TITLE Strategies used by patients when getting in and out of bed early after hip fracture surgery – the HIP-ME-UP cohort

AUTHORS

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ABSTRACT

Aim In patients hospitalized following hip fracture, basic mobility status early after surgery and at discharge is associated with long-term outcomes. Getting in and out of bed is the basic mobility activity identified as one of the most challenging. Therefore, this study described strategies used by patients when getting in and out of bed early after hip fracture surgery.

Methods We conducted an observational cross-sectional study (the HIP-ME-UP cohort; NCT05756517) at Copenhagen University Hospital Hvidovre. We filmed patients getting in and out of bed during physiotherapy sessions on post operative days 3-5 by using an iPad. We analyzed the recordings using a quantitative film analysis with all recordings structured into three phases: preparation, lie-to-sit (out of bed)/sit-to-lie (into bed) and positioning.

Results 42 patients (23 women) with a mean (SD) age of 78.7 (7.6) years were enrolled. For getting out of bed, we identified five strategies in the preparation phase, seven strategies in the lie-to-sit phase, and two strategies in the positioning phase. For getting into bed, we identified five strategies within each of the three phases. The choice of strategies for patients who were independent in getting in/out of bed was similar to patients in need of assistance.

Conclusion Patients hospitalized following hip fracture surgery use different strategies when getting in and out of bed. Patients requiring assistance and those being independent used similar strategies, which suggests that it is important to tailor rehabilitation to each patient's specific needs rather than their level of independence.

Keywords: Hip fracture, basic mobility, getting out of bed, hospitalization

Highlights:

- Strategies used when getting in/out of bed after hip fracture surgery are described
- Getting out of bed had a greater variation of strategies than getting into bed
- Our results suggest the importance to tailor rehabilitation individually

INTRODUCTION

Hip fractures primarily affect older individuals (1). The typical patient is often frail (2), with declining muscle mass (3) and several comorbidities (4), while for some, cognitive impairments (5) add further challenges. A hip fracture often marks a critical turning, and frequently leads to a decline in health and independence (6). This perspective is supported by evidence showing that patients who undergo hip fracture surgery are at a high risk of mortality (1).

When focusing on getting patients out of bed during hospitalization, various terms are used, and they are not always clearly defined. Additionally, the terminology used in clinical practice does not always align with that found in scientific literature. Several terms overlap and are also interpreted differently by different professions (7). Therefore, the key terms used in this article will be clarified to reflect how we use them in our context. *Mobility* is defined as movement in all its forms (8). We interpret *mobility* as an umbrella term that covers the following terms: *Mobilization, basic mobility, and early mobilization. Mobilization* has been defined as getting a patient out of bed (sitting next to the bed, going to the bathroom, standing, and walking) (9). Based on empirical data from our hospital (7) and Hoyer et al. (9), our definition of mobility is assisting the patient (both actively and passively) to movement from one place to another e.g. getting in and out of bed, sit-to-stand from a chair, walking to the bathroom to use the toilet. *Basic mobility* refers to the ability to perform three specific activities: getting in and out of bed, standing from a chair, and walking as assessed by the validated Cumulated Ambulation Score (CAS) (10). The term *early mobilization* is defined as supporting the patient in mobilization shortly after surgery (11,12). The primary focus of this article is the patient's movement when *getting in and out of bed*, in conditions that resemble their home environment.

For patients hospitalized following hip fracture surgery, the risk of mortality and readmission increases if the patients do not regain their pre-fracture level of independence in basic mobility activities before discharge (13). Recent evidence also state that early mobilization post-operative is associated with lower rates of death both during the hospital stay and within 30 days after surgery (12).

Mobilizing patients begins with the fundamental step of getting patients out of bed, a task identified as one of the most challenging basic mobility activities (14,15). A previous study on 400 patients who had undergone hip fracture surgery revealed that 25 % of the patients were not independent in basic mobility activities at discharge from the hospital and 90% of these patients required assistance with getting in/out of bed (15). Correspondingly, a study in 235 patients following hip fracture surgery found that getting in and out of bed were the most common basic mobility activities that were not regained at discharge, affecting 55% of the patients (14). Despite short hospital stays (16), it therefore makes sense to prioritize supporting patients in regaining their ability to perform basic mobility activities before discharge (13,17). From the patients' perspective, supporting the recovery of independent mobility is emphasized in the literature due to the considerable negative impact that loss of independence can have on their quality of life (18). The objective of this study was to describe strategies used by patients when getting in and out of bed early after hip fracture surgery.

METHODS

Study registration and protocol

The HIP-ME-UP study was pre-registered on Clinicaltrials.gov (NCT05756517). The present study reports on the second of two pre-registered objectives of HIP-ME-UP. Data on the first pre-registered objective has been submitted and is available open access as a pre-print (19). During the analysis process, we amended our objective to focus only on getting in and out of bed and not on the chair and walking activities.

Ethical considerations and approvals

The study was approved by the Capital Regions Research Ethics Committee (journal number: F-22060655) and adheres to the Declaration of Helsinki.

Our decision on filming patients during acute hospitalization has been considered with regards to ethical challenges (20). We made sure to protect the patients' privacy by ensuring that the door was closed, that the patients were appropriately dressed, and that other individuals did not witness the filming. Filming basic mobility activities provided an opportunity to analyze the activities in depth instead of viewing them on the spot, as would be the alternative. Also, the recordings enabled viewing by more than one researcher, which strengthens the quality and validity of the results by reducing potential bias and increasing the reliability of the analysis. Before the film recordings, we performed pilot-filming on three patients. None of them expressed any inconveniences with being filmed while performing the basic mobility activities. Before the recordings, the patients were informed about the aim of the recordings and signed an informed consent.

Reporting and Guidelines

The study adheres to the STrengthening the Reporting of Observationally studies in Epidemiology (STROBE) checklist (21) and the REPORT trial guide (22).

Study design and setting

This observational cross-sectional study (the HIP-ME-UP cohort) was conducted at Copenhagen University Hospital Hvidovre. Data were gathered from March 8th, 2023, to June 29th, 2023.

Patients

We included a subpopulation from the first study of the HIP-ME-UP cohort (19) with slightly different eligibility criteria. We used purposive sampling (23). Eligible patients were patients aged 60 years or older who: had undergone hip fracture surgery at Copenhagen University Hospital Hvidovre, had a pre-fracture Cumulated Ambulation Score (by recall) of 6 (10), were able to speak and understand Danish and to demonstrate the ability to provide written informed consent not later than the fifth postoperative day (POD). Patients met the exclusion criteria if they: had any weight-bearing restrictions postoperatively, suffered from multiple fractures or were suspected to have a pathological fracture due to cancer, were terminally ill or had post operative medical complications limiting the patient from participating in physio- or occupational therapy, had a history of stroke with motor disability, had cognitive dysfunction

(determined by chart review, reported by nursing staff, or observed by trained research staff (disoriented, dementia, active delirium)), were unwilling to participate in rehabilitation post-operatively or did not want to cooperate for testing and to be filmed during when getting out of/into bed.

Standard care

All patients were offered standard care based on a standardized multimodal fast-track program (24). This encompassed daily physiotherapy sessions on POD 1-3 no matter the day of the week and hereafter physiotherapy on weekdays when indicated. Physiotherapy consisted of early mobilization, hip-related exercises, and training towards independence in basic mobility activities and walking inside. For more details, please see Hansen et al. (19). Patients were discharged once the treating physician considered them medically stable and sufficiently treated for hip fracture related pain.

Outcome

Film recordings

The patients were filmed getting in and out of bed during physiotherapy sessions on POD 3-5 using an iPad. The investigator moved around in the room to capture the movements of the patient.

Descriptives

Basic mobility was assessed using the *Cumulated Ambulation Score (CAS)* (10) which allows day-to-day assessments of basic mobility. It describes the patient's independence in the three basic mobility activities: getting in and out of bed, sit-to-stand from a chair, and walking. Each activity is scored on a three-point ordinal scale from 0 to 2, resulting in a total 1-day CAS score between 0 and 6 (6 being the maximum score indicating independent basic mobility (10)). CAS was registered on inclusion (pre-fracture score based on the patient's recall), daily on weekdays, on the day of filming and at discharge. Daily CAS registrations were collected from the patients' medical records.

Pain was assessed at rest and during walking using the 5-point *Verbal Rating Scale (VRS)* (25), with categories ranging from "0=no pain" to "4=unbearable pain". Pain was registered on inclusion and the day of filming.

Hand-grip strength (HGS) was used as an indication of overall body strength (26). The highest value of three tests (27).

Frailty was assessed using the *Clinical Frailty Scale* (CFS) (28), which is based on clinical judgment of areas such as comorbidity, functionality, and cognitive ability, assigning a score from 1 (indicating robust health) to 9 (indicative of terminal illness)(28). The evaluation was performed by a physiotherapist through an interview, recalling the past two weeks' information from the patient (29).

Cognitive function was evaluated using the *Short Orientation-Memory Concentration Test* (OMC), a 6-item self-reported questionnaire recognized for its efficacy in detecting cognitive deficits (30,31). The study did not differentiate between cognitive impairment caused by delirium or dementia, considering a score of 22 or lower as indicative of cognitive impairment (30).

The patient's health status was measured using the *American Society of Anesthesiologists* (ASA) physical status classification (32), which rates overall health on a scale from 1 (healthy) to 5 (critically ill).

The *New Mobility Score* (NMS) was used to describe pre-fracture function. NMS is a score of a patient's ability to walk indoors, walk outdoors, and go shopping. It provides a score between 0 and 3 (0: not at all able, 1: able with help from another person, 2: able with a walking aid, 3: able without difficulty and without aid) for each function, and results in a total score from 0 to 9 (33,34). On inclusion, the score was assessed to reflect the week before hospital admission. All descriptive variables were collected on inclusion.

Patient inclusion and data collection

Patients were included on weekdays, POD 1 to 5, either by the primary investigator, MSH, or KMS. The decision on the POD of inclusion depended on the patient's overall physical and cognitive condition and the availability of both the investigator and the patient. Filming of patients getting in and out of bed took place on POD 3-5 during regular physiotherapy sessions at the ward. In cases where the patient's physiotherapist deemed them unsuitable for filming due to general health issues, medical instability, or acute cognitive impairment, filming could be rescheduled for the next day, but no later than POD 5. The POD 5 limitation was chosen to describe the patients' strategies at fairly the same timepoint during hospitalization and considering our average length of stay. If POD 3 fell on a Friday, filming had to be completed on that day, as filming was not possible during the weekend. Otherwise, the patient was excluded.

We conducted purposive sampling until we had achieved two primary criteria: saturation in the variation of strategies used, and representation of two of the most common predictive factors for basic mobility and functional recovery (35–38). These factors were age categories (60-64/65-74/75-84/85+) and fracture types (cervical femoral neck fractures/per- and subtrochanteric fractures). The distribution of patients within these subgroups aimed to approximate the demographics of hip fracture patients in Denmark (13). However, we did not expect to include a fully representative sample for all subgroups due to our inclusion and exclusion criteria, and the restricted inclusion timeline. Therefore, data collection concluded upon meeting the first criterion (saturation) and when the representation of age and fracture type was deemed sufficient to conduct the analysis.

Before the study commenced, all physiotherapists at the ward received specific instructions. E.g., when supporting patients in getting in and out of bed, they used an individualized approach based on the home situation (e.g., getting out of bed from the right or left side, using the bed's elevation function if available at home, or training the function from a flat bed). We thought it was important for the patients to mimic the home conditions they would be discharged to. The physiotherapists were encouraged to promote the patient's independence in performing the activities and to allow the patient to take the time needed. These instructions were thoroughly discussed with the physiotherapists and pilot-tested by filming three patients (not included in the final data) before the study started to ensure consistent understanding and interpretation of the instructions.

After filming was completed, the recordings were transferred from the iPad to a secure drive. Descriptive data were directly entered into an electronic database by MSH or KMS (RedCAP, Research Electronic Data Capture, Vanderbilt University, Nashville, TN, USA) using an iPad. MSH conducted weekly reviews of all entered data to identify any missing information or typing errors. If possible, missing information was filled in based on the patient's medical record or information received from the staff.

Film analysis methodology

We initially drew inspiration from Mount et al.'s (39) analysis of older individuals' movements when getting out of bed. However, as we reviewed our own analysis, it became evident that Mount et al´s (39) approach was not fully suitable for our purposes, prompting the need to develop our own analysis methodology. Their analysis of movement patterns focused on uninjured older adults, whereas we included patients having an injured side. This posed complexities in terms of using left/right or near/far arm/leg distinctions. Additionally, Mount et al.'s (39) analysis primarily centered on body structure and function, in line with the International Classification of Functioning, Disability, and Health (ICF) (40), whereas our observations primarily pertained to the activity level. The development of our analysis is presented in Table 1 and visually presented in Figure 1.

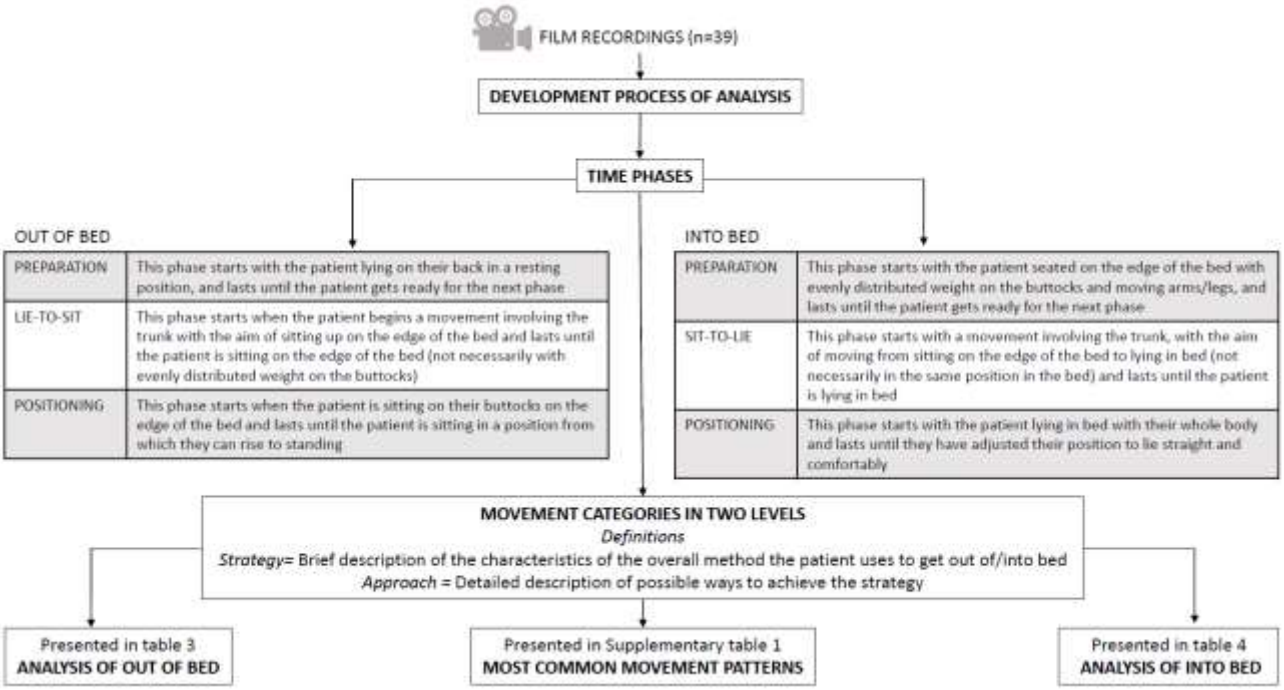

Figure 1. Overview of the development of the analysis, definitions of time phases and movement categories.

Data analysis

The film recordings were analyzed using the quantitative film analysis described previously (Table 1). All recordings were included in the analysis, which also included the recordings used in the development of the analysis.

The film analysis was conducted by evaluating all recordings of a patient getting in and out of bed, which was structured into three time phases: preparation, sit-to-lie (into bed)/lie-to-sit (out of bed) and positioning. The movement within each time phase was given a movement category, which was divided into two levels: strategy (definition: brief description of the characteristics of the overall method the patient uses to get out of/into bed) and approach (definition: detailed description of possible ways to

achieve the strategy). The most common movement patterns (e.g., the same combination of strategies in all three phases) among at least four or more patients were registered for getting in and out of bed, respectively. The cut-off at four or more patients was pragmatically decided after reviewing the result and how data were distributed.

The patients were also described in two groups: patients being able to independently get in and out of bed and those in need of help as defined by CAS (without use of a raised headboard and the activity ended when the patient had got out of bed an over sitting in a chair). These groups were described with regards to movement strategies, patterns as well as descriptive variables.

Normally distributed data are presented as means with standard deviations and non-normally distributed data as medians with interquartile ranges. Categorical data are presented as frequencies with percentages.

All analyses were made using SPSS version 29.0.1.0 (SPSS Inc., 233 SWacker Dr, 11th Floor, Chicago, IL 60606).

RESULTS

A total of 267 patients were screened for inclusion and 42 patients were enrolled. A flowchart of the data inclusion process is presented in Figure 2. Descriptive variables within the 39 patients remaining after drop out (3 patients) on inclusion are presented in Table 2.

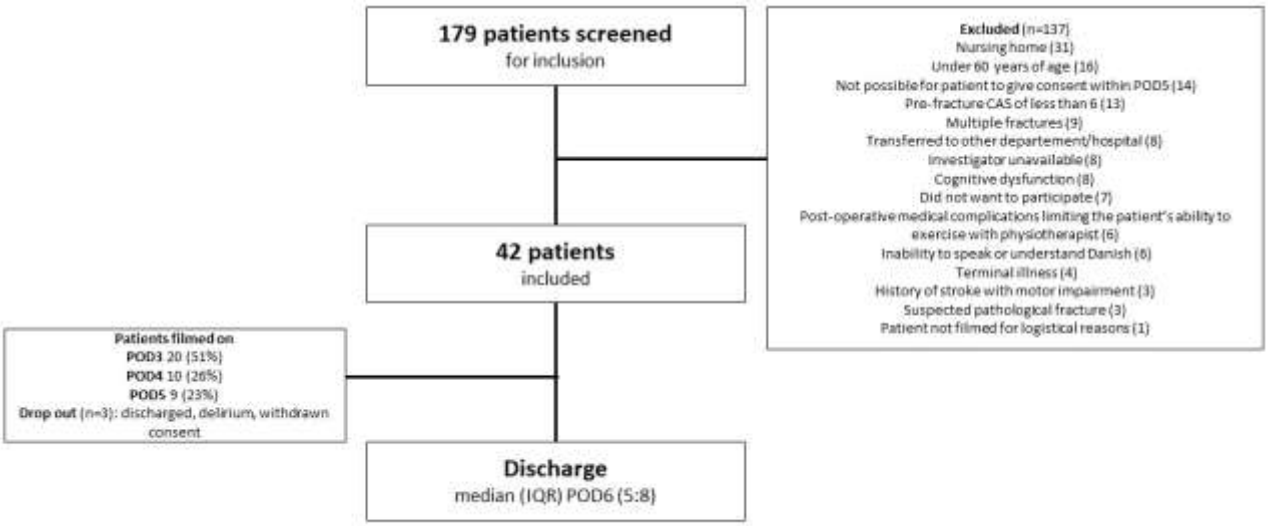

Figure 2. Flowchart for data collection process.

OUT OF BED

Strategies used to get out of bed

Five different strategies were presented in the preparation phase, seven in the lie-to-sit phase, and two in the positioning phase. All strategies and associated approaches are described in Table 3. Most of the patients (n=19, 49%) prepared the movement with the strategy “legs to the edge”. For the second phase,

the four most common strategies were “raised headboard”, “long-sitting position”, “hamstring-hook” and “fully or partly side lying”. For the positioning phase, almost all patients (n=36, 82%) used the strategy “raising while applying the arms”.

Movement patterns used to get out of bed

We saw five movement patterns for getting out of bed (e.g., the same combination of strategies in all three phases among four or more patients). Two different strategies were presented in the first phase, four different strategies in the second phase and the same strategy (with two variations in approaches) for the last phase. Figure 3 illustrates the most common movement patterns when getting out of bed and is also shown in recordings in the supplementary material (supplementary materials OUT of bed movement patterns A-E). The full evaluation of all movement patterns is presented in supplementary table 1.

Movement pattern	PREPARATION	LIE-TO-SIT	POSITIONING
A)	1a No preparation 	3a Longsitting position 	2a Raising while applying the arms 
B)	2b Legs to the edge of bed 	5a Raised headboard 	2b Raising while applying the arms 
C)	2a Legs to the edge of bed 	4b Hamstring-hook 	2a Raising while applying the arms 

Movement pattern	PREPARATION	LIE-TO-SIT	POSITIONING
D)	2a Legs to the edge of bed 	7a Fully or partially side lying 	2a Raising while applying the arms 
E) dst gemt: Lige nu	1a No preparation 	5a Raised headboard 	2a Raising while applying the arms 

Figure 3. Most common movement patterns when getting out of bed.

INTO BED

Strategies used to get into bed

Each time phase (preparation/sit-to-lie/positioning) contained five different strategies. All strategies and associated approaches are described in Table 4. Half of the patients (n=22, 56%) prepared the movement with the strategy “Buttocks tilted into bed”. For the second phase, 27 patients (74%) got into bed by using “leg lift, one at the time”, where half of these patients also used a raised headboard. In the third phase, the patients primarily got positioned in lying position by the strategies “adjustment with arms and legs” (n=13, 36%) and “pelvic lift” (n=13, 36%).

Movement patterns used to get into bed

We saw two movement patterns for getting into bed (e.g., the same combination of strategies in all three phases among four or more patients). Both movement patterns contained the same strategy in the first two phases, but differed regarding the last, preparation phase. Figure 4 illustrates the most common movement patterns when getting into bed. This can also be viewed in a film recording in the supplementary materials (supplementary materials INTO bed movement pattern F-G). The full evaluation of all movement patterns is presented in supplementary Table 1.

Movement pattern	PREPARATION	SIT-TO-LIE	POSITIONING
F)	2a Buttocks tilted into bed 	1a Leglift, one at a time 	3a Pelvic lift 
G)	2a Buttocks tilted into bed 	1b Leglift, one at a time 	2a Adjusting position with arms and legs 

Figure 4. Most common movement patterns when getting into bed.

Patients being independent or in need of help

Some discrepancies were observed between patients who were independent and those in need of assistance regarding the movement strategies used. For instance, 7 independent patients (28%) initiated the movement directly at the second phase (sit-to-lie) when getting into bed, while all patients who were not independent required some form of preparation. However, there were predominantly similarities when comparing the most common strategies and movement patterns employed. Table 5 presents movement strategies and patterns among patients being independent or in need of help when getting out of or into bed on the day of filming.

Patients in need of help when getting out of bed seemed to have more pain (median VRS 2 vs. 0) and more often an extracapsular (than an intracapsular) fracture than patients who were independent. Descriptive variables for patients being independent or in need of help are presented in Table 6.

Descriptive variables at discharge

The median length of stay was six days (IQR 5:8). The patients were discharged to their own home (29 patients, 74.4%), to another department (1 patient, 2.6%), to a 24-hour setting in the municipality (6 patients, 15.4%), or to a family member (2 patients, 5.1 %) (with one patient missing). 30 patients (76.9%)

were independent in basic mobility activities at discharge (CAS=6) and 32 patients (82.1%) were independent in getting out of/into bed.

DISCUSSION

The present study described strategies used by patients hospitalized following hip fracture surgery when getting in and out of bed in an acute care setting. To the best of our knowledge, this has not been previously documented in the literature. For getting into bed, we identified five strategies within each of the three defined time phases (preparation, sit-to-lie, and positioning) and two distinct movement patterns. For getting out of bed, the strategies expanded to five for the preparation phase, seven for the lie-to-sit phase, and two for the positioning phase, and five different movements. This indicates a wider variety of strategies for getting out of bed than getting into bed. The greater variation seen in getting out of bed can be a sign that getting out of bed is a more complex activity than getting into bed and the movement that is against gravity. Getting out of bed involves great coordination and engagement of many muscle groups, balance, and stability, especially when going from lying to sitting (41).

Whether a patient was independent or needed help getting in and out of bed did not seem to affect the strategy or movement patterns they used. As we strived to film the patients' activities so that they mimicked their home situation after discharge, the patients were instructed to get in/out of bed from the same side of the bed, as they usually did. This might have affected their movement strategies and their need for help. Whether or not getting in/out of the bed with the injured leg first is an advantage or disadvantage is unclear. Factors that might influence independence in getting in/out of bed seemed descriptively to be the level of pain when walking and if the patient had an intra- or extracapsular fracture. The number of patients in the present study does not allow for firm conclusions, but pain has previously been found to be one of the primary limitations (together with fatigue) for getting in and out of bed independently on the first postoperative day (42).

To the best of our knowledge, only one other study by Mount et al (39) has investigated movement patterns when getting out of bed. Their study, however, focuses on uninjured people and how they get out of bed, not into bed. Also, elevated headboard was not an option. Comparing their defined movement patterns to our findings is challenging due to their detailed focus on individual body parts (head and trunk, near/far arm, legs) at a functional level. Nevertheless, there appears to be an overlap in the movement strategies used by the older, uninjured participants in Mount et al.'s study (39) and our patients with a hip fracture. Mount et al. identified five to eight distinct movements for each body part, which parallels the range of two to seven movement strategies we observed across the three phases of getting out of bed. Certain movement patterns for the head and trunk described by Mount et al. (39), such as "roll off," "come to sit," and "legs-first seesaw," seem to align with the strategies in our lie-to-sit phase, namely "sidelying," "long sitting position" and "hamstring hook." However, in our study the main strategy for getting out of bed was "elevated headboard". This shows that the patients relied on the bed's mechanical functions, which might be a sign of a low force-generating ability and need for external help when performing work against the gravity.

Our objective was to describe the movement strategies patients use while getting in and out of bed following hip fracture surgery. This description is intended to contribute to important initiatives on improving patients' restoration of their pre-fracture mobility at the time of hospital discharge. The significance of basic mobility functions, such as bed mobility, is underscored by the literature (13,17).

Kristensen et al (13) found that loss of pre-fracture basic mobility level upon discharge from the hospital was associated with an increased risk of 30-day mortality (adjusted hazard ratios: 2.76 (95% confidence interval [CI] = 2.01–3.78) and readmission 1.26 (95% CI = 1.07, 1.48) for patients that did not reach the same level of basic mobility at discharge as they had pre-fracture compared to those who did. A recent publication (12) pointed out that the extent of mobilization within the first postoperative day, evaluated with the CAS-score, was associated with 30-day mortality (one-unit increase in CAS was associated with a lower risk). While these studies encompass various aspects of basic mobility during acute hospitalization after hip fracture surgery, the present study focuses solely on getting in and out of bed. However, getting out of bed is the first step and this can be considered a bottle neck for mobility. Given that getting out of bed is a common challenge for patients (14,15), it is crucial to improve how we help patients to overcome this activity during their hospital stay. Additionally, improving this ability is vital for long-term quality of life, as loss of independence is one of the most significant fears among older adults as they age (43) and a considerable negative consequence of sustaining a hip fracture (18).

Our study focused on patients during their acute hospital stay. It remains uncertain how movement strategies might evolve once patients are discharged. Investigating this could be important, especially considering findings from a previous study (14) indicating that patients continue to face challenges with getting out of bed even six months after discharge.

Our population was limited to patients having independent pre-fracture basic mobility (CAS=6) and to patients capable of comprehending and providing informed consent for participation. Given that most of the patients sustaining a hip fracture in Denmark have a pre-fracture CAS of 6 (44), we believe our findings to be representative and applicable to a broad population of hospitalized patients. However, it remains uncertain whether movement strategies for getting out of bed vary in patients with cognitive impairments since these patients were excluded. A previous study investigated strategies used to stand up from sitting position. Their demonstrated that people living with dementia used more strategies than people without (45). Considering that cognitive impairment during hospitalization is a known risk factor for poor functional outcomes (5), the possibility of different strategies in these patients is plausible.

Initially, we intended to adopt the analytical framework and process utilized by Mount et al. (39) in their examination of movement patterns among older adults when getting out of bed. However, a few weeks into the study, we opted to deviate from this plan and develop our own method. While our approach remained influenced by Mount et al.'s (39) analysis, the structure of our method and potentially its external validity could have been improved if we had used a specific theory or framework from the beginning.

CONCLUSION

We have identified and described the strategies used by patients early after hip fracture surgery when getting in and out of bed. Our findings revealed a greater variety of strategies for getting out of bed compared to getting into bed. The similarity in movement strategies between patients requiring assistance and those who were independent in basic mobility underlines the importance of tailoring interventions to each patient's specific needs, rather than solely basing interventions on their level of independence.

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Conflict of Interest disclosure

There was no declaration of interest in the form of financial competition or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon request.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of the manuscript the author (MSH) used ChatGPT in order to improve the readability of the text. After using this tool/service, the author (MSH) reviewed and edited the content as needed and take full responsibility for the content of the published article.

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Table 1. Overview of the development of the film analysis

DEVELOPMENT PROCES	ANALYSIS	DESCRIPTION OF THE PROCESS	WORK CONDUCTED BY WHOM AND WHEN	NO OF FILM CLIPS VIEWED
1. Data collection			MSH, KS 2023.03.13-2023.06.29	
2. Familiarizing with data		We initiated our analysis by collectively reviewing the initial recordings, which established our analytical methodology. Through discussions, we identified the study's aim. We resolved to concentrate on movement strategies that enhance activity, deliberately avoiding a focus on the body function level. We deliberated on whether to continue filming all three basic mobility activities (getting in/out of bed, rising from a chair, and walking). Although we had not yet finalized which activities to include in the analysis, we decided to proceed with recording all three activities. For the analytical method, we drew inspiration from the approach outlined by Mount et al. (39), initially attempting to adapt their techniques to our specific research context.	MSH, KS, MMP, TB 2023.03.29	14
3. Categorize movements based on timing – three time phases		We were inspired to categorize movements based on their time sequencing, dividing the process of getting in and out of bed into three distinct phases: preparation, transitioning from lying to sitting (and vice versa), and positioning.	MSH, KS, MMP, TB 2023.04.12	16
4. Confirming use of time phases		We meticulously examined the recordings, correlating our observations with the time phases. These phases proved to be logical, as we observed a natural tendency among many patients to pause or adjust their movement strategies when transitioning between phases.	MSH 2023.04.12	46
Decision to continue to develop a new analysis method		At this stage, the limitations of employing the analytic method by Mount et al. (39) became evident. Their methodology concentrated extensively on body functions and offered a level of detail that did not align with our study's objective. Consequently, we opted to further develop our specific analysis rather than attempting to adapt our data to fit Mount et al.'s method.		
5. Mind map – categorize movement categories using the time phases. Movement categories in two levels		A preliminary outline of novel movement taxonomies was generated via a mind map, informed by the delineation of the three time phases. This culminated in the establishment of movement categories at two distinct levels: overarching "strategy" and their detailed "approach".	MSH 2023.04.13	143

6. Refinement of categories	To test the applicability of the new categories, these were applied in the analysis of recently recorded patient sessions. This iterative process facilitated additional refinement of the categories, focusing on enhancing their specificity and relevance on a detailed level.	MSH 2023.04.20	40
7. Use of terminology **Review of language and spelling**	The recently refined categories were presented to the local group for feedback. During the discussion, we deliberated on the terminology for the two levels, ultimately opting for “strategy” to denote the overarching methods and “approach” to designate the more detailed movement. We acknowledged the imperative to meticulously scrutinize both the language and spelling, ensuring clarity and precision in the description of each strategy.	MSH, KS, MMP, TB 2023.04.21	43
8. Definition of frequently used terms **Criteria for completion of development process of analysis** **Plan for validation process**	We recognized the imperative to elucidate frequently utilized terminology within the documents to promote consistent comprehension. The author group established criteria for the completion of this analytical method, encompassing: - The absence of novel strategies during the second time phase over the subsequent five patient evaluations. Nonetheless, the emergence of new approaches or strategies during phases one or three remained acceptable. Following the completion of the analysis development, we planned the initial validation process: - Validation conducted by the PTs at the ward, querying whether any strategies might be missing, the representativeness of the analysis, the relevance of the category nomenclature, and the alignment of our descriptions with clinical observations. - Additionally, MTK and CKZ, who had not been previously engaged in the development process, reviewed recordings from seven patients each and were asked identical queries as those presented to PTs.	MSH, KS, MMP, TB, JWK, MTK, CKZ 2023.05.11	
9. Criteria for completing the analysis development were met	Definitions of frequently employed terminology were integrated into the documents at the group level. MSH conducted further recordings to assess adherence to the criteria for finalizing the analysis development, thus confirming the completion of the development phase.	MSH 2023.05.16 2023.05.22 2023.05.23	39
10. Validation among physiotherapists	The validation analysis was conducted with PTs on the initial 15 patients. The conclusion was that our analysis accurately reflected clinical practice. PTs proposed some revisions at the “approach” level, yet no substantial	MSH, KS, three PT 2023.06.06	15

		modifications were recommended for the “strategy” level or the overarching analytical process.		
11. Validation among researchers		Validation was also carried out among two researchers using the first 15 patient cases. Each researcher reviewed 7-8 patients. The consensus was that the analysis was representative of the observed phenomena. They offered detailed feedback on the descriptions within both the approaches and strategies, enhancing the precision of the analysis.	CKZ, MTK 2023.06.19 Revisions made by MSH 2023.06.26	30 12
12. Data collection finalized		The last patient was filmed.	MSH 2023.06.29	
13. Validation among researchers		For the ultimate validation phase, two researchers independently categorized the initial 15 patients, focusing on both the “strategy” and “approach” levels. Additionally, they provided feedback on the terminology and content employed in the categorization process.	MMP, TB 2023.08.10	120
14. Refining categories	**The first 15 recordings used in the development process were analyzed and divided into final strategies and approaches when getting in and out of bed.**	In the follow-up to the ultimate validation of the categories, the researchers compared their individual categorizations. In cases of disagreement, MSH's categorization was consulted to facilitate consensus. Disagreements initially arose in only two categories, which were subsequently resolved through discussion. The overarching review highlighted the need for more consistent terminology concerning the patients' positions in bed. Furthermore, there was a discussion on finding the right balance between broad and specific descriptions within the categories to ensure clarity and applicability.	MSH, MMP, TB 2023.08.31	10
15. Revision of categories		Following the meeting described above, we conducted a revision in which several categories were merged.	MSH 2023.09.01	18
	16. The last 24 recordings were analyzed and divided into final strategies and approaches when getting in and out of bed.	The remaining recordings, encompassing 24 patients, underwent evaluation by two researchers working independently (MP-MSH and KS-MSH). They subsequently met to reconcile any discrepancies and achieve consensus in cases of disagreement. Feedback from these evaluations highlighted the similarity between certain categories, prompting consideration of merging some of them.	MSH, KS, MMP 2023.09.05	342
	17. Final review of all movement categories-	Lastly, we thoroughly reviewed all movement categories. During this process, certain approaches were consolidated into more general categories.	MSH 2024.01.28	73
				TOTAL 961 Unique views

Abbreviations: **No:** Number; **PT**: Physiotherapists.

(39). Mount J, Kresge L, Klaus G, Mann L, Palomba C. Movement patterns used by the elderly when getting out of bed. 2006; Available from: https://jdc.jefferson.edu/ptfp/2

Table 2. Descriptive variables at inclusion and at day of filming (n=39)

VARIABLES	n (%)
Mean age years, (SD)	78.7 (7.6)
Women	23 (59)
Men	16 (41)
Type of fracture	
Intracapsular (cervical femoral fracture)	23 (59)
Extracapsular (per- og subtrochanteric)	16 (41)
Type of surgery	
Parallel pins	5 (12.8)
Hemiarthroplasty	15 (38.5)
Total hip arthroplasty	2 (5.1)
Dymaic hip screw	2 (5.1)
Short intra medullar hip screw	12 (30.8)
Long intra medullar hip screw	3 (7.7)
Pre-fracture New Mobility Score 0-9, median (IQR)	9 (7:9)
Pre-fracture Cumulated Ambulation Score 0-6, median (IQR)	6 (6:6)
The American Society of Anesthesiologists physical status classification system 1-5	
High health status (1-2)	22 (56.4)
Low health status (3-4)	17 (43.6)
Pre-fracture Clinical Frailty Scale 1-9, median (IQR)	3 (3:4)
Short Orientation-Memory Concentration test 0-28, median (IQR)	22 (20:26)
Mini Nutritional Assessment Short form 0-14, median (IQR)	10 (8:11) 10 missing
Malnourished (0-7)	7 (17.9)
At risk of malnutrition (8-11)	22 (56.4)
Normal nutritional status (12-14)	0
Body Mass Index median (IQR)	24.2 (21.3:29.4) 13 missing
Hand grip strength kg, median (IQR)	
Women	21.9 (18.6:24.9) 1 missing
Men	30.9 (25.3:36.7)
Residential status	
Own home	39 (100)
Patient able to get in and out of bed independently at day of filming	
Yes	25 (64.1)
No	14 (35.9)
Pain at rest, day of filming Verbal Rating Scale, 0-4, median (IQR)	0 (0:1)
Pain walking, day of filming Verbal Rating Scale, 0-4, median (IQR)	2 (1:2)
Post-operative pain medication, day of filming	
Pain killers	30 (76.9)
Epidural analgesia	9 (23.1)

Data are presented as mean (SD), median (IQR) or as numbers (%). *Abbreviations:* **SD:** Standard Deviation **IQR**: Inter Quartile Range

Table 3. Out of bed - strategies and approaches

PHASE	STRATEGY	APPROACH	NO OF PT WITH SAME STRATEGY (n, %)	NO OF PT WITH SAME APPROACH (n, %)
PREPARATION	**1**. No preparation	**a**. Proceeding directly to the subsequent phase.	14 (36.8)	14 (36.8)
	2. Legs to the edge	**a**. Sliding one leg to the edge of the bed.	19 (50.0)	10 (26.3)
		b. Raised headboard. Both feet are moved over the edge. Pt. positions himself/herself at an angle in the bed.		6 (15.8)
		c. **Assisted** in positioning the sliding piece. Employing it beneath the pelvis and utilizing the bed rail for support, pt. initiates the process of angling himself/herself within the bed. The non-op. leg slides over the edge. **Another person** elevates the op. leg, facilitating pt.'s repositioning to lie more obliquely with both feet extended beyond the bed's edge.		1 (2.6)
		d. Using one leg to perform a pelvic lift. Pt. positions himself/herself at an angle in bed. One foot is positioned slightly outside the edge of the bed.		2 (5.3)
	3. Entire body towards the edge	**a**. **Another person assists both by moving the feet and by lifting the pelvis to the side.** Pt. bends the legs, does small pelvic lifts and moves the feet to the side.	2 (5.3)	2 (5.3)
	4. Grasps the mattress	**a**. Grasping the edges of the mattress using both hands and bends the neck slightly while looking down towards the feet.	2 (5.3)	2 (5.3)
	5. Strap	**a**. Placing a strap around the foot of the op. side.	1 (2.6)	1 (2.6)
LIE-TO-SIT	**1**. Tilt	**a**. Raising vigorously the non-op. leg high above the bed, while elevating the upper body. The non-op. leg is swung toward the floor, pt. utilizes elbows and hands to exert downward pressure onto the bed, facilitating the ascent of the trunk.	3 (7.9)	3 (7.9)
	2. Strap	**a**. Elevating both legs simultaneously over the edge, the op. leg is elevated using a strap, synchronously	1 (2.6)	1 (2.6)

	with pt.’s semi-upright position. One hand holds the strap and the other applies downward pressure onto the bed.		
3. Long sitting position	**a.** Assuming a seated position in bed with legs extended, pushing down with arms onto the bed. Each leg is maneuvered out of bed individually. If needed, the legs are lifted over the edge with the aid of the hands.	9 (23.7)	7 (18.4)
	b. **Assisted by another person, pt. elevates the trunk**, achieving substantial or complete long sitting positioning. **In collaboration with other person, pt. moves both legs abruptly to the edge**. The legs are maneuvered over the edge simultaneously, **with verbal or physical assistance from the other person**. Pt. supports himself/herself with hands either on the bed or bed rail. **The other person provides support to pt.´s trunk, facilitating the transition to an upright sitting position**.		2 (5.2)
4. Hamsting-hook	**a**. Hamstring-hook with one leg against the bed. Ascending to a seated position by pressing arms down into the bed.	6 (15.8)	1 (2.6)
	b. Using both legs alternately to perform a "hamstring-hook" while applying downward pressure with arms onto the bed to sit up.		5 (13.2)
5. Raised headboard	**a**. Raised headboard. One leg gets out of the bed individually or simultaneously. Optionally, pt.'s one hand assists by supporting the op. leg, while **alternatively obtaining help from another person** to lift the leg. Hands are pressed down into the bed.	11 (28.9)	11 (28.9)
6. **Diagonal pull using another person**	**a. Another person grasps pt.'s hand at a diagonal angle and assists in elevating pt. into a seated position. One additional person provides support to pt.'s trunk from a posterior position or by assisting in lifting one leg over the edge**. Sliding piece under pt., possibly an elevated bed.	2 (5.3)	2 (5.3)
7. Fully or partially side lying	**a**. Raised headboard. Shifts to the side (same side as pt. gets out of bed), pushes off with opposite arm on the headboard. Both legs perform a hamstring-hook.	6 (15.8)	2 (5.3)

		b. Leaning towards one side and pivots out of bed while weight on one buttock. Applying pressure with arms against the surface of the bed. If necessary, both legs perform a hamstring-hook.		4 (10.5)
POSITIONING	**1**. Sliding forward	**a**. Sliding towards the edge by using a *sliding piece* and support from hands on the bed. **Another person provides physical guidance and ensures that pt. remains securely within the bed.**	8 (18.2)	8 (18.2)
	2. Raising while applying the arms	**a**. Applying pressure with hands onto the bed and elevates the body towards the edge of the bed to enable the feet touching the floor.	36 (81.8)	19 (43.2)
		b. Similar to 2.a, however, pt. already maintains contact with the floor with the feet, requiring only adjustment for comfort.		13 (29.5)
		c. Applying “walking buttocks" and employs both upper and lower limbs to maneuver towards the edge of the bed, culminating in placing the feet on the floor.		2 (4.5)
		d. Applying downward pressure with arms against the bed, while **another person moves the legs (primarily the op. leg) to assume a straight forward position while this person supports the trunk.**		2 (4.5)

When the text within the table is presented in **bold** or <u>underlined</u> characters, it indicates that the strategy or approach can be employed with or without **support from another person** or the <u>use of assistive devices</u>, respectively.

Definition of frequently used terms:

Long sitting position: Seated position in bed with legs extended.

*Pelvic lif*t: While supine, legs are flexed with one or both feet resting on the mattress. The buttocks are raised from the surface, albeit not necessarily fully elevated.

Walking buttocks: When moving the body forward or backward while sitting on the edge of the bed, the body weight is shifted to the right/left buttock alternately, while the other buttock is moved forward/backward.

Strap: A strap/band/or similar that can be positioned beneath op. leg to provide support during the process of lifting it in or out of bed. During the recording, we utilized a fabric band commonly employed for a loose sling.

Abbreviations: **No.:** Number; **Op.:** Operated; **Pt.:** Patient

Table 4. Getting into bed - strategies and approaches

PHASE	STRATEGY	APPROACH	NO OF PT WITH SAME STRATEGY (n, %)	NO OF PT WITH SAME APPROACH (n, %)
PREPARATION	**1.** Hands behind the body	**a**. Placing hands behind the body in bed.	5 (12.8)	5 (12.8)
	2. Buttocks tilted into bed	**a.** Using feet on the floor and hands on the bed.	22 (56.4)	17 (43.6)
		b. Using a sliding piece and/or **another person to guide and support.**		2 (5.1)
		c. Using a high walker frame in one hand and placing the other hand on bed.		3 (7.7)
	3. Buttocks far back in bed	**a**. Using hands in bed, feet on floor, and perhaps employing ”walking buttocks", pt. moves far back in bed with the buttocks (straight backwards).	4 (10.3)	4 (10.3)
	4. Mounting strap around the foot	**a**. Mounting the strap around the foot of the op. side.	1 (2.6)	1 (2.6)
	5. No preparation	**a**. Proceeding directly to the next phase.	7 (17.9)	7 (17.9)
SIT-TO-LIE	**1**. Leg lift, one at a time	**a**. Optionally with a raised headboard, lifting one leg at a time into bed, with both arms placed behind the body as the trunk is lowered.	27 (73.8)	13 (35.1)
		b. Optionally with a raised headboard, lifting one leg at a time in bed. The op. leg is lightly assisted by one or two hands or **alternatively by another person**. Either pt. leans back against the raised headboard from the start, or the trunk is lowered at the end.		10 (27.0)
		c. Lifting one leg at a time into bed, pt transitions into a long sitting position. The op. leg may be assisted into bed with the light help of one or two hands, while the trunk is lowered.		3 (8.1)
		d. Using a sliding piece and **substantial assistance from two people,** the op. leg is initially lifted, followed by rotation of the upper body into the bed and then lifting the non-op. leg into the bed.		1 (2.7)
	2. Elevating legs simultaneously	**a**. Elevating both legs simultaneously into bed, pt. transitions into a long sitting position. Descends to supine position with support from the elbows.	4 (10.8)	1 (2.7)
		b. Elevating both legs simultaneously, pt. descends to supine position at the same time.		3 (8.1)
	3. Side lying	**a**. Reclining and positioning on the non-op. side, with the hand on the op. side providing gentle support to the op. leg. **Another person lightly supports the op. leg to avoid inward rotation when lifting the leg up**	3 (8.1)	3 (8.1)

		into bed. Pt. rotates onto the back and assumes a supine position.		
	4. Hook by using the non-op. leg	**a.** Elevating both legs simultaneously. Pt. lowers the upper body and assumes a reclined angle in bed. The non-op. leg makes a hook under the op. leg and lifts it into bed.	2 (5.4)	2 (5.4)
	5. Strap	**a**. Inclining laterally, pt. initially raises the op. leg into the bed utilizing a strap, followed by lifting the contralateral leg. Pt. reclines onto the elbow, providing support with the forearm and hand on the opposite side from where the strap is being held.	1 (2.7)	1 (2.7)
POSITIONING	**1.** Unnecessary	**a.** Positioning at the end of the sit-to-lie phase.	7 (19.4)	7 (19.4)
	2. Adjusting with arms and legs	**a**. Using support from hands and movements of buttocks/legs, pt. lies in the middle of the bed.	13 (36.1)	13 (36.1)
	3. Pelvic lift	**a**. Performing one or more pelvic lifts and supports with arms in bed to be positioned centrally. **b**. Performing pelvic lifts only with the non-op. leg. **c**. Performing a small pelvic lift where pt. supports on both heels with the intention of being elevated within the bed.	13 (36.1)	7 (19.4) 4 (11.1) 2 (5.6)
	4. Pushing with the non-op. leg	**a**. Pushing the op. leg with the non-op. leg towards the center of the bed, moving the upper body with it.	1 (2.8)	1 (2.8)
	5. **Another person supports and centers the op. leg**	**a**. **Another person lifts op. leg towards the center. Using one or two persons and** possibly a sliding piece and bed rail, pt. positions to the central area through a pelvic lift and adjustment of the upper body.	2 (5.6)	2 (5.6)

When the text within the table is presented in **bold** or underlined characters, it indicates that the strategy or approach can be employed with or without **support from another person** or the use of assistive devices, respectively.

Definition of frequently used terms:

Long sitting position: Seated position in bed with legs extended.

*Pelvic lif*t: While supine, legs are flexed with one or both feet resting on the mattress. The buttocks are raised from the surface, albeit not necessarily fully elevated.

Walking buttocks: When moving the body forward or backward while sitting on the edge of the bed, the body weight is shifted to the right/left buttock alternately, while the other buttock is moved forward/backward.

Strap: A strap/band/or similar that can be positioned beneath op. leg to provide support during the process of lifting it in or out of bed. During the recording, we utilized a fabric band commonly employed for a loose sling.

Abbreviations: **No:** Number; **Op.:** Operated; **Pt.:** Patient

Table 5. Movement strategies and movement patterns among patients being independent or in need of help when getting out of and into bed on the day of filming

GETTING **OUT** OF BED		
	Not independent getting out of/into bed, n=14	Independent getting out of/into bed, n=25
PREPATATION		
No preparation	6 (42.9)	8 (32)
Legs to the edge	6 (42.9)	13 (52)
Entire body towards the edge	1 (7.1)	1 (4)
Grasps the mattress		2 (8)
Strap		1 (4)
Missing	1 (7.1)	
LIE-TO-SIT		
Tilt		3 (12)
Strap		1 (4)
Long sitting position	3 (21.4)	6 (24)
Hamsting-hook	1 (7.1)	5 (20)
Raised headboard	6 (42.9)	5 (20)
Diagonal pull using another person	2 (14.3)	
Fully or partially side lying	1 (7.1)	5 (20)
Missing	1 (7.1)	
POSITIONING		
Sliding forward	1 (7.1)	
Raising while applying the arms	11 (78.6)	25 (100)
Missing	2 (14.3)	
MOVEMENT PATTERNS		
A	2 (14.3)	3 (12)
B	2 (14.3)	3 (12)
C	1 (7.1)	4 (16)
D	1 (7.1)	3 (12)
E	4 (28.6)	2 (8)
Missing	4 (28.6)	10 (40)
GETTING **INTO** OF BED		
POSITIONING		
Hands behind the body	2 (14.3)	3 (12)
Buttocks tilted into bed	9 (64.3)	11 (44)
Buttocks far back in bed	1 (7.1)	3 (12)
Mounting strap around the foot		1 (4)
No preparation		7 (28)
Missing	2 (14.3)	
SIT-TO-LIE		
Leg lift, one at a time	8 (57.1)	19 (76)
Elevating legs simultaneously	1 (7.1)	3 (12)
Side lying	3 (21.4)	
Hook by using the non-op. leg		2 (8)
Strap		1 (4)
Missing	2 (14.3)	
POSITIONING		
Unnecessary	1 (7.1)	6 (24)
Adjusting with arms and legs	5 (35.7)	8 (32)
Pelvic lift	4 (28.6)	9 (36)
Pushing with the non-op. leg		1 (4)
Another person supports and centers the op. leg	2 (14.3)	
Missing	2 (14.3)	1 (4)
MOVEMENT PATTERNS		
F	1 (7.1)	4 (16)
G	2 (14.3)	3 (12)
Missing	11 (78.6)	18 (72)

Data are presented as numbers (%). The division of patients into "Not independent getting out of/into bed" and "Independent getting out of/into bed" was based on their Cumulated Ambulation Score, where being able to move from lying to standing or to

chair and back to lying in bed without verbal instruction or personal support, or use of the functions of the bed, was defined as independent. All walking aids could be used.
Movement strategies were divided into three time phases; preparation, lie-to-sit/sit-to-lie, and positioning.
A movement pattern was registered when the same combination of strategies in all three phases among at least four or more patients occurred.

Table 6. Descriptive variables among patients being independent or in need of help when getting in/out of bed on the day of filming

	HGS women median (IQR)	**HGS men** median (IQR)	**Pain at rest** VRS, 0-4, median (IQR)	**Pain walking** VRS, 0-4, median (IQR)	**Fracture type** intracapsular/extracapsular number (%)
Not independent getting in/out of bed N=14	20.8 (15.9:22.9) N=9 Missing =5	33.0 (28.5:-) N=3 Missing=11	0 (0:1)	2 (1:2)	5 (35.7)/9 (64.3)
Independent getting in/out of bed N=25	20.9 (18.7:25.7) N=12 Missing=13	31.5 (26.1:36.5) N=13 Missing=12	0 (0:1)	0 (0:1)	18 (72)/7(28)

Abbreviations: **HGS**: Handgrip strength; **VRS**: Verbal Rating Scale, 0-4 point; **IQR:** Inter Quartile Range. (%).

The division of patients into "Not independent getting in/out of bed" and "Independent getting in/out bed" was based on their Cumulated Ambulation Score, where being able to move from lying to standing or to chair and back to lying in bed without verbal instruction or personal support, or use of the functions of the bed, was defined as independent. All walking aids could be used.

Supplementary table 1. Movement patterns – combinations of strategies and approaches in the three time phases

OUT OF BED				
Combination of STRATEGIES	**Combination of APPROACHES**	**CAS**	**Four patients ≤ with the same combination of STRATEGIES**	**Four patients ≤ with the same combination of APPROACHES**
2 1 2	2d 1a 2b	6		
2 1 2	2a 1a 2b	6		
1 3 2	1a 3a 2b	6		
1 3 2	1a 3a 2b	6		
1 3 2	1a 3b 2a	1/1/1		
1 3 2	1a 3a 2a	1/1/1		
1 3 2	1a 3a 2a	2/2/1	**5 pt:** 1 3 2 **Movement pattern A**	
2 6 1		1/1/1		
2 5 2	2b 5a 2b	1/1/1		
2 5 2	2b 5a 2b	6		
2 5 2	2b 5a 2b	6		
2 5 2	2a 5a 2c	6		
2 5 2	2a 5a 2a	1/2/1	**5 pt:** 2 5 2 **Movement pattern B**	
2 4 2	2a 4b 2a	1/1/1		
2 4 2	2a 4a 2a	6		
2 4 2	2a 4b 2b	6		
2 4 2	2b 4b 2b	2/1/1		
2 4 2	2b 4b 2a	6	**5 pt:** 2 4 2 **Movement pattern C**	
2 3 2		6		
4 3 2	4a 3a 2c	2/2/1		
4 3 2	4a 3a 2a	2/1/1		
3 3 2		3		
2 7 2	2a 7a 2a	6		
2 7 2	2b 7b 2a	6		
2 7 2	2d 7a 2a	6		
2 7 2	2a 7b 2a	1/2/2	**4 pt:** 2 7 2 **Movement pattern D**	
1 5 2	1a 5a 2a	1/1/1		
1 5 2	1a 5a 2a	1/2/1		
1 5 2	1a 5a 2a	6		
1 5 2	1a 5a 2b	6		
1 5 2	1a 5a 2b	1/1/1		
1 5 2	1a 5a 2d	1/2/1	**6 pt:** 1 5 2 **Movement pattern E**	
1 7 2	1a 7b 2a	6		
1 7 2	1a 7b 2a	2/2/1		
3 1 2		6		
1 4 2		6		
2 6 -		1/1/1		
5 2 2		6		

A total of 15 different combinations of strategies

INTO BED				
Combination of STRATEGIES	**Combination of APPROACHES**	**CAS**	**Four patients ≤ with the same combination of STRATEGIES**	**Four patients ≤ with the same combination of APPROACHES**
1 4 4	1a 4a 4a	6		
5 2 3		6		
2 1 3	2c 1a 3a	1/2/2		
2 1 3	2a 1a 3b	6		
2 1 3	2a 1a 3a	6		
2 1 3	2a 1a 3a	6		
2 1 3	2a 1b 3b	2/1/1	**5 pt:** 2 1 3 **Movement pattern F**	
2 1 5	2b 1d 5a	1/1/1		
2 1 5	2a 1b 5b	1/1/1		
2 3 3		1/1/1		
1 1 1		6		
3 1 1		2/2/1		
2 1 1	2a 1c 1a	6		
2 1 1	2a 1c 1a	6		
2 1 1	2b 1b 1a	1/1/1		
2 1 2	2a 1b 2a	6		
2 1 2	2a 1b 2a	6		
2 1 2	2a 1b 2a	1/2/1		
2 1 2	2a 1b 2a	1/1/1		**4 pt:** 2a 1b 2a
2 1 2	2a 1a 2a	6	**5 pt:** 2 1 2 **Movement pattern G**	
5 1 1	5a 1a 1a	6		
5 1 1	5a 1a 1a	6		
5 2 2		6		
1 1 3	1a 1a 3a	1/1/1		
1 1 3	1a 1a 3b	1/2/1		
3 2 2		1/1/1		
5 1 2	5a 1b 2a	2/1/1		
5 1 2	5a 1a 2a	2/2/1		
2 4 3		6		
3 1 3		6		
2 3 2	2a 3a 2a	1/2/1		
2 3 2	2a 3a 2a	1/2/2		
3 1 2		6		
2 2 3		6		
1 1 2		6		
5 1 3		2/2/1		
4 5 -		6		

A total of 22 different combinations of strategies

The combination of strategies is based on the patients' movements in each of the three time phases (preparation, lie-to-sit/sit-to lie, and positioning).

All movement strategies and approaches are described in table 3-4, figure 3-4 and visually demonstrated in Supplementary videorecordings.

Abbreviations: **CAS**: Cumulated Ambulation Score; **Pt**.: Patient