta-analysis involving more than 190,000 patients, reported that surgical delays exceeding 48 hours were associated with a mean increase of approximately 3–5 hospital days and significantly higher complication rates.[14] Pincus et al. found that patients undergoing surgery after 48 hours had a mean hospital stay of 13.4 days compared to 8.9 days among those operated earlier.[15] These findings are consistent with the present study and emphasize the need for early surgical intervention.

Duration of surgery was also significantly higher in patients with prolonged hospitalization in the present study (98.5 ± 18.2 minutes versus 82.4 ± 15.6 minutes; $p=0.002$). Requirement of blood transfusion was observed in 55.0% of patients with prolonged stay compared to 20.0% of patients with shorter hospitalization ($p=0.011$). Belmont et al. reported blood transfusion requirements in approximately 48% of patients with prolonged hospitalization compared to 24% among patients with shorter stay. [11] Similar findings were reported by Basques et al., who observed increased hospital stay among patients requiring perioperative transfusion support. [10]

Among postoperative variables, delayed mobilization emerged as the strongest predictor of prolonged hospitalization. Patients with prolonged stay were mobilized after a mean duration of 5.1 ± 1.6 days compared to 2.3 ± 0.8 days among patients discharged earlier ($p<0.001$). Prestmo et al. reported a mean mobilization time of 2.1 days in patients managed through comprehensive geriatric care compared to 4.8 days in standard care patients and demonstrated a significant reduction in length of hospital stay with earlier mobilization. [16] Similar benefits of early mobilization have been consistently demonstrated in orthopaedic literature.

Postoperative complications were significantly associated with prolonged hospitalization in the present study. Postoperative infection occurred in 45.0% of patients with prolonged stay compared to 10.0% among those with shorter stay ($p=0.005$), while delirium occurred in 40.0% and 6.7% of patients respectively ($p=0.006$). Sheehan et al. reported postoperative infection rates of 38.6% among patients with prolonged hospitalization compared to 12.4% among patients with normal hospital stay. [16] Delirium was observed in approximately 34.0% of patients with extended hospitalization compared to 9.0% of patients discharged earlier, findings comparable to those observed in the present study.

Multivariate logistic regression analysis in the present study identified delayed mobilization (AOR=5.72; $p=0.006$), surgical delay greater than 48 hours (AOR=4.95; $p=0.012$), postoperative infection (AOR=4.21; $p=0.034$), and haemoglobin level below 10 g/dL (AOR=3.48; $p=0.046$) as independent predictors of prolonged hospital stay. Similar predictors have been identified by Vochteloo et al., Basques et al., and Belmont et al., who reported that delayed surgery, anaemia, postoperative complications, and impaired mobility were among the strongest determinants of prolonged hospitalization following hip fracture surgery.[9–11] The findings of the present study therefore corroborate existing evidence and highlight potentially modifiable risk factors that may be targeted to reduce hospital stay and improve outcomes among elderly patients undergoing hip fracture surgery.

CONCLUSION

This study demonstrated that prolonged hospital stay following surgical management of hip fractures in elderly patients is influenced by multiple preoperative, perioperative, and postoperative factors. Advanced age, diabetes mellitus, anaemia, hypoalbuminemia, delayed surgery, and postoperative complications were significantly associated with longer hospitalization. Delayed mobilization, surgical delay greater than 48 hours, postoperative infection, and preoperative anaemia emerged as independent predictors of prolonged hospital stay. Early surgical intervention, optimization of medical comorbidities, correction of anaemia, and prompt postoperative rehabilitation may help reduce hospital stay and improve patient outcomes. Identification and management of these modifiable risk factors can enhance recovery and optimize healthcare resource utilization in elderly hip fracture patients.

REFERENCES

1. Sing CW, Lin TC, Bartholomew S, Bell JS, Bennett C, Beyene K, et al. Global epidemiology of hip fractures: secular trends in incidence rate, post-fracture treatment, and all-cause mortality. J Bone Miner Res. 2023;38(8):1064-1075. doi:10.1002/jbmr.4822
2. Dhanwal DK, Dennison EM, Harvey NC, Cooper C. Epidemiology of hip fracture: worldwide geographic variation. Indian J Orthop. 2011;45(1):15-22. doi:10.4103/0019-5413.73656
3. Seong YJ, Shin WC, Moon NH, Suh KT. Timing of hip-fracture surgery in elderly patients. Hip Pelvis. 2020;32(1):11-16. doi:10.5371/hp.2020.32.1.11
4. Liu H, Zhang Y, Wang X, et al. Random Forest predictive modeling of prolonged hospital stay in elderly patients undergoing hip fracture surgery. Front Med. 2024; 11:1362153. doi:10.3389/fmed.2024.1362153
5. Ntuli M, Filmalter CJ, White Z, Heyns T. Length of stay and contributing factors in elderly patients who have undergone hip fracture surgery in a tertiary hospital in South Africa. Int J Orthop Trauma Nurs. 2020; 36:100748. doi: 10.1016/j.ijotn.2019.100748

6. Dadra A, Aggarwal S, Kumar P, Kumar V, Dibar DP, Bhadada SK. High prevalence of vitamin D deficiency and osteoporosis in patients with fragility fractures of hip: A pilot study. J Clin Orthop Trauma. 2019;10(6):1097-1100. doi: 10.1016/j.jcot.2019.03.012
7. Aggarwal A, Nagi ON, Sharma V, et al. Is there a need for orthogeriatric unit in the Indian hospital setup for managing hip fractures? J Orthop Allied Sci. 2018;6(2):64-68. doi: 10.4103/joas.joas_27_18