ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2018;99:893-9

ORIGINAL RESEARCH

What Factors Are Associated With the Recovery of Autonomy After a Hip Fracture? A Prospective, Multicentric Cohort Study

Mattia Morri, PT,[a] Paolo Chiari, RN,[b] Cristiana Forni, RN,[c] Antonella Orlandi Magli, PT,[a] Domenica Gazineo, RN,[b] Natalia Franchini, PT,[a] Lorenzo Marconato, PT,[d] Tiziana Giamboi, PT,[a] Andrea Cotti, PT[a]

From the [a]Department of Nursing and Allied Health Professions, Rizzoli Orthopaedic Institute, Bologna, Italy; [b]Department of Medicine and Surgical Sciences, University of Bologna, Italy; [c]Research Nursing Unit, Rizzoli Orthopaedic Institute, Bologna, Italy; [d]Department of Physical Therapy and Rehabilitation, Bologna University Hospital Authority St. Orsola-Malpighi Polyclinic, Bologna, Italy.

Abstract

Objective: To identify the factors associated with recovering autonomy in activities of daily living (ADL) in patients who have had a hip fracture.

Design: A prospective cohort study.

Setting: The orthopedic and orthogeriatric departments of 2 regional hospitals.

Participants: Patients (N = 742) aged ≥65 years with a diagnosis of fragility hip fracture.

Main Outcome Measures: The level of autonomy at 4 months was assessed using the ADL scale.

Results: The median score on the ADL scale at 4 months was 3 (interquartile range, 5). Half of the population was unable to recover their prefracture autonomy levels. The following were found to be risk factors: increasing age (B = .02, P <.001); an elevated number of comorbidities (B = .044, P = .005); a lower level of prefracture autonomy (B = .087, P <.001); more frequent use of an antidecubitus mattress (B = .211, P <.001); an increased number of days with disorientation (B = .002, P = .012); failure to recover deambulation (B = .199, P <.001); an increased number of days with diapers (B = .003, P <.001), with a urinary catheter (B = .03, P <.001), and with bed rails (B = .001, P = .014); and a nonintensive care pathway (B = .199, P = .014).

Conclusions: Recovery of deambulation, treatment of disorientation and management of incontinence are modifiable factors significantly associated with the functional recovery of autonomy.

Archives of Physical Medicine and Rehabilitation 2018;99:893-9

Hip fractures represent one of the principal causes of hospitalization for older adults, and are a serious health problem because of the resulting mortality and disability.[1,2] A history of hip fracture is often associated with a low level of autonomy in activities of daily living (ADL).[3] Various studies[4-6] have demonstrated how difficult it is for older adults with fractures to regain the levels of autonomy they had previous to the traumatic event. In the case of a problem that is so diffuse and has such an impact on patients' lives, the international guidelines recommend the establishment of specific clinical pathways for managing fragility hip fractures.[7] A recent randomized controlled trial[8] has shown the importance of the geriatric clinical approach for these patients. However, given the heterogeneity of the approaches to date and the scarcity of evidence for these approaches, it has not yet been possible to identify a management model that is recognized to be of greater efficacy.[9-12] Age, cognitive deterioration, nutritional state, prefracture functional level, early recovery of deambulation, rapid removal of the urinary catheter, and type and rapidity of surgery are some of the elements indicated by various authors as factors significantly associated with functional recovery.[3,5,11-18] However, the studies available have some potential limitations, such as a retrospective study design,[15,16] historical comparison between 2 cohorts of patients,[5] small sample size,[14] and a long-term enrollment

Disclosures: none.

0003-9993/18/$36 - see front matter © 2018 by the American Congress of Rehabilitation Medicine
https://doi.org/10.1016/j.apmr.2018.01.021

period.[3,17] Furthermore, the characteristics of the patient care/rehabilitative pathways, such as the intensity of the physiotherapy treatment and the postdischarge rehabilitative pathway, are poorly described or have not been described at all, thus rendering it difficult to differentiate between what took place in the hospital and what took place after discharge. Recent revisions in the literature have had the aim of investigating the pathway of recovery after a hip fracture; they indicate the necessity of additional high-quality methodological studies in order to be able to describe the results over the medium-/long-term together with the relevant determining factors.[19,20]

The aim of the present study was to identify the factors linked to the recovery/loss of autonomy in ADL in the first 4 months after surgery for a hip fracture, taking into consideration the basic characteristics of the patient, hospital care (medical, nursing, and rehabilitative), and the postdischarge pathway.

Methods

Population

A prognostic prospective cohort study was carried out that involved 2 hospitals and their respective orthopedic and orthogeriatric departments. All consecutive patients aged ≥65 years who were hospitalized with a diagnosis of fragility hip fracture (pertrochanteric or of the femoral neck) were enrolled over a 1-year period. The exclusion criteria were refusing consent for participation in the study, the absence of a legal guardian to sign the consent form in cases of cognitive deficit, and a diagnosis of periprosthetic or pathologic fracture. The study was approved by the ethics committees of both participating centers.

Description of pathway

Patients with a diagnosis of hip fracture were enrolled according to the inclusion criteria of their respective emergency departments. In both hospitals, surgery was to be performed within a short period, with postponement only for clinical reasons.

Hospital care

The rehabilitative program, carried out from Monday to Saturday, was to have physiotherapy sessions begin within a day after surgery. The physiotherapy involved exercises of active and passive mobilization in bed, rapid placement in an upright sitting position, reaching deambulation according to the clinical condition of the patient and using the device adopted for walking.

Postdischarge pathway

According to the diagnostic-therapeutic pathway defined by the local and regional patient care programs, patients could be discharged to a rehabilitation center with intensive or extensive physiotherapy treatment or to a health care center (residential facility or nursing home) with rehabilitation counseling. The rehabilitative counseling was furnished by a physiotherapist and consisted of education/information for the patient and the caregiver. The rehabilitation treatment consisted of physiotherapy sessions at least 5 times a week with functional exercises and deambulatory training. An intensive treatment session lasted not less than 3 hours daily, while an extensive session lasted for more than 1 hour but for less than 3 hours. The choice of both the setting and the most appropriate intensity of the treatment were agreed on by a multiprofessional team.

List of abbreviations:

ADL activities of daily living
IQR interquartile range

Primary and secondary outcome measures

The level of autonomy at 4 months was assessed using the ADL scale.[21] The ADL scale uses 7 items of evaluation: feeding, use of the toilet, dressing, intestinal continence, bladder continence, getting out of bed, and deambulation. One point is assigned for each function in which the patient is dependent, yielding a total score ranging from 0 (complete independence) to 7 (dependent in all functions). A 4-month evaluation was chosen because, within the health setting in which this study took place, the length of the period of care was approximately 3 to 4 months, the same as that as is also true in other European contexts.[22] A 4-month period has previously been reported as sufficient for permitting patients to reach the principal objective of recovering basic autonomy.[23]

With the aim of collecting more specific data regarding the impact of clinical practice on patient recovery/loss of autonomy, an additional outcome was included. Taking into account the characteristics of the scale and expecting a worsening of the ADL at 4 months with respect to the ability at the beginning, the secondary outcome was calculated as a percentage of worsening according to the following formula: ([ADLpost − ADLpre] / [7 − ADLpre]) × 100. Other secondary outcomes were the incidence of mortality and rehospitalization, and their relative causes, occurring within the first 4 months after the event.

Identification of possible predictive factors

Possible predictive factors were identified by a multiprofessional team of experts assembled for the occasion, based on data reported in the literature and on clinical experience. The variables and the modalities of collecting the data were selected and planned before enrolling the first patient. The list of prognostic factors is presented in tables 1 and 2.

Data collection

Within 24 hours of the patients arriving at the emergency departments of the 2 hospitals, a nurse-researcher collected the patients' basic data (eg, age, sex, presence of comorbidities, type of residence, and level of prefracture mobility—ADL) by means of a direct interview with the patients or with their relatives for patients with cognitive impairment. The variables linked to the period of hospitalization (eg, type of surgery, its duration, waiting time between arrival and surgery) were collected daily by the nurse in the department and were reported on the appropriate form. The functional results that the patients were able to reach during their hospital stay were reported on the rehabilitative form. When discharged, all the information regarding the successive follow-up was given to the patients and relatives. Four months after surgery, the physiotherapist-researcher contacted the patient or the relatives by telephone to collect the information relative to the secondary outcome and the postdischarge pathway—that is, whether the scheduled pathway had been followed and within which structure (nursing home with an intensive or

Table 1 Characteristics of population and univariate analysis for continuous variables—ADL 4th month

Characteristics	Values (N = 742)	Rho	*P*
Basic variables			
Age (y)	83.7±7.8	.38	<.001
Comorbidity (Charlson score)	2 (2)	.23	<.001
Hb level at presentation (g/dL)	12.3±1.6	−.09	.022
ADL prefracture	0 (3)	.43	<.001
Hospital patient care			
Wait time from arrival in ED to surgery (h)	47 (39)	.05	.248
Percentage of days with pain ≥4 (NRS)	12.5 (25)	−.05	.179
Percentage of decrease in Hb with respect to initial values	22.5±11.2	−.09	.023
Length of surgery (min)	60 (32)	−.10	.014
No. of days from surgery to start of physiotherapy	1 (1)	.05	.238
No. of days until drain removal	1 (1)	−.04	.368
Percentage of days of disorientation (clinical judgment)	0 (39.2)	.29	<.001
Percentage of days with restraints (bed rails)*	83.3 (100)	.21	<.001
Daily postoperative positioning†	4.4 (1.8)	−.11	.004
Percentage of days with a partial caregiver	90 (42)	−.163	<.001
No. of physiotherapy treatments	5.9±2.5	−.01	.829
Percentage of days of fever	29.2±24.6	−.06	.137
Percentage of days with urinary catheter	100 (38)	−.14	<.001
Percentage of days with a diaper	47.7±40.5	.26	<.001
Length of stay (d)	9 (4)	.07	.063

NOTE. Values are mean ± SD, median (IQR), or as otherwise indicated. Missing cases for each variable: 5, number of physiotherapy treatment; 1, percentage of days of fever; 36, indications of the hemoglobin level on admission and of the percentage of its drop.
Abbreviations: ED, emergency department; Hb, hemoglobin; IQR, interquartile range; NRS, numeric rating scale.
* Number of days when bed rails were used.
† Frequency of mobilization carried out by both the patient care and the rehabilitative personnel.

Table 2 Characteristics and univariate analysis for dichotomous variables—ADL 4th month

Characteristics	n (%) (N = 742)	% variation in ADL Median (IQR)	*P*
Basic variables			
Sex			.556
Women	573 (77.2)	3 (5)	
Men	169 (22.8)	2.5 (5)	
Patients living in nursing homes (vs home)			<.001
Home	682 (91.9)	2 (5)	
Nursing homes	60 (8.1)	5 (4)	
Other fracture at presentation			.067
Yes	55 (7.4)	4 (3)	
No	692 (93.3)	2 (5)	
Pressure ulcers at presentation			.004
Yes	34 (4.6)	5 (2.25)	
No	708 (95.4)	2 (5)	
Physique very thin (vs normal or obese)			.006
Very thin or obese	214 (29.2)	4 (5)	
Normal	518 (57.1)	2 (5)	
Fracture			.012
Femoral neck	352 (47.4)	2 (5)	
Trochanteric	390 (52.6)	3 (5)	
Hospital patient care			
Surgery			.012
Arthro- or endoprosthesis	336 (45.3)	2 (5)	
Osteosynthesis	406 (54.7)	3 (5)	
Postoperative in intensive care unit			.949
No	709 (95.6)	3 (5)	
Yes	33 (4.4)	3 (5)	
Antidecubitus mattress with a motor			<.001
No	377 (50.8)	1 (5)	
Yes	365 (49.2)	4 (4.25)	
Deambulation			.017
Without weight bearing	366 (49.3)	3 (5)	
Partial or total	376 (50.7)	2 (5)	
Reach a standing position			<.001
Yes	629 (84.8)	2 (5)	
No	113 (15.2)	5 (3)	
Reach ambulation			<.001
Yes	450 (60.6)	1 (5)	
No	292 (39.4)	5 (4)	
Hospitalization in			.908
Orthogeriatrics	219 (29.5)	2 (6)	
Orthopedics ward	523 (70.5)	3 (5)	
Rehabilitative pathway variables			
Postdischarge rehabilitative pathway			.717
Yes	611 (91.5)	3 (5)	
No	57 (8.5)	2 (5.25)	

(*continued on next page*)

extensive regimen, nursing home, residential facility), and the level of autonomy reached (by means of filling out the ADL scale). The nurses and physiotherapists involved in the process of collecting the data were blinded among themselves and with respect to who subsequently carried out the statistical analysis of the data.

Sample size

We considered an effect size of .19 (expected correlation, 0.4), a predictor number of 20, an alpha error of .05, and a power of at least 0.9, yielding a minimum sample size of 209. When we then considered a stability of at least 5%, the number increased to at least 450. However, we planned to proceed with the enrollment for approximately 1 year in order to avoid the possible effects linked to the seasonality of the recruitment.

Table 2 (*continued*)

Characteristics	n (%) (N = 742)	% variation in ADL Median (IQR)	*P*
Intensive patient care			<.001
Yes	73 (10.9)	0 (4)	
No	595 (89.1)	3 (5)	
Extensive patient care			.942
Yes	223 (33.4)	3 (5)	
No	445 (66.6)	2 (5)	
Residential facility			.964
Yes	80 (12.0)	3 (5)	
No	588 (88.0)	3 (5)	
Nursing home			<.001
Yes	142 (21.3)	5 (4)	
No	526 (78.7)	2 (5)	
Home care physiotherapy			<.001
Yes	324 (51.5)	2 (5)	
No	344 (48.5)	4 (6)	
Pain (NRS)			.001
Yes	341 (51.1)	3.5 (6)	
No	313 (47.9)	2 (5)	

NOTE. Missing cases for each variable: 10, costitutionally; 74, post-discharge rehabilitative/nursing pathway; 88, pain at 4 months.
Abbreviations: IQR, interquartile range; NRS, numeric rating scale.

Statistical analysis

All statistical analyses were carried out using SPSS version 15.0.[a] All continuous data were expressed as mean and the SD of the mean when normally distributed, and as median and interquartile range (IQR) when not normally distributed; the categorical data were expressed as frequencies and percentages. The Kolmogorov-Smirnov test was carried out to test the normality of the continuous variables. The Levene test was used to test the homoscedasticity. The Spearman correlation test was used to assess the influence of the continuous variables on the primary outcome because of its nonnormal distribution. The analysis of variance test was used to assess the between-group differences of the continuous, normally distributed, and homoscedastic data, and the Mann-Whitney test was used for nonnormal or heteroscedastic data. The chi-square test, evaluated by exact methods for small samples, was used to investigate the relationships between the categorical variables. The variables that were significant at univariate analysis were inserted into a multivariate analysis that used the generalized linear model with gamma distribution, and log-link function was used as a multivariate analysis to identify the variables that independently predicted variation in the ADL scale. The gamma distribution was used because of the strong nonsymmetrical distribution of the primary outcome; the analyses were run on a per-protocol dataset. $P<.05$ was considered significant for all tests.

Results

During the study period (October 2013 through January 2015), 840 potentially eligible patients were admitted to the emergency departments of the hospitals involved (fig 1). The total number of patients enrolled was 742 at the time of hospitalization and 727 at follow-up. The basic characteristics of the population are described in tables 1 and 2. The median score of the prefracture ADL was 0 (IQR = 3) and that at 4 months was 3 (IQR = 5). When considering the single items of the prefracture ADL scale, use of the toilet, dressing, and bladder control were the most frequently lost abilities, and they were lacking in 24.7%, 20.6%, and 19.6% of patients, respectively. At the 4-month evaluation, this trend was confirmed; use of the toilet and dressing were lacking in 50.5% and 49.5% of the patients, respectively. The ability of patients to transfer from their bed unaided was the most severely affected; it was lacking in 51.4% of the patients. The percentage variation of the basic autonomies, determined on the basis of the initial value and that at 4 months, worsened by a median of 14.3 (IQR = 57.9). The data demonstrated that half of the population was not able to recover their prefracture autonomy levels at 4 months after surgery. The mortality rate was 9.1%, with a total of 66 deaths. Ninety-two patients (13.8%) had to be hospitalized again during the first 4 months. The most frequent causes of hospitalization were cardiorespiratory problems (25.9%), wound infection (12.9%), and a new fracture (9.7%).

Univariate analysis, the results of which are reported in tables 1 and 2, identified the possible prognostic factors of the fourth month variation in the ADL score. These variables were successively inserted into a model of multivariate analysis to identify eventual confounding factors and the independent predictors of the ADL score. The results are reported in table 3. In the initial phase, treatment of patients with hip fractures is associated with the pathway of recovering autonomy. Failure to recover deambulation; an elevated percentage of days of disorientation; and an increased number of days with diapers, a urinary catheter, and bed rails were the factors associated with the ADL score.

The same statistical analysis was also carried out for the percentage of variation in the ADL, and the result was consistent with that found for the primary outcome (table 4). Some variables, such as the intensive care pathway, were no longer statistically significant.

Discussion

In the 4 months after surgery for a hip fracture, recovery of autonomy in ADL is a difficult objective to attain. Not recovering early deambulation, prolonged disorientation, and the greater use of some devices, such as an antidecubitus air mattress, diapers, catheters, and restraints, are the clinical factors that are independent predictors of recovering the ADL at 4 months. Half of the sample had a reduction in autonomy with respect to their initial level, confirming the data present in the literature.[6,7] The negative effects of bed rest on older adults have already been reported by Gill et al.[24] The importance of attaining an upright sitting position early on was confirmed by Siu et al,[13] who reported that the rapid recovery of deambulation improved results in terms of walking ability at 2 months. The type of fracture, the choice of the type and the length of surgery, and the relative blood loss did not emerge as significant factors in the present study. The association between these factors and the recovery of autonomy is still under discussion in the literature.[3,17,18,25]

Our data indicated that the choice and the management of surgery, such as the organization of patient care and the rehabilitative pathway, have to be defined in order to facilitate early deambulation of the patient. Furthermore, the capacity of the

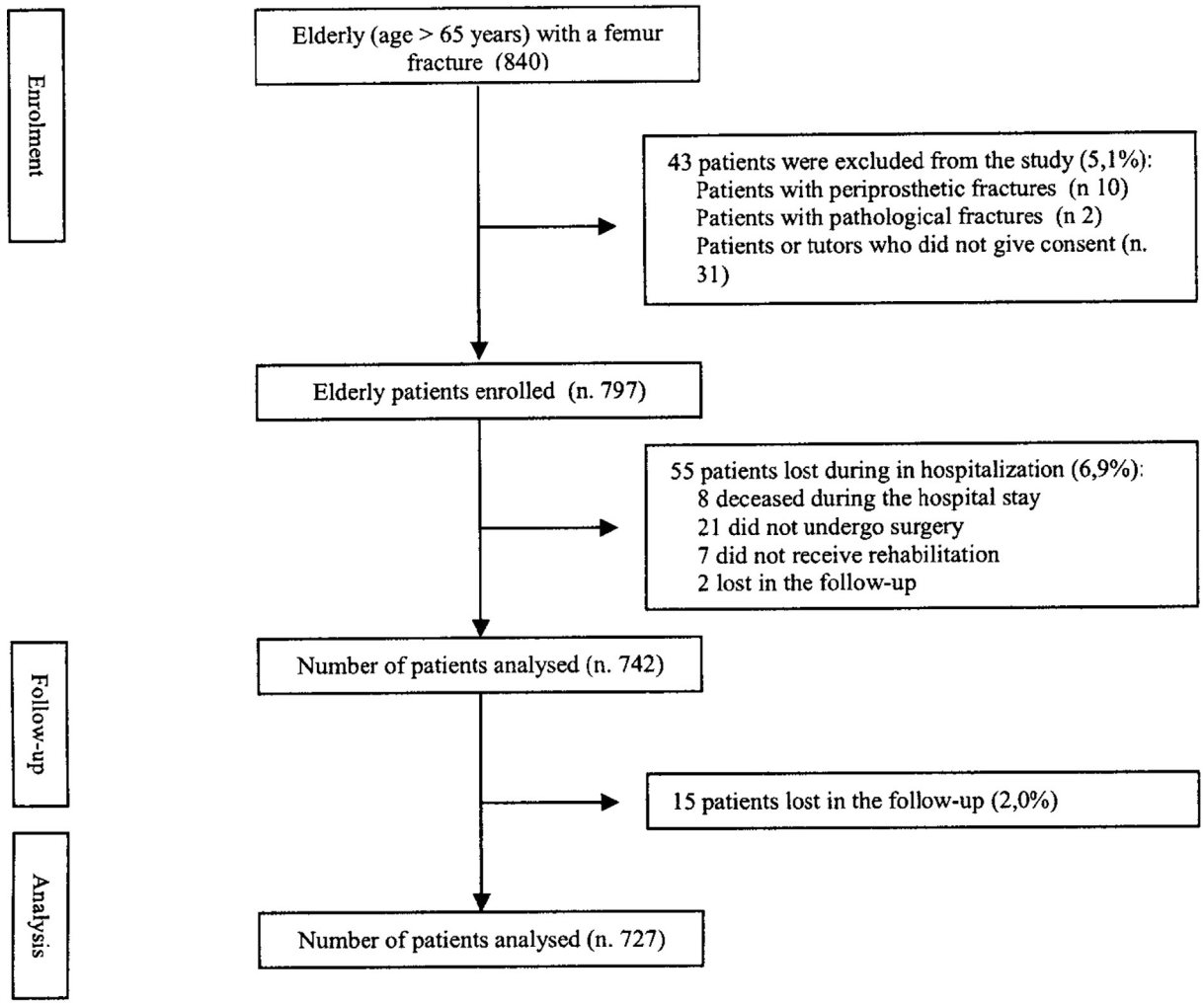

Fig 1 Flow chart of enrollment process.

Table 3 Generalized linear model with gamma distribution and log-link function—ADL 4th month

Variable	B	Confidence of Wald (95%) Inferior	Superior	*P*
Antidecubitus mattress with a motor	.211	.050	.113	<.001
Age	.020	.013	.027	<.001
Percentage of days of disorientation	.002	.000	.003	.012
No deambulation recovery	.199	.099	.299	<.001
Percentage of days with a diaper	.003	.002	.005	<.001
Percentage of days with urinary catheter	.002	.000	.004	.030
Percentage of days with restraints (bed rails)	.001	.000	.003	.014
ADL prefracture	.087	.065	.110	<.001
Comorbidity (Charlson score)	.044	.13	.76	.005
Not intensive patient care	.199	.040	.357	.014

patient to walk at the moment of discharge must be considered when planning postdischarge care. The data confirmed that the treatment of disorientation in older adults after surgery took priority in obtaining improvement of autonomy.[3,6,16] Some patient care choices, such as the use of an antidecubitus air mattress, the management of fecal incontinence with a diaper, and the use of a urinary catheter and bed rails, negatively affect the patient's recovery of autonomy. In clinical practice, the use of an

Table 4 Generalized linear model with gamma distribution and log-link function—% variation in ADL 4th month

Variable	B	Confidence of Wald (95%) Inferior	Superior	*P*
Antidecubitus mattress with a motor	.244	.068	.421	.007
Age	.016	.006	.026	.002
Percentage of days of disorientation	.005	.002	.008	.001
No deambulation recovery	.248	.071	.424	.006
Percentage of days with a diaper	.003	.001	.005	.002

antidecubitus air mattress to reduce the risk of developing pressure ulcers[26] impedes attaining an upright sitting position. This is because its elevated height makes it difficult to get out of and return to bed. In the immediate postoperative phase, being bedridden and disoriented make recovery of normal continence difficult. Both the excessive use of a diaper and a urinary catheter are elements that slow down the recovery of autonomy by the patient. The management of intestinal and bladder continence should be considered a pivotal objective.[27]

The results of the present study demonstrated that only the opportunity of receiving intensive care was significantly associated with better recovery. Although Auais et al[28] have reported the positive impact of rehabilitative treatment at home, Leigheb[9] and Beaupre[5] and colleagues have confirmed that, to date, it has not been possible to identify the advantages of specific postdischarge patient care pathways. In the second multivariate analysis, when the percentage of variation in the ADL was considered, the intensive care pathway was no longer statistically significant. Additional studies are needed to define the selection criteria for assigning patients to the different rehabilitative pathways and for correlating the patient's level of autonomy at hospital discharge with that achieved during the follow-up period.

With respect to the characteristics of the individual patient, the elements linked to recovery are age, the Charlson score, and the prefracture ADL score, confirming what various authors have already reported.[3,18] Multiple variables considered important in clinical practice or significant in other studies,[3,14,17] such as sex, where the patient came from, the orthogeriatric approach, the type of fracture, and the type and rapidity of surgery, have not been found to be predictors of the recovery of ADL autonomy. In the study by Beaupre et al,[29] the authors pointed out how coming from a nursing home was closely linked to a very compromised prefracture ability level.

Recent guidelines recommend surgical treatment within 24 hours after the fracture. The authors who support this theory report the positive impact on the reduction of mortality, hospital stay, and postoperative complications.[30-32] Our data, with a median waiting time of 47 hours, supported the hypothesis according to which a delay in surgery did not compromise the final result, as has also been reported by Moran[32] and Orosz[33] and colleagues.

Many authors hold that a multidisciplinary approach in an orthogeriatric context may improve patient's recovery of autonomy.[8,10-12] Data do not confirm this hypothesis. Although a multiprofessional geriatric approach results in a reduction in mortality and an increase in the percentage of patients returning home in the first 12 months, it does not translate into an increase in autonomy.[10] Instead, according to Saltvedt et al,[34] orthogeriatric departments are useful in helping patients recover autonomy, but this contribution is linked to the clinical aspects managed, including disorientation, constipation, and early mobilization.

The multivariate analysis that was carried out which considered the percentage of variation in the ADL confirmed the data presented. The use of an outcome that takes into consideration the prefracture ADL score permits better highlighting the clinical factors that are independent predictors of the recovery/loss of ADL autonomy.

Study limitations

This study has several limitations. First, not all the variables considered were measured using validated measurements; disorientation and physical constitution were based on the clinical judgment of the health staff. Second, the variables linked to the postdischarge pathway were collected only from information reported by the patient or the caregiver. Finally, when patients were initially admitted to the emergency department, it was not possible to appropriately evaluate their prefracture cognitive state; for this reason, this variable was not measured. The strengths of our approach included the size of the sample and access to a wide variety of clinical characteristics affecting care.

Conclusions

In the initial phase, treatment of patients with hip fractures is associated with the pathway of recovering autonomy. Recovering deambulation, the prevention and treatment of disorientation, and the management of incontinence are the independent predictive factors that can be addressed in clinical practice.

Supplier

a. SPSS version 15.0; SPSS, Inc.

Keywords

Activities of daily living; Hip fractures; Nursing care; Progressive patient care; Rehabilitation

Corresponding author

Mattia Morri, PT, Istituto Ortopedico Rizzoli, Via Pupilli 1, 40136 Bologna, IT. *E-mail address:* mattia.morri@ior.it.

References

1. Fischer S, Kapinos KA, Mulcahy A, Pinto L, Hayden O, Barron R. Estimating the long-term functional burden of osteoporosis-related fractures. Osteoporos Int 2017;28:2843-51.
2. Griffin XL, Parsons N, Achten J, Fernandez M, Costa ML. Recovery of health-related quality of life in a United Kingdom hip fracture population. The Warwick Hip Trauma Evaluation—a prospective cohort study. Bone Joint J 2015;97-B:372-82.
3. Kim SM, Moon YW, Lim SJ, et al. Prediction of survival, second fracture, and functional recovery following the first hip fracture surgery in elderly patients. Bone 2012;50:1343-50.
4. Stenvall M, Olofsson B, Nyberg L, et al. Improved performance in activities of daily living and mobility after a multidisciplinary postoperative rehabilitation in older people with femoral neck fracture: a randomized controlled trial with 1-year follow-up. J Rehabil Med 2007;39:232-8.
5. Beaupre LA, Cinats JG, Senthilselvan A, et al. Does standardized rehabilitation and discharge planning improve functional recovery in elderly patients with hip fracture? Arch Phys Med Rehabil 2005;86:2231-9.
6. Vochteloo AJ, Moerman S, Tuinebreijer WE, et al. More than half of hip fracture patients do not regain mobility in the first postoperative year. Geriatr Gerontol Int 2013;13:334-41.
7. Mak JC, Cameron ID, March LM. National Health and Medical Research Council. Evidence-based guidelines for the management of hip fractures in older persons: an update. Med J Aust 2010;192:37-41.

8. Prestmo A, Hagen G, Sletvold O, et al. Comprehensive geriatric care for patients with hip fractures: a prospective, randomized, controlled trial. Lancet 2015;385:1623-33.
9. Leigheb F, Vanhaecht K, Sermeus W, et al. The effect of care pathways for hip fractures: a systematic overview of secondary studies. Eur J Orthop Surg Traumatol 2013;23:737-45.
10. Ellis G, Whitehead MA, O'Neill D, et al. Comprehensive geriatric assessment for older adults admitted to hospital. Cochrane Database Syst Rev 2011;(7):CD006211.
11. Giusti A, Barone A, Razzano M, et al. Optimal setting and care organization in the management of older adults with hip fracture. Eur J Phys Rehabil Med 2011;47:281-96.
12. Kammerlander C, Roth T, Friedman SM, et al. Ortho-geriatric service a literature review comparing different models. Osteoporos Int 2010; 21(Suppl 4):S637-46.
13. Siu AL, Penrod JD, Boockvar KS, et al. Early ambulation after hip fracture: effects on function and mortality. Arch Intern Med 2006;166:766-71.
14. Hershkovitz A, Kalandariov Z, Hermush V, et al. Factors affecting short-term rehabilitation outcomes of disabled elderly patients with proximal hip fracture. Arch Phys Med Rehabil 2007;88:916-21.
15. Beaupre LA, Carson JL, Noveck H, et al. Recovery of walking ability and return to community living within 60 days of hip fracture does not differ between male and female survivors. J Am Geriatr Soc 2015;63: 1640-4.
16. Tarazona-Santabalbina FJ, Belenguer-Varea Á, Rovira Daudi E, et al. Severity of cognitive impairment as a prognostic factor for mortality and functional recovery of geriatric patients with hip fracture. Geriatr Gerontol Int 2015;15:289-95.
17. Pajulammi HM, Pihlajamäki HK, Luukkaala TH, et al. Pre- and perioperative predictors of changes in mobility and living arrangements after hip fracture—a population-based study. Arch Gerontol Geriatr 2015;61:182-9.
18. Kristensen MT. Factors affecting functional prognosis of patients with hip fracture. Eur J Phys Rehabil Med 2011;47:257-64.
19. Brown K, Cameron ID, Keay L, Coxon K, Ivers R. Functioning and health-related quality of life following injury in older people: a systematic review. Inj Prev 2017;23:403-17.
20. Dyer SM, Crotty M, Fairhall N, et al. A critical review of the long-term disability outcomes following hip fracture. BMC Geriatr 2016;16:158.
21. Chen Q, Kane RL. Effects of using consumer and expert ratings of an activities of daily living scale on predicting functional outcomes of postacute care. J Clin Epidemiol 2001;54:334-42.
22. Kronborg L, Bandholm T, Kehlet H, Kristensen MT. Municipality-based physical rehabilitation after acute hip fracture surgery in Denmark. Dan Med J 2015;62:A5023.
23. Pedersen TJ, Lauritsen JM. Routine functional assessment for hip fracture patients. Acta Orthop 2016;87:374-9.
24. Gill TM, Allore H, Guo Z. The deleterious effects of bed rest among community-living older persons. J Gerontol A Biol Sci Med Sci 2004; 59:755-61.
25. Queally JM, Harris E, Handoll HH, et al. Intramedullary nails for extracapsular hip fractures in adults. Cochrane Database Syst Rev 2014;(9):CD004961.
26. Stansby G, Avital L, Jones K, Marsden G; Guideline Development Group. Prevention and management of pressure ulcers in primary and secondary care: summary of NICE guidance. BMJ 2014;348: g2592.
27. Roe B, Flanagan L, Maden M. Systematic review of systematic reviews for the management of urinary incontinence and promotion of continence using conservative behavioural approaches in older people in care homes. J Adv Nurs 2015;71:1464-83.
28. Auais MA, Eilayyan O, Mayo NE. Extended exercise rehabilitation after hip fracture improves patients' physical function: a systematic review and meta-analysis. Phys Ther 2012;92:1437-51.
29. Beaupre LA, Cinats JG, Jones CA, et al. Does functional recovery in elderly hip fracture patients differ between patients admitted from long-term care and the community? J Gerontol A Biol Sci Med Sci 2007;62:1127-33.
30. Panesar SS, Simunovic N, Bhandari M. When should we operate on elderly patients with a hip fracture? It's about time! Surgeon 2012;10: 185-8.
31. Uzoigwe CE, Burnand HG, Cheesman CL, et al. Early and ultra-early surgery in hip fracture patients improves survival. Injury 2013;44:726-9.
32. Moran CG, Wenn RT, Sikand M, et al. Early mortality after hip fracture: is delay before surgery important? J Bone Joint Surg Am 2005;87:483-9.
33. Orosz GM, Magaziner J, Hannan EL, et al. Association of timing of surgery for hip fracture and patient outcomes. JAMA 2004;291: 1738-43.
34. Saltvedt I, Prestmo A, Einarsen E, et al. Development and delivery of patient treatment in the Trondheim Hip Fracture Trial. A new geriatric in-hospital pathway for elderly patients with hip fracture. BMC Res Notes 2012;5:355.