Early Mobilization Compliance as a Quality Indicator after Hip Fracture Surgery: An Observational Study

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Posted Date: 13 March 2026

doi: 10.20944/preprints202603.1099.v1

Keywords: hip fracture; hospitalization; early mobilization; quality indicator

 doi:10.20944/preprints202603.1099.v1

Article

Early Mobilization Compliance as a Quality Indicator after Hip Fracture Surgery: An Observational Study

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Abstract

A single paragraph of about 200 words maximum. For research articles, abstracts should give a pertinent overview of the work. We strongly encourage authors to use the following style of structured abstracts, but without headings: (1) Background: place the question addressed in a broad context and highlight the purpose of the study; (2) Methods: describe briefly the main methods or treatments applied; (3) Results: summarize the article's main findings; (4) Conclusions: indicate the main conclusions or interpretations. The abstract should be an objective representation of the article, it must not contain results which are not presented and substantiated in the main text and should not exaggerate the main conclusions.

Keywords: hip fracture; hospitalization; early mobilization; quality indicator

1. Introduction

Hip fracture represents a major epidemiological problem, strongly associated with population aging [1]. In Spain, according to the latest available National Hip Fracture Registry (Registro Nacional de Fracturas de Cadera, RNFC) report published in 2025, which includes data from patients ≥74 years treated in collaborating Spanish hospitals during 2023, a total of 9,906 cases were recorded. The Community of Madrid ranks among the regions contributing the highest volume of data, accounting for approximately 30% of national cases in the analyzed years. The average hospital stay is slightly above the national mean, whereas surgical timing, in-hospital mortality, and 30-day mortality remain comparable[2].

Since its establishment in 2017, the RNFC has defined eight healthcare quality indicators aimed at monitoring hospital performance and benchmarking best practices based on top-performing centers. Among these indicators, early sitting or mobilization within the first 24 hours after surgery is considered a key parameter for early functional recovery [3].

The evolution of the early mobilization indicator (<24 h) in the Community of Madrid is available from 2017 to 2020, with reported rates of 59.2%, 54.8%, 40.3%, and 12.4%, respectively. These figures remained similar to or higher than the national average (58.9%, 58.5%, 38%, and 11%), with a marked decline in 2020 associated with the impact of the COVID-19 pandemic. The most recent registry data (2023) show a favorable recovery trend in 2021, 2022, and 2023 (72.3%, 75%, and 75.8%), although still below the recommended standard of 86% [2].

Early mobilization after hip fracture surgery has been associated with improved short-term functional recovery, reduced postoperative pain, greater restoration of baseline functional capacity,

 doi:10.20944/preprints202603.1099.v1

shorter length of stay (LOS), improved quality of life [4], and higher survival rates[2]. This early mobilization requires coordinated collaboration among surgeons, therapists, and nursing staff to facilitate weight-bearing mobilization on the day of surgery or the first postoperative day, aiming to prevent complications and accelerate rehabilitation[3].

The coordinated work of multidisciplinary healthcare professionals is, therefore, essential and requires a comprehensive approach that includes surgical planning and the adaptation of health and social care resources[4]. Training, role definition, and competency development are key factors in achieving a truly multidisciplinary model that enables patients to get out of bed on the first postoperative day [5].

Barriers to mobilization include non-modifiable patient-related factors such as age, pre-fracture mobility, and cognitive impairment[6], as well as system-related factors including staffing availability, resource constraints, healthcare professionals' attitudes toward early mobilization, and role delineation in mobilization practices [7,8].

In this context, our hospital, as a collaborating center of the RNFC, annually evaluates several quality indicators, including the proportion of patients mobilized on the first postoperative day. In 2023, compliance with this indicator decreased compared with the previous year, prompting the need to describe and analyze the causes of non-compliance.

Therefore, the aim of this study was to identify the determinants of non-compliance and to analyze associated clinical and/or organizational factors, with the purpose of proposing and implementing mechanisms to improve this quality indicator.

2. Materials and Methods

2.1. Study design and Setting

This observational, analytical, and descriptive retrospective study was conducted in the surgical hospitalization unit of Hospital Universitario Infanta Cristina, Madrid (Spain), between January 1, 2023, and December 31, 2023.

The study population included all adult patients who underwent surgery for hip fracture. Patients who died within the first 24 hours after surgery were excluded.

The study was approved (PI 149/24) by the Research Ethics Committee of Hospital Universitario Puerta de Hierro Majadahonda. The study was conducted in accordance with the Declaration of Helsinki.

Considering the total number of patients treated in the surgical hospitalization unit after hip fracture surgery during 2023 (n = 184), and assuming a 15% loss rate, with a 95% confidence level, 3% precision, and an estimated proportion of 5%, the calculated sample size was 156 patients. Finally, the study sample consisted of 139 patients.

2.2. Statistical Analysis

Data were retrospectively obtained through a review of electronic medical records (SELENE system). For each patient, an ad hoc data collection form was completed, and the information was subsequently entered into a database specifically created for the study.

Sociodemographic variables included age (<69 years, 70–84 years, and ≥85 years) and sex.

Additional clinical and functional data were collected, including comorbidities, admission dates, blood transfusion requirements, the performance of postoperative radiography within 24 hours, and the existence of an explicit medical order for early mobilization.

To define preoperative functional autonomy, the Barthel Index was used to assess independence in activities of daily living (ADL), the Pfeiffer Scale to evaluate cognitive status, and the Functional Ambulation Classification (FAC) scale to assess baseline mobility.

Preoperative physical status and anesthetic risk were described using the American Society of Anesthesiologists (ASA) classification.

Finally, mobilization and/or sitting up in bed within the first 24 hours after surgery was recorded.

 doi:10.20944/preprints202603.1099.v1

2.3. Statistical Analysis

All statistical analyzes were performed using IBM SPSS Statistics® version 25.

Continuous variables were summarized as the mean and standard deviation (SD) or the median and interquartile range (IQR), depending on the data distribution assessed by visual inspection and the Shapiro–Wilk test.

Categorical variables were reported as absolute and relative frequencies.

The primary outcome measure—mobilization within 24 hours (yes/no)—was analyzed descriptively and compared with the remaining variables using proportion comparison tests (Chi-square test or Fisher's exact test when appropriate).

A two-sided p value < 0.05 was considered statistically significant.

In this section, where applicable, authors are required to disclose details of how gen-erative artificial intelligence (GenAI) has been used in this paper (e.g., to generate text, data, or graphics, or to assist in study design, data collection, analysis, or interpretation). The use of GenAI for superficial text editing (e.g., grammar, spelling, punctuation, and formatting) does not need to be declared.

3. Results

3.1. Participant Demographic Data

During the study period, a total of 139 patients underwent hip fracture surgery. Of these, 79.1% (n = 110) were women and 20.9% (n = 29) were men. The mean age of the patients was 82.4 years (SD 11.3; range: 31–101 years).

3.2. Functional and Mobility levels

Functional and autonomy levels are shown in Table 1.

According to the Barthel Index, more than half of the participants were independent in activities of daily living (51.8%, 72/139).

Consistent with these findings, the Pfeiffer Scale showed that the same proportion of patients presented no signs of cognitive impairment (51.8%).

Regarding mobility, based on the Functional Ambulation Classification (FAC) scale—adapted into the categories: independent, walks with difficulty, walks with technical assistance, walks with major assistance or great difficulty, and bed–chair bound—approximately one-third of patients (33.1%, 46/139) required some type of assistive device, and more than half showed mobility limitations (55.4%, 77/139).

 doi:10.20944/preprints202603.1099.v1

Table 1. Functional and mobility levels

Variables	n = 139	(%)
Pfeiffer Scale (Cognitive)		
0 (None)	72	51.8
1 (Mild)	29	20.9
2 (Moderate)	18	12.9
3 (Severe dependence)	20	14.4
Barthel Index (Dependence)		
0 (Independent)	72	51.8
1 (Moderate dependence)	41	29.5
2 (Severe dependence)	23	16.5
3 (Total dependence)	3	2.2
Physical Mobility Scale		
0 (Independent)	38	27.3
1 (Walks with difficulty)	31	22.3
2 (Technical aid required)	46	33.1
3 (Major assistance)	9	6.5
4 (Extreme difficulty)	11	7.9
5 (Bed–chair bound)	4	2.9

3.3. ASA Classification System

According to the American Society of Anesthesiologists (ASA) physical status classification, which stratifies morbidity and mortality risk in patients undergoing anesthesia and surgery, patients are categorized from ASA I to ASA V.

ASA I corresponds to patients fit for any standard anesthetic procedure, with minimal anesthetic risk and a low probability of anesthesia-related complications. Conversely, ASA V represents critically ill, moribund patients who are not expected to survive without surgery.

As shown in Table 2, most patients presented a highly compromised clinical profile characterized by a high burden of disease and considerable anesthetic risk.

A total of 65.9% of participants were classified as ASA III, corresponding to patients with one or more severe systemic diseases causing significant functional limitations.

This finding is consistent with the typical profile of pluripathological patients in medium- and high-complexity hospital settings, where comorbidities directly impact anesthetic risk and perioperative planning.

Additionally, 18.1% of patients were classified as ASA II, indicating mild or well-controlled systemic disease without relevant functional limitation.

Only 2.2% were categorized as ASA I.

Regarding more severe categories, 13.0% were classified as ASA IV, representing patients with severe systemic disease, disabling functional limitations, and life-threatening risks prior to surgery, requiring specialized perioperative management.

Finally, 0.7% were classified as ASA V.

Table 2. ASA classification

Variables	n = 138	(%)
I	3	2.2
II	25	18.1
III	91	65.9
IV	18	13.0
V	1	0.7

 doi:10.20944/preprints202603.1099.v1

3.4. Early mobilization

Early mobilization within the first 24 hours after surgery was analyzed.

Results showed that 66.2% of patients (n = 92) were mobilized within the first 24 hours, whereas 33.8% (n = 47) did not receive early mobilization.

This observed rate suggests moderate compliance with early mobilization recommendations while highlighting a substantial proportion of patients who were not mobilized early.

The determinants of early mobilization are presented in Table 3.

Table 3. Clinical outcomes

Variable	Group 1	Group 2	Total	p-value
Blood transfusion				0.002
Yes	6 (6.5)	12 (25.5)	18 (12.9)	
No	86 (93.5)	35 (74.5)	121 (87.1)	
Prescription within the first 24 h post-surgery				0.004
Yes	88 (95.7)	38 (80.9)	126 (90.6)	
No	4 (4.3)	9 (19.1)	13 (9.4)	
Mobilization order				<0.001
Yes	87 (94.6)	33 (70.2)	120 (86.3)	
No	5 (5.4)	14 (29.8)	19 (13.7)	

3.4.1. Reasons for Lack of Early Mobilization

When analyzing the reasons for non-mobilization recorded in nursing progress notes, among the 47 non-mobilized patients, no cause was documented in 29.7% of cases (n = 12).

For the remaining cases, reasons were grouped thematically due to variability in narrative documentation.

Five main categories were identified:

- Pending radiography/medical order or delayed prescription: 17.0% (n = 10)
- Decreased level of consciousness, somnolence, or hypoactive status: 14.9% (n = 7)
- Hypotension or blood transfusion requirements: 12.8% (n = 6)
- Agitation, hyperactive status, need for restraints, or medical indication for mobilization at 48 hours: 10.7% (n = 5).
- Patient refusal or lack of collaboration: 4.2% (n = 2)

3.5. Bivariate Analysis

Bivariate analysis showed no statistically significant associations between mobilization within the first 24 hours and the sociodemographic or clinical variables evaluated.

No significant differences were observed by sex (p = 0.093) or age (p = 0.139), although a trend toward lower mobilization rates was identified among older patients.

Similarly, language barriers did not reach statistical significance (p = 0.077), although a clinically relevant difference was observed between patients with language barriers (20% mobilized) and those without (67.9%), suggesting a potential influence on patient participation in postoperative activities.

No significant associations were found with functional dependency (p = 0.620), cognitive impairment (p = 0.158), baseline mobility (p = 0.334), or ASA classification (p = 0.431).

3.6. Significant Associations

In contrast, statistically significant associations were identified between mobilization within the first 24 hours and the following variables: blood transfusion, performance of postoperative radiography within 24 hours, and the existence of an explicit order to mobilize.

 doi:10.20944/preprints202603.1099.v1

Patients who received blood transfusions had a lower probability of early mobilization compared with non-transfused patients (33.3%, 6/18 vs. 71.1%, 86/121), representing an absolute reduction of 37.7 percentage points (OR 0.203; 95% CI 0.07–0.58; p = 0.002).

Conversely, the performance of postoperative radiography within the first 24 hours was associated with a higher frequency of early mobilization (69.8%, 88/126 vs. 30.8%, 4/13), with an OR of 5.29 (95% CI 1.53–18.3; p = 0.004).

The explicit order to mobilize showed the strongest association. Patients with this indication had an early mobilization rate of 72.5% (87/120), compared with 26.3% (5/19) among those without the order (OR 7.38; 95% CI 2.46–22.11; p < 0.001).

4. Discussion

This observational study shows that hip fractures occur more frequently in older patients and are more prevalent in women than in men.

In line with these findings, international data indicate that the incidence of this condition increases markedly after the age of 70, peaking in individuals over 80 years old, with between 70% and 75% of cases occurring in women[9,10]. These data reinforce that advanced age and female sex remain the main structural risk factors for hip fracture worldwide.

According to the Barthel Index results (51.8%), more than half of the participants maintained an adequate level of independence in basic activities of daily living prior to surgery. This trend is consistent with findings from recent epidemiological studies showing that a relevant proportion of adults undergoing hip fracture surgery preserve some degree of functional autonomy even at advanced ages[11,12].

Similarly, the comparable proportion of cognitive impairment observed among participants aligns with reports by Cieza-Macedo et al. and Coviello et al. [13,14].

Regarding mobility, the data show a less favorable situation: more than half of the participants presented some degree of limitation (55.4%), and one-third required assistive devices (33.1%). Recent literature highlights that mobility problems increase substantially after the age of 75, even in the absence of cognitive impairment [15] [Falta 19]. Furthermore, approximately one-third of patients require assistive devices prior to hip fracture due to musculoskeletal frailty and progressive loss of strength, which is consistent with the findings of this study[16].

The distribution of patients according to the ASA classification revealed that most of the sample had a highly compromised clinical profile, characterized by a high burden of disease and considerable anesthetic risk. This pattern is consistent with what is commonly observed in medium- and high-complexity hospital settings, where patients frequently present multiple chronic conditions requiring individualized perioperative management[17].

However, our findings do not confirm the close relationship between preoperative physical status, as measured by ASA classification, and the likelihood of achieving early mobilization after hip fracture surgery, contrary to other studies in which ASA has been identified as a predictor of early mobilization probability [18].

Early mobilization in our study was influenced by several patient-related factors, including the need for blood transfusion, which was present in 12.9% of patients (n = 18). These rates are lower than those reported in other studies, where transfusion rates range between 30% and 40% [19,20].

However, when analyzing the relationship between transfusion and postoperative weight-bearing authorization, differences emerge. In the study by María Macho [20], statistical significance was not reached, with 74.2% of transfused patients authorized for postoperative weight-bearing and 25.8% maintained without load-bearing. In contrast, our findings showed that 66% of transfused patients were not authorized for weight-bearing compared with 33% who maintained load-bearing.

In recent years, the concept of Patient Blood Management (PBM) has emerged in the surgical patient setting and could be applicable to hip fracture management. The fundamental pillar of PBM consists of optimizing hemoglobin levels through hematinic precursors (iron, vitamin B12, and folic

 doi:10.20944/preprints202603.1099.v1

acid), together with erythropoietin administration, enabling patients to reach surgery with adequate hemoglobin levels and potentially avoid perioperative transfusion[21–25].

Hemodynamic instability[26], postoperative delirium—manifested as hyperactive, hypoactive, or mixed subtypes[27] —and resistance to mobilization also represent major challenges, often accompanied by patient reluctance to mobilize[28].

The presence of acute stress and post-traumatic stress disorder after surgery may also influence recovery. Orthopedic and trauma surgeons tend to focus primarily on the physical aspects of treatment, whereas rehabilitation adopts a more holistic perspective, considering the individual as a whole[29].

Therefore, treatment and rehabilitation should focus not only on restoring physical function but also on supporting psychological and social reintegration. Early mobilization should thus be accompanied by psychological support [30].

Another perioperative factor amenable to intervention is pain, which perpetuates the immobility cycle. Analgesia is often required to facilitate mobilization, highlighting the importance of integrating pre-planned pharmacological interventions to achieve optimal pain control, in coordination with nursing staff[18].

This aspect, together with the prescription of postoperative radiography within 24 hours and the explicit order to mobilize, represents organizational factors that can be addressed through the implementation of an early mobilization protocol, formally initiated by medical prescription[29,31]

Such a protocol constitutes a promising, cost-effective, and patient-centered intervention to improve recovery outcomes.

5. Conclusions

This study highlights that the main determinants of the absence of early mobilization in patients undergoing hip fracture surgery are related to organizational and clinical factors that are potentially modifiable through protocolized strategies.

Proposed measures include the implementation of automatic mobilization order protocols generated upon validation of the postoperative report, as well as analgesic block pathways aimed at improving patient tolerance during mobilization.

Additionally, establishing a care circuit that guaranties postoperative control radiography within the first 24 hours and optimizes transfusion criteria through blood-saving strategies and rapid patient stabilization may contribute to improving early mobilization rates.

These measures, together with the creation of a postoperative checklist to be reviewed by nursing staff during the first postoperative round and the incorporation of an alert icon in the electronic medical record indicating early mobilization when activated in the protocol, could increase the likelihood of compliance with early mobilization.

6. Future Directions

Future research should focus on the prospective evaluation of protocolized early mobilization pathways in patients undergoing hip fracture surgery, assessing their impact on functional recovery, postoperative complications, and length of hospital stay.

Multi-center studies would be valuable to validate the organizational and clinical determinants identified in this study and evaluate variability across different healthcare settings.

In addition, interventional designs assessing the implementation of automatic mobilization orders, standardized postoperative radiography circuits, and transfusion optimization strategies could provide higher-level evidence regarding their effectiveness in improving early mobilization compliance.

Further research should also explore the role of multidisciplinary educational interventions aimed at healthcare professionals, as well as patient-centered strategies to enhance participation in postoperative mobilization.

 doi:10.20944/preprints202603.1099.v1

Finally, integrating digital alert systems and postoperative checklists within electronic medical records represents a promising area for quality improvement research, particularly in relation to adherence monitoring and real-time clinical decision support.

Author Contributions: Conceptualization, N.E-E. and M.B-P.; methodology, N.E-T.; software, F.G-S. and M.A-V; validation, S.C-O., N.E-E. and M.A-V.; formal analysis, F.G-S.; investigation, N.E-E.; resources, S.C-O.; data curation, F.G-S.; writing—original draft preparation, N.E-T and M.B-P.; writing—review and editing, M.A-V.; visualization, F.G-S and M.A-V.; supervision, F.G-S.; project administration, M.B-P and M.A-V; funding acquisition, F.G-S. All authors have read and agreed to the published version of the manuscript.

Funding: The APC was funded through the funds of the IDIPHISA Foundation (Research Institute of the Puerta de Hierro University Hospital), with which the Infanta Cristina University Hospital in Madrid was affiliated.

Institutional Review Board Statement: The study was approved (PI 149/24) by the Research Ethics Committee with Medicines of Hospital Universitario Puerta de Hierro Majadahonda.

Informed Consent Statement: This retrospective observational study used anonymized clinical data; therefore, the requirement for informed consent was waived.

Data Availability Statement: We encourage all authors of articles published in MDPI journals to share their research data. In this section, please provide details regarding where data supporting reported results can be found, including links to publicly archived datasets analyzed or generated during the study. Where no new data were created, or where data is unavailable due to privacy or ethical restrictions, a statement is still required. Suggested Data Availability Statements are available in section "MDPI Research Data Policies" at https://www.mdpi.com/ethics.

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Acknowledgments: In this section you can acknowledge any support given which is not covered by the author contribution or funding sections. This may include administrative and technical support, or donations in kind (e.g., materials used for experiments). Where GenAI has been used for purposes such as generating text, data, or graphics, or for study design, data collection, analysis, or interpretation of data, please add "During the preparation of this manuscript/study, the author(s) used [tool name, version information] for the purposes of [description of use]. The authors have reviewed and edited the output and take full responsibility for the content of this publication."

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

FAC	Functional Ambulation Classification
ADL	activities of daily living
LOS	Length of stay
RNFC	Registro Nacional de Fracturas de Cadera

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