**ORIGINAL RESEARCH**

# Assessing Functional Outcomes in Geriatric Patients After Hip Fracture Surgery: An Observational Study

[1]Dr. Vishant Gawri, [2]Dr. Siddharth Gupta

[1]Assistant Professor, Department of Orthopaedics, F H Medical College, Tundla, Firozabad, U.P, India
[2]Assistant Professor, Department of Orthopaedics, Krishna Mohan Medical College & Hospital, Mathura, U.P, India

**Corresponding Author**
Dr. Siddharth Gupta
Assistant Professor, Department of Orthopaedics, Krishna Mohan Medical College & Hospital, Mathura, U.P, India

Received: 14 January, 2022 Accepted: 18 February, 2022

**ABSTRACT**

**Aim:** This study aimed to assess functional outcomes in geriatric patients following hip fracture surgery and to identify key demographic, clinical, and surgical factors influencing recovery trajectories. **Material and Methods:** This was an observational, prospective cohort study conducted over one year in the Orthopedic Department. A total of 100 geriatric patients aged ≥65 years who underwent hip fracture surgery were included using purposive sampling. Data were collected using demographic questionnaires, the Modified Barthel Index (MBI), Timed Up and Go Test (TUG), Harris Hip Score (HHS), and Visual Analog Scale (VAS). Radiological evaluations and complication tracking were performed during follow-ups at 1 month, 3 months, and 6 months. Statistical analysis was conducted using SPSS version 25.0, with significance set at $p<0.05$. **Results:** The majority of participants were aged 65–74 years (45%) and female (62%). Surgical procedures included hemiarthroplasty (45%), total hip arthroplasty (35%), and internal fixation (20%). Functional scores improved significantly over time, with MBI increasing from 45.5 ± 12.3 at baseline to 85.4 ± 9.6 at 6 months, TUG improving from 28.4 ± 5.5 to 16.7 ± 3.4 seconds, and HHS rising from 45.2 ± 7.5 to 85.3 ± 6.5. Pain levels decreased steadily. Radiological assessments showed 95% correct implant positioning and 95% fracture healing by 6 months. Complications included surgical site infections (5%), delayed healing (7%), and deep vein thrombosis (4%). Age, BMI, time to surgery, and hospital stay were identified as significant predictors of functional recovery. **Conclusion:** This study emphasizes the importance of early surgical intervention, optimal hospital stay, and comprehensive rehabilitation in improving postoperative functional outcomes in geriatric patients. A multidisciplinary approach remains essential for addressing clinical and functional needs, reducing complications, and enhancing overall recovery.

**Keywords:** Geriatric patients, Hip fracture surgery, Functional outcomes, Rehabilitation, Predictive factors.



## INTRODUCTION

Hip fractures in geriatric patients represent a significant public health concern due to their profound impact on mobility, independence, and overall quality of life. With the global population aging rapidly, the incidence of hip fractures has seen a corresponding rise, placing an increased burden on healthcare systems worldwide. These fractures are often considered a life-altering event for elderly individuals, leading to prolonged hospital stays, functional decline, and, in many cases, permanent disability. Beyond the immediate physical consequences, hip fractures are also associated with increased morbidity, mortality, and significant financial costs to healthcare providers and families.[1-4]Geriatric patients, defined as individuals aged 65 years and older, are particularly vulnerable to hip fractures due to age-related physiological changes, decreased bone density, poor balance, and increased susceptibility to falls. Osteoporosis, a condition characterized by weakened bones, is a primary contributing factor to hip fractures in this population. Additionally, comorbidities such as diabetes, cardiovascular diseases, and chronic respiratory conditions further complicate both the surgical intervention and the recovery process. Polypharmacy, cognitive impairment, and frailty also add layers of complexity to the management and rehabilitation of these patients.[5,6]Surgical intervention remains the mainstay of treatment for hip fractures in elderly patients, with options including hemiarthroplasty, total hip arthroplasty, and internal fixation. The choice of surgical procedure depends on

factors such as fracture type, patient health status, pre-fracture functional level, and surgeon expertise. While surgery aims to restore mobility and minimize pain, achieving successful outcomes in this age group requires a multifaceted approach that extends beyond the operating room. Effective perioperative care, early mobilization, comprehensive geriatric assessments, and targeted rehabilitation programs play crucial roles in determining recovery trajectories.[7-9]Despite advancements in surgical techniques and perioperative care, many geriatric patients experience delayed recovery and face challenges in regaining pre-fracture mobility and independence. Factors such as delayed time to surgery, prolonged hospital stays, nutritional deficiencies, and inadequate postoperative rehabilitation have been shown to negatively impact functional outcomes. Furthermore, complications such as infections, implant failure, deep vein thrombosis, and pressure ulcers remain significant concerns in this population. These complications not only prolong recovery but also increase healthcare costs and pose substantial emotional and physical burdens on both patients and their families.[10,11]Functional recovery after hip fracture surgery is often measured through parameters such as the Modified Barthel Index (MBI), Timed Up and Go Test (TUG), Harris Hip Score (HHS), and Visual Analog Scale (VAS) for pain assessment. These tools help healthcare professionals evaluate progress in activities of daily living (ADLs), mobility, joint function, and pain management. Radiological assessments also play a pivotal role in monitoring fracture healing and implant stability over time. Regular follow-up and ongoing assessments are critical for identifying potential complications early and ensuring optimal recovery outcomes.[12]Timely surgical intervention is one of the most significant predictors of successful recovery following a hip fracture. Studies have shown that surgery performed within 24 hours of injury is associated with better functional outcomes, shorter hospital stays, and reduced mortality rates. Conversely, delays in surgical intervention, whether due to medical instability or systemic healthcare inefficiencies, often result in poorer outcomes. Similarly, nutritional status, especially adequate levels of calcium and vitamin D, has been recognized as a crucial factor in bone healing and functional recovery.[13]The importance of a multidisciplinary approach cannot be overstated in the management of geriatric hip fractures. Orthopedic surgeons, geriatricians, anesthesiologists, physiotherapists, nurses, and nutritionists must work collaboratively to address the multifactorial challenges posed by these injuries. Comprehensive geriatric assessments, which consider both medical and social factors, are essential for optimizing preoperative, intraoperative, and postoperative care. Early mobilization programs, supported by tailored physical therapy sessions, have been shown to significantly improve recovery outcomes and reduce the risk of complications.[14]In addition to clinical and surgical factors, psychosocial aspects play a vital role in the recovery journey of geriatric patients. Depression, anxiety, fear of falling, and social isolation are common in this population and can hinder motivation and adherence to rehabilitation programs. Family support and caregiver involvement are crucial components of postoperative care, providing both emotional encouragement and practical assistance in daily activities.As healthcare systems grapple with the increasing incidence of hip fractures among the elderly, there is a growing need for evidence-based strategies to improve surgical outcomes, minimize complications, and enhance quality of life for these patients. Research focusing on predictors of functional recovery, optimal surgical timing, and effective rehabilitation protocols is essential for guiding clinical practice and resource allocation.[15]Hip fractures in geriatric patients remain a major healthcare challenge, necessitating a holistic and multidisciplinary approach to care. While surgical intervention is the cornerstone of treatment, recovery outcomes are heavily influenced by preoperative optimization, timely surgery, postoperative care, and rehabilitation efforts. Understanding the complex interplay of medical, functional, and psychosocial factors is key to improving recovery and ensuring that geriatric patients can regain their independence and maintain a good quality of life following hip fracture surgery.

## MATERIAL AND METHODS

This study was conducted as an observational, prospective cohort study aimed at assessing the functional outcomes in geriatric patients after hip fracture surgery. The study focused on evaluating recovery trajectories, functional independence, and factors influencing postoperative outcomes in elderly individuals.A total of 100 geriatric patients (aged ≥65 years) who underwent hip fracture surgery were included in the study. Purposive sampling was used to select participants meeting the inclusion criteria.

### Inclusion Criteria

1. Patients aged 65 years and above.
2. Diagnosed with hip fractures confirmed radiologically.
3. Underwent surgical intervention (e.g., hemiarthroplasty, total hip arthroplasty, or internal fixation).
4. Medically stable and able to participate in follow-up assessments.
5. Provided written informed consent or consent obtained from legal guardians if required.

### Exclusion Criteria

1. Patients with pathological fractures (e.g., metastatic bone disease).
2. Presence of severe cognitive impairment (e.g., advanced dementia).

3. Patients with multiple trauma injuries affecting other body parts.
4. Patients with pre-existing mobility limitations unrelated to the current hip fracture.
5. Patients lost to follow-up or unwilling to participate in postoperative evaluations.

**Data Collection Tools and Instruments**

Data collection involved multiple tools to ensure a comprehensive assessment of functional outcomes in geriatric patients after hip fracture surgery. Demographic and clinical data were collected using a structured questionnaire that included details such as age, sex, BMI, comorbidities, smoking and alcohol history, pre-fracture mobility status, and time to surgery. Functional outcomes were evaluated using standardized tools, including the Modified Barthel Index (MBI) to measure activities of daily living (ADLs), the Timed Up and Go Test (TUG) to assess mobility, and the Harris Hip Score (HHS) for evaluating hip joint function and overall functional recovery. Pain levels were assessed using the Visual Analog Scale (VAS) to quantify the severity of pain during recovery. Additionally, radiological assessments were performed postoperatively using X-rays to evaluate implant positioning and fracture healing at different follow-up intervals. Complications, such as infection, dislocation, and thromboembolism, were meticulously tracked and documented to identify potential barriers to recovery and guide clinical interventions.

**Data Collection Procedure**

Data collection was carried out in distinct phases to ensure accuracy and consistency throughout the study period. In the baseline assessment phase, preoperative data, including demographic information, medical history, and pre-fracture mobility status, were recorded. This phase provided a reference point for postoperative comparisons. During the in-hospital assessment phase, data regarding surgical details, duration of hospital stay, and immediate postoperative complications were documented. Patients were then subjected to follow-up assessments at 1 month, 3 months, and 6 months post-surgery, during which functional recovery was evaluated using tools such as the Modified Barthel Index (MBI), Timed Up and Go Test (TUG), and Harris Hip Score (HHS). Radiological evaluations were conducted at each follow-up visit using X-rays to assess fracture healing and implant stability, ensuring an objective measure of recovery progression.

**Statistical Analysis**

Statistical analysis was performed using SPSS version 25.0 to ensure accurate interpretation of the collected data. Descriptive statistics, including mean, standard deviation, frequency, and percentages, were employed to summarize demographic and clinical variables. Inferential statistical tests, such as paired t-tests and repeated-measures ANOVA, were used to compare functional outcomes across multiple follow-up time points and identify significant changes over time. Furthermore, multivariate regression analysis was conducted to identify predictors of better functional outcomes, accounting for demographic, clinical, and biochemical variables. A p-value $<0.05$ was considered statistically significant, establishing a robust statistical framework for deriving meaningful conclusions from the study findings.

## RESULTS

**Demographic and Clinical Characteristics (Table 1)**

The study included 100 geriatric patients aged ≥65 years who underwent hip fracture surgery. The majority of participants were in the 65-74 age group (45%), followed by 75-84 years (35%), and ≥85 years (20%). Females constituted a larger proportion (62%) compared to males (38%). The mean BMI distribution showed that 15% of participants were underweight (BMI <18.5 kg/m²), 60% had a normal BMI (18.5-24.9 kg/m²), and 25% were overweight or obese (≥25 kg/m²). Regarding lifestyle habits, 22% had a history of smoking, while 15% reported alcohol consumption. Among comorbidities, 55% had hypertension, 40% had diabetes, 30% had cardiovascular disease, and 18% had chronic respiratory disease. Additionally, 20% reported other chronic illnesses. These findings highlight the diverse baseline clinical and demographic profiles of geriatric patients undergoing hip fracture surgery.

**Pre-Fracture and Surgical Details (Table 2)**

Pre-fracture mobility assessment revealed that 65% of patients were independent, 25% required assisted devices, and 10% were bed or chair-bound before the injury. Time to surgery varied significantly, with 40% undergoing surgery within 24 hours, 35% between 24-48 hours, and 25% after 48 hours. Surgical intervention types included hemiarthroplasty (45%), total hip arthroplasty (35%), and internal fixation (20%). The length of hospital stay also varied, with 50% staying ≤7 days, 30% between 8-14 days, and 20% staying longer than 14 days. These findings suggest variability in surgical timelines and recovery pathways, which may influence postoperative outcomes.

**Functional Outcome Assessment (Table 3)**

Functional recovery was assessed at baseline, 1 month, 3 months, and 6 months post-surgery using the Modified Barthel Index (MBI), Timed Up and Go Test (TUG), Harris Hip Score (HHS), and Visual Analog Scale (VAS) for pain. The MBI score improved progressively, from 45.5 ± 12.3 at baseline to 85.4 ± 9.6 at 6 months, indicating significant improvement in activities of daily living (ADLs). Similarly, the TUG score improved from 28.4 ± 5.5 seconds at baseline to 16.7 ± 3.4 seconds at 6 months,

demonstrating enhanced mobility. The HHS improved significantly, from 45.2 ± 7.5 at baseline to 85.3 ± 6.5 at 6 months, reflecting better hip joint function and recovery. Pain levels, measured using the VAS score, showed a steady decline from 7.5 ± 1.2 at baseline to 2.0 ± 0.8 at 6 months, suggesting effective pain management throughout recovery.

**Radiological Assessment Findings (Table 4)**

Radiological outcomes were evaluated at 1 month, 3 months, and 6 months post-surgery. At 1 month, 90% had correct implant positioning, with 10% showing malposition. By 6 months, correct implant positioning improved to 95%, while malposition decreased to 5%. Fracture healing progressed over time, with 60% showing partial healing at 1 month, 80% showing significant healing at 3 months, and 95% achieving complete healing by 6 months. Complication rates reduced progressively across follow-ups. At 1 month, 85% had no complications, while 5% had infections, 3% experienced dislocation, and 7% had thromboembolism. By 6 months, 90% had no complications, with infections and dislocations reduced to 2% and 1%, respectively, and thromboembolism dropping to 4%. These results suggest favorable radiological outcomes with time, supporting effective surgical interventions.

**Complications Observed Post-Surgery (Table 5)**

Postoperative complications were documented in 19% of participants, with the majority (81%) experiencing no complications. The most common complications were surgical site infections (5%), followed by delayed healing (7%), deep vein thrombosis (4%), and implant dislocation (3%). The low complication rates observed indicate effective surgical and postoperative care, but they also highlight the importance of vigilant monitoring and early intervention to prevent adverse events.

**Predictors of Functional Recovery (Table 6)**

Multiple regression analysis identified age, BMI, time to surgery, and length of hospital stay as significant predictors of functional recovery following hip fracture surgery. Age ($\beta = -0.215$, $p = 0.002$) and time to surgery ($\beta = -0.198$, $p = 0.004$) had significant negative associations with recovery outcomes, indicating that older age and delayed surgical intervention negatively impacted recovery. Conversely, BMI ($\beta = 0.145$, $p = 0.017$) showed a positive association, suggesting that patients with normal BMI had better recovery outcomes. Additionally, length of hospital stay ($\beta = -0.152$, $p = 0.028$) was identified as a significant negative predictor, indicating that prolonged hospitalization adversely affected functional recovery. These findings highlight the importance of timely intervention, appropriate BMI management, and optimized hospital stays in improving recovery outcomes for geriatric patients.

**Table 1: Demographic and Clinical Characteristics of Participants**

| Variable | Category | Number (n) | Percentage (%) |
|---|---|---|---|
| **Age Group (years)** | 65-74 | 45 | 45.0 |
| | 75-84 | 35 | 35.0 |
| | ≥85 | 20 | 20.0 |
| **Gender** | Male | 38 | 38.0 |
| | Female | 62 | 62.0 |
| **BMI (kg/m²)** | <18.5 | 15 | 15.0 |
| | 18.5-24.9 | 60 | 60.0 |
| | ≥25 | 25 | 25.0 |
| **Smoking History** | Yes | 22 | 22.0 |
| | No | 78 | 78.0 |
| **Alcohol History** | Yes | 15 | 15.0 |
| | No | 85 | 85.0 |
| **Comorbidities** | Hypertension | 55 | 55.0 |
| | Diabetes | 40 | 40.0 |
| | Cardiovascular Disease | 30 | 30.0 |
| | Chronic Respiratory Disease | 18 | 18.0 |
| | Others | 20 | 20.0 |

**Table 2: Pre-Fracture and Surgical Details**

| Variable | Category | Number (n) | Percentage (%) |
|---|---|---|---|
| **Pre-Fracture Mobility** | Independent | 65 | 65.0 |
| | Assisted Device | 25 | 25.0 |
| | Bed/Chair Bound | 10 | 10.0 |
| **Time to Surgery (hours)** | ≤24 | 40 | 40.0 |
| | 24-48 | 35 | 35.0 |

| | | | |
|---|---|---|---|
| | >48 | 25 | 25.0 |
| **Type of Surgery** | Hemiarthroplasty | 45 | 45.0 |
| | Total Hip Arthroplasty | 35 | 35.0 |
| | Internal Fixation | 20 | 20.0 |
| **Length of Hospital Stay** | ≤7 days | 50 | 50.0 |
| | 8-14 days | 30 | 30.0 |
| | >14 days | 20 | 20.0 |

**Table 3: Functional Outcome Assessment at Different Follow-Up Periods**

| Outcome Measure | Baseline Mean (SD) | 1 Month Mean (SD) | 3 Months Mean (SD) | 6 Months Mean (SD) |
|---|---|---|---|---|
| **Modified Barthel Index (MBI)** | 45.5 ± 12.3 | 60.2 ± 10.8 | 75.8 ± 11.4 | 85.4 ± 9.6 |
| **Timed Up and Go Test (TUG) (sec)** | 28.4 ± 5.5 | 24.3 ± 4.8 | 20.1 ± 3.9 | 16.7 ± 3.4 |
| **Harris Hip Score (HHS)** | 45.2 ± 7.5 | 60.8 ± 8.2 | 75.1 ± 7.9 | 85.3 ± 6.5 |
| **Pain (VAS Score)** | 7.5 ± 1.2 | 5.8 ± 1.0 | 3.5 ± 0.9 | 2.0 ± 0.8 |

**Table 4: Radiological Assessment Findings**

| Parameter | 1 Month (%) | 3 Months (%) | 6 Months (%) |
|---|---|---|---|
| **Implant Positioning** | Correct (90) | Correct (93) | Correct (95) |
| | Malposition (10) | Malposition (7) | Malposition (5) |
| **Fracture Healing** | Partial (60) | Significant (80) | Complete (95) |
| **Complications Observed** | None (85) | None (88) | None (90) |
| | Infection (5) | Infection (4) | Infection (2) |
| | Dislocation (3) | Dislocation (2) | Dislocation (1) |
| | Thromboembolism (7) | Thromboembolism (6) | Thromboembolism (4) |

**Table 5: Complications Observed Post-Surgery**

| Complication Type | Number (n) | Percentage (%) |
|---|---|---|
| **Surgical Site Infection** | 5 | 5.0 |
| **Implant Dislocation** | 3 | 3.0 |
| **Deep Vein Thrombosis** | 4 | 4.0 |
| **Delayed Healing** | 7 | 7.0 |
| **No Complications** | 81 | 81.0 |

**Table 6: Predictors of Functional Recovery (Multiple Regression Analysis)**

| Predictor Variable | Beta Coefficient (β) | Standard Error | p-Value | Significance |
|---|---|---|---|---|
| **Age** | -0.215 | 0.067 | 0.002 | Significant |
| **BMI** | 0.145 | 0.058 | 0.017 | Significant |
| **Time to Surgery** | -0.198 | 0.061 | 0.004 | Significant |
| **Length of Stay** | -0.152 | 0.049 | 0.028 | Significant |

## DISCUSSION

The study population consisted of 100 geriatric patients aged ≥65 years, with a majority being in the 65-74 age group (45%). This age distribution is consistent with findings by Buecking et al. (2016), who reported that hip fractures predominantly occur in patients aged 65-75 years, accounting for nearly 50% of cases in their cohort.[1] The female predominance (62%) observed in this study aligns with Jiang et al. (2020), who identified a similar gender distribution, emphasizing the higher risk of osteoporosis and fragility fractures in postmenopausal women due to hormonal changes.[2] The BMI distribution, where 15% were underweight and 25% were overweight, corresponds with Chesser et al. (2018), who found that both extremes of BMI are associated with poor surgical outcomes and complications in hip fracture patients.[3]

Pre-fracture mobility assessment revealed that 65% of patients were independent, which closely matches the findings of Parker et al. (2017), who reported 67% independence among similar populations. Timely surgical intervention is critical, as shown in this study, where 40% underwent surgery within 24 hours.[4] This finding is supported by Sobolev et al. (2016), who reported significantly better functional outcomes and lower mortality rates in patients operated on within 24 hours of admission.[5] Regarding surgical procedures, hemiarthroplasty was the most common intervention (45%), consistent with the findings of Vidán et al. (2018), who noted that it remains the preferred method for managing displaced femoral neck

fractures in the elderly due to quicker recovery and fewer complications.[6]

The Modified Barthel Index (MBI) showed significant improvement from 45.5 ± 12.3 at baseline to 85.4 ± 9.6 at 6 months, reflecting substantial recovery in activities of daily living (ADLs). Similar improvements were reported by Prestmo et al. (2015), who observed comparable MBI recovery trajectories in patients undergoing early postoperative rehabilitation.[7] The Timed Up and Go Test (TUG) results improved from 28.4 ± 5.5 seconds to 16.7 ± 3.4 seconds, indicating enhanced mobility. These findings align with Freter et al. (2019), who found similar improvements in mobility post-surgery, highlighting the importance of targeted physiotherapy. The Harris Hip Score (HHS) improvements from 45.2 ± 7.5 to 85.3 ± 6.5 further validate the effectiveness of surgical and rehabilitative interventions.[8]

Radiological assessments demonstrated a progressive improvement in fracture healing and implant positioning. At 6 months, 95% achieved correct implant positioning, consistent with studies by Rogmark et al. (2016), who reported optimal implant alignment in 92% of cases following hemiarthroplasty.[9] Fracture healing rates, with 95% complete healing at 6 months, are in agreement with Palm et al. (2018), who observed comparable healing patterns with similar surgical techniques.[10] The low rates of complications, such as infections (2%) and dislocations (1%) at 6 months, underscore the effectiveness of perioperative care, as also noted by Sharma et al. (2020), who reported a 3% infection rate and 1% dislocation rate in a comparable population.[11]

Postoperative complications were minimal, with 81% of participants experiencing no issues. The most common complications were surgical site infections (5%) and delayed healing (7%), which are in line with results from Saxena et al. (2017), who reported infection rates of 4% and delayed healing in 6% of geriatric patients undergoing hip surgery. These findings emphasize the importance of stringent infection control measures and early mobilization to minimize complications.[12]

Age and time to surgery were significant predictors of recovery, with older age ($\beta = -0.215$) and delayed surgery ($\beta = -0.198$) negatively affecting outcomes. Similar trends were reported by Hu et al. (2019), who identified age and surgical delay as critical factors influencing postoperative recovery.[13] BMI ($\beta = 0.145$) was positively associated with recovery, consistent with findings by Kristensen et al. (2020), who noted better recovery outcomes in patients with normal BMI.[14] Length of hospital stay ($\beta = -0.152$) negatively impacted recovery, corroborating results from Lin et al. (2017), who observed prolonged hospitalization leading to increased risk of deconditioning and delayed functional improvement.[15]

## CONCLUSION

This study highlights the significant challenges and outcomes associated with hip fracture surgery in geriatric patients. Factors such as age, BMI, time to surgery, and length of hospital stay were identified as critical predictors of functional recovery. The findings emphasize the importance of timely surgical intervention, early mobilization, and comprehensive postoperative care in improving mobility, pain management, and overall quality of life. A multidisciplinary approach, including personalized rehabilitation programs, remains essential for optimizing recovery outcomes and minimizing complications in this vulnerable population.

## REFERENCES

1. Buecking B, Timmesfeld N, Riem S, Bliemel C, Balzer-Geldsetzer M, Ruchholtz S, et al. Predictors of functional outcomes after hip fracture surgery in elderly patients. *GeriatrOrthopSurgRehabil*. 2016;7(1):2-8.
2. Jiang J, Yang CH, Deng L, Zhong GQ, Zhang Y. Gender differences in hip fracture risk and outcomes: A meta-analysis. *BMC MusculoskeletDisord*. 2020;21(1):141.
3. Chesser TJ, Handley R, Swift C. The impact of BMI on outcomes after hip fracture surgery: A retrospective study. *Bone Joint J*. 2018;100-B(5):674-9.
4. Parker MJ, Gurusamy K, Azegami S. Mobility after hip fracture surgery in elderly patients: A systematic review and meta-analysis. *Cochrane Database Syst Rev*. 2017;12(1):CD001706.
5. Sobolev B, Guy P, Sheehan KJ, Kuramoto L, Sutherland JM. Mortality and functional outcomes in patients undergoing early versus delayed hip fracture surgery. *JAMA Surg*. 2016;151(6):1-9.
6. Vidán M, Serra JA, Moreno C, Riquelme G, Ortiz J. Hemiarthroplasty vs. total hip arthroplasty in elderly patients with femoral neck fractures. *Clin OrthopRelat Res*. 2018;476(2):391-7.
7. Prestmo A, Hagen G, Sletvold O, Helbostad JL, Thingstad P, Taraldsen K, et al. Comprehensive geriatric care for patients with hip fractures: A randomised controlled trial. *Lancet*. 2015;385(9978):1856-65.
8. Freter S, Koller K, Dunbar M, MacKnight C, Rockwood K. Timed Up and Go test as a predictor of functional recovery after hip fracture surgery. *J Am Geriatr Soc*. 2019;67(4):798-804.
9. Rogmark C, Leonardsson O. Hip arthroplasty for the treatment of displaced femoral neck fractures: A systematic review. *Acta Orthop*. 2016;87(4):376-82.
10. Palm H, Jacobsen S, Krasheninnikoff M, Foss NB, Kehlet H. Radiological outcomes after hemiarthroplasty in geriatric hip fracture patients. *J Bone Joint Surg Am*. 2018;100(14):1232-8.
11. Sharma H, Devgan A, Agarwal S. Complication rates and functional outcomes after hemiarthroplasty for hip fractures. *Injury*. 2020;51(7):1573-80.
12. Saxena P, Mace SE, Krishna N, Stiller K. Postoperative complications in geriatric hip fracture patients: A retrospective analysis. *GeriatrOrthopSurgRehabil*. 2017;8(2):90-6.
13. Hu F, Jiang C, Shen J, Tang P, Wang Y. Preoperative predictors of functional outcomes in elderly patients

after hip fracture surgery. *J OrthopSurg Res*. 2019;14(1):120.

14. Kristensen MT, Bandholm T, Foss NB, Ekdahl C, Kehlet H. Factors affecting functional recovery after hip fracture surgery in older adults. *Age Ageing*. 2020;49(4):603-10.
15. Lin T, Liu Z, Wang Z, Shao X, Xu C, Zhang C. The influence of length of hospital stay on functional outcomes after hip fracture surgery. *J Orthop Surg*. 2017;25(3):1-6.