Published in final edited form as:

J Am Geriatr Soc. 2004 November ; 52(11): 1826–1831.

Patient Relocation in the 6 Months After Hip Fracture: Risk Factors for Fragmented Care

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Abstract

OBJECTIVES—To describe the incidence and patterns of patient relocation after hip fracture, identify factors associated with relocation, and examine effect of relocation on outcomes.

DESIGN—Prospective cohort study.

SETTING—Four hospitals in the New York metropolitan area.

PARTICIPANTS—A total of 562 patients hospitalized for hip fracture discharged alive in 1997 to 1998.

MEASUREMENTS—Patient characteristics and hospital course were ascertained using patient or surrogate interview, research nurse assessment, and medical record review. Patient location was ascertained at five time points using patient or surrogate interview, and hospital readmissions were identified using New York state and hospital admission databases. Mobility was measured using patient or surrogate report using the Functional Independence Measure.

RESULTS—During 6 months of follow-up, the mean number of relocations per patient $\pm$ standard deviation was 3.5 ± 1.5 (range 2–10). Forty-one percent of relocations were between home and hospital, 36% between rehabilitation or nursing facility and hospital, 17% between rehabilitation or nursing facility and home, and 4% between two rehabilitation/nursing facilities. In a Poisson regression model that controlled for patient characteristics, hospital course, and length of follow-up, factors associated with relocation ($P < .05$) were absence of dementia, in-hospital delirium, one or more new impairments at hospital discharge, hospital discharge other than to home, and not living

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This project was supported by Grants HS09973 and U18HS09459-0 from the Agency for Healthcare Research and Quality. The Mary and David Hoar Fellowship of the New York Community Trust and the New York Academy of Medicine (Dr. Boockvar), the National Institute on Aging (Midcareer Investigator Award to Dr. Siu and Mentored Clinical Scientist Development Award to Dr. Morrison), the Paul Beeson Faculty Scholars Program (Dr. Morrison), and the Robert Wood Johnson Generalist Physician Faculty Scholars Program (Dr. Halm) provided additional support.

at home alone prefracture. Relocation was not significantly associated with immobility or mortality at 6 months (odds ratio = 1.14, 95% confidence interval = 0.97–1.35).

CONCLUSION—Subgroups of patients with elevated risk of relocation after hip fracture may be target groups for intensive care coordination and care planning interventions.

Keywords

patient transfer; hospitalization; hip fracture; risk factors

Outcomes of hip fracture, which occurs in approximately 340,000 adults annually,¹ are poor, despite most patients having access to an extended period of post-hospital care and rehabilitation covered by Medicare. In recent studies, 44% of patients developed one or more new permanent activity of daily living (ADL) limitations within 3 months after hip fracture,² and mortality was 13.5% by 6 months after hip fracture.³

Fragmentation in care delivery after hip fracture may be a barrier to achievement of optimal outcomes. Patients receive care at multiple sites, in part influenced by Medicare payment policies. Short hospital lengths of stay result in a substantial proportion of patients being discharged with active clinical problems,⁴ and the majority of hip fracture patients are discharged to rehabilitation hospitals and nursing facilities.³ Many patients subsequently undertake an additional residential transition to home or to another setting for long-term care. Fluctuations in patients' medical and functional status over time further exacerbate care fragmentation. Nearly one-third of hip fracture patients experience an acute illness that requires hospital readmission within 6 months of initial hospital discharge.⁵

Although hip fracture patients experience transitions between multiple care sites, including hospitals, rehabilitation units, nursing home units, and home, the incidence and patterns of relocation associated with hip fracture have not been well characterized. Studies have examined outcomes of hip fracture patients discharged to different postacute care locations,^{6–8} but studies that describe patterns of relocation during an episode of care are limited.^{9,10} The American Geriatrics Society¹¹ and others^{12–14} have identified the care transition as a frequently poorly executed process with potentially harmful consequences for patients, and others have documented gaps in preventive care after hip fracture that care fragmentation might influence.^{15,16} Examination of patterns of care transitions is an important first step in identifying and preventing adverse consequences of transitions between care sites.

The objectives of this study were to describe the incidence and patterns of relocation during the care of patients with hip fracture, identify factors associated with patient relocation, and examine possible adverse effects of relocation on outcomes after hip fracture. It was hypothesized that patient relocation is common after hip fracture and that it occurs in recognizable patterns. If relocations have the potential to cause harm, an association between number or pattern of relocations and physical function or mortality may be detectable. Finally, a subgroup of patients with greater risk of relocation may be a candidate group to target with intensive care coordination and care planning interventions.

METHODS

Setting and Participants

All patients hospitalized for hip fracture between August 1997 and August 1998 at four not-for-profit hospitals in the New York metropolitan area were eligible to be enrolled in a prospective observational cohort study. The study design and cohort characteristics have been described previously.³ Excluding criteria were age younger than 50; fractures that occurred while patients were inpatients; transfer from another hospital; or occurrence of concurrent

major internal injuries, pathological fractures, fractures not limited to the pelvis or acetabulum, fractures 2 cm or more below the trochanter, bilateral hip fractures, prior surgery on the same hip, or previous ipsilateral hip fracture. Of 804 patients screened during the enrollment period, 650 met eligibility criteria. Of these, 571 (88%) or their legal surrogates gave written informed consent to participate in the study. The 562 consenting patients who were discharged alive from the hospital were included in this report. The human subjects committee at each participating institution approved the study protocol.

Measurements

Information was gathered in the hospital and 2 to 3 months and 6 months after hospital admission; further interviews with patients or surrogates, research nurse assessments, and medical record review were also conducted. Prefracture patient characteristics recorded by interview included sociodemographic characteristics (age, sex, race), living arrangements, locomotion, and function in ADLs. Locomotion and function in ADLs were measured using the Functional Independence Measure (FIM).^{17,18} For locomotion, the patient's self-reported independence in traveling 150 feet walking or in a wheelchair and self-reported independence in going up and down 12 to 14 stairs were each scored from 1 to 7, where 1 indicates requires total assistance and 7 indicates complete independence. A FIM locomotion score was calculated by summing the scores for walking and stairs (range 2–14; 14 indicates complete independence in walking and stairs). Prefracture medical conditions and presence or absence of dementia were ascertained using medical record review supplemented by interview. A modified RAND comorbidity score was calculated as a measure of chronic illness burden.¹⁹

Aspects of the hospital course recorded using medical record review included a modified Acute Physiology and Chronic Health Evaluation (APACHE) score as a measure of admission clinical condition,²⁰ type of fracture and repair procedure, major postoperative complications, do-not-resuscitate (DNR) status, and active clinical problems and new impairments at the time of hospital discharge. Major postoperative complications were those that posed a threat to life or organ function as determined by record review by two physicians. Active clinical problems consisted of a set of abnormal vital symptoms and signs that have been shown to be associated with increased risk-adjusted rate of death or hospital readmission after hip fracture.⁴ New impairments were one or more of the inability to eat, bladder or bowel incontinence, being bedbound, or presence of a pressure ulcer.⁴ Research nurse assessment ascertained in-hospital delirium daily for the first 5 days after hospital admission and then every other day until hospital Day 9 using the Confusion Assessment Method.²¹

Patients were followed for 6 months from hospital admission or until death. Six months was chosen as the boundary of the hip fracture episode because previous studies have shown that most recovery in patient function occurs by that time.²² In addition, by 6 months, the risk of acute illness requiring hospital readmission has plateaued.⁵ Patient location was ascertained at five time points: prefracture, index hospital discharge, postacute care facility discharge (for the 354 patients who went to one of the 13 most commonly used postacute care facilities), 2 months after the index hospital admission, and 6 months after the index hospital admission. In addition, at each time point, patients were classified as being in one of three types of locations: home, hospital, or rehabilitation/nursing facility. Acute rehabilitation facilities and skilled nursing facilities were grouped together as nonhospital facilities that are equipped to provide postfracture rehabilitative and nursing care. Intervening hospital readmissions were ascertained from admission/discharge databases at each participating hospital and the New York Statewide Planning and Research Cooperative System, a statewide database of hospital admissions. Dates of hospital readmission were reconciled with dates reported by patients or their surrogates.

At 6 months, mobility was measured using the FIM walking scale. Immobility was defined as a FIM walking scale score of 1 or 2, which indicates an inability to walk 150 feet without

maximal or total assistance. Six-month mortality was ascertained by proxy report and review of public death registries.

Analysis

Relocation was defined as a change in location of residence between any two consecutive time points. Because of the challenge of following patients in multiple locations over time, 2- and 6-month data were unavailable in some patients. To avoid excluding patients missing small amounts of location information, missing location information was imputed if the missing data point was flanked in time by two known locations. To make the calculation of number of relocations a conservative estimate, the missing location was imputed to be the same as the next known location. This resulted in a data set of 2,538 locations in 546 patients, of which 101 locations (4.0%) in 96 patients were imputed. Patients with two consecutive missing location data points ($n = 16$) were excluded. The minimum number of relocations was set at two to reflect relocations associated with the initial hospital admission and discharge.

Mean, median, standard deviation (SD), and range of relocations were calculated. Risk factors for experiencing greater numbers of relocations or for having five or more relocations (the highest quintile) were examined using multivariate Poisson and logistic regression, respectively. Variables examined were patient age, sex, ethnicity, chronic illness burden (RAND score¹⁹), dementia, prefracture mobility, prefracture ADL function, prefracture living arrangements, DNR status, admission clinical condition (APACHE score²⁰), postoperative complications, in-hospital delirium, active clinical problems and new impairments⁴ on hospital discharge, and hospital discharge location. To control for length of follow-up an indicator variable was included for last follow-up data collection point. Correlation between relocation and hospital readmission was examined using the Pearson correlation coefficient and simple regression. Mean, median, SD, and range of relocations were calculated for relocations between home and rehabilitation/nursing facility or between two rehabilitation/nursing facilities (i.e., unassociated with hospital admission or readmission). Finally, multiple logistic regression was used to examine the relationship between the number of relocations and 6-month immobility and mortality, controlling for the above list of variables as covariates.

RESULTS

Characteristics of 562 patients with hip fracture who survived to hospital discharge are shown in Table 1. Eighty-two percent were women, 93% were white, and 12% resided in a nursing home before admission. Ninety-seven percent underwent surgical repair of the fracture.

Four general location patterns occurred in the 6 months after hip fracture. Of 546 patients who did not have two consecutive missing location data points, 277 (51%) lived at home before hip fracture, were discharged from the hospital to a nursing or rehabilitation facility, and resided at home at 6 months; 61 (11%) lived at home before hip fracture, were discharged from the hospital to a nursing or rehabilitation facility, and resided in a nursing home at 6 months; and 77 (14%) and 53 (10%) resided at home and in a nursing home at all three time points, respectively. The percentage of survivors located in rehabilitation or nursing facilities declined over time, with 83%, 27%, and 21% of survivors located in such facilities at hospital discharge, 2-month follow-up, and 6-month follow-up, respectively. Location patterns for 477 patients who lived at home prefracture are shown in Figure 1. Only 94 patients (20%) in this group were discharged to home after the index hospitalization, but 354 (74%) resided at home by 6 months.

Relocations were common in the 6 months after hip fracture. The median number of relocations, including the index hospital admission and all hospital readmissions, was three (range 2–10; interquartile range 3–4), and the mean $\pm$ SD was 3.5 ± 1.5 . Four hundred twenty-five patients

(78%) had three or more relocations, 190 (35%) had four or more, and 106 (19%) had five or more. Seventy-one patients (13%) experienced one or more late relocations between 2 and 6 months after hip fracture.

Of a total of 1,920 relocations, 784 (41%) were between home and hospital, 686 (36%) were between rehabilitation or nursing facility and hospital, 330 (17%) were between rehabilitation or nursing facility and home, and 69 (4%) were between two rehabilitation or nursing facilities. One thousand four hundred seventy relocations (77%) involved the hospital as origination or destination site, and number of relocations was closely correlated with hospital readmission (Pearson correlation coefficient = 0.87; $P < .001$). The 174 patients (32%) who experienced hospital readmission experienced on average 1.83 ± 1.05 additional relocations for each readmission. Considering relocations unassociated with hospital admission or readmission, patients experienced a mean of 0.73 ± 0.66 relocations between home and rehabilitation/nursing facility or between two rehabilitation/nursing facilities (median = 1; range = 0–3).

In a Poisson regression model that examined risk factors for relocation after hip fracture, occurrence of delirium during the index hospitalization and new impairments at index hospital discharge were each associated with more frequent relocation ($P = .02$ and $.001$, respectively), and presence of dementia, index hospital discharge to home, and living at home alone prefracture were each associated with less frequent relocation ($P < .001$, $.001$, and $.04$, respectively) (Table 2). Results of a multivariate logistic regression model that examined factors associated with experiencing five or more relocations (the highest quintile) were similar (data not shown).

Relocations were not significantly associated with worse outcomes after hip fracture. In a multivariate logistic regression model, number of relocations was not significantly associated with immobility or mortality combined at 6 months (odds ratio = 1.14, 95% confidence interval = 0.97–1.35), after controlling for patient demographics, chronic illness burden, dementia, prefracture mobility, prefracture ADL function, prefracture living arrangements, DNR status, admission clinical condition, postoperative complications, in-hospital delirium, active clinical problems and new impairments at hospital discharge, and hospital discharge location.

DISCUSSION

In this study of adults with hip fracture admitted to four hospitals in the New York metropolitan area, participants experienced on average 3.5 relocations in the 6 months after hip fracture, including relocations associated with the initial hospital admission and discharge and all subsequent hospital readmissions. Nineteen percent of patients had five or more relocations, and 13% of patients experienced one or more late relocations between 2 and 6 months after hip fracture. Although 74% of those who lived at home prefracture were at home 6 months after fracture, the vast majority of these received temporary posthospital care in a rehabilitation or nursing facility. Strengths of this study are its prospective, multisite design, its large sample of hip fracture patients, the serial ascertainment of physical function and residence, and the detailed data collection that permitted use of a hip fracture–specific risk-adjustment model.³

Relocation between different sites of care typically occurs at a time of change in patient needs and at a time of patient vulnerability. Although some sequences of relocation may be planned and potentially effective⁷ (e.g., hospital to rehabilitation facility to home), any relocation may cause care discontinuity that has potential adverse effects on patient health. Provider discontinuity can cause unrecognized disease²³ and iatrogenic harm.²⁴ In studies involving single types of relocation, transfer between hospital and nursing home was associated with adverse drug events from drug-use changes,¹⁴ and relocation between two nursing facilities was associated with an increase in fall risk.²⁵ In addition, although transfer from a higher- to

lower-acuity level of care may provide care at lower daily cost, relocation may increase overall costs of care²⁶ and decrease patient and caregiver satisfaction.¹²

Although older adults with acute and chronic medical conditions receive care at multiple sites, the incidence and patterns of relocation associated with an episode of care are not well characterized. One study¹⁰ ascertained the use of short-stay hospitals and postacute and long-term care settings for a national sample of adults aged 65 and older responding to the 1994 National Long-term Care Survey, excluding those who died during the 1992–1994 study period. Eighteen percent were admitted to or discharged from one of those three care settings over the 2-year period, and 12.9% of those with at least one transition experienced an emergency room visit or potentially avoidable hospital stay within 30 days of a transition. Risk of transition increased with age and was greater for women, and as with this study, hospital admissions had a multiplicative impact on transitions.¹⁰ The results of this study are also consistent with a study of 920 community-dwelling older patients enrolled in 11 Medicare managed care and fee-for-service plans who were hospitalized and discharged to a nursing home or rehabilitation facility for restorative therapy between 1993 and 1995. Nearly half of those patients underwent an additional four or more institutional relocations (to an acute hospital, nursing facility, or rehabilitation facility) over a 12-month follow-up period.⁹

In this study, absence of dementia, occurrence of delirium, one or more new impairments at hospital discharge, not living at home alone prefracture, and hospital discharge other than to home were risk factors for frequent relocation. The use of a hip fracture–specific population and inclusion of decedents may explain differences in risk factor results between this study and those of a previous study.¹⁰ The association between dementia and less relocation may be because of fewer hospital readmissions,²⁷ which may be a result of a less aggressive plan of care. The current results suggest strategies for reducing additional patient relocations after hospitalization for hip fracture. Such strategies might include preventing in-hospital delirium and reducing occurrence of new impairments, developing interventions that increase the number of hip fracture patients who can receive postacute care at home,²⁸ and developing care coordination interventions that decrease the risk of hospital readmission, such as advance practice nurse discharge planning and follow-up.²⁹

This study has several limitations. First, because this was a secondary data analysis, there are several factors potentially associated with patient relocation that were not measured. These included presence of a primary care provider, occurrence of intercurrent illnesses, family and patient preferences, insurance coverage, and deficiencies in quality of care or medical errors that might influence transfers. Second, the main clinical outcome, 6-month immobility or mortality, was not measured at a standard interval after relocation and may have been distant in time from any episode of relocation. This might explain why no association was detected between relocation and 6-month immobility or mortality. Finally, this study could not control for all the differences between groups that experienced different relocation patterns. Thus, a comparison of outcomes between groups that experienced different relocation patterns would be subject to substantial confounding.

As the number of older adults in the U.S. healthcare system increases, the issues of effectiveness and cost of patient relocation will need more research investment. Identifying patterns of relocation after hip fracture provides valuable information for planning and targeting interventions designed to improve coordination of care.

Acknowledgements

We gratefully acknowledge the invaluable contributions of our colleagues at the Mount Sinai Medical Center, New York, New York (Gretchen Orosz, MD, Maryann McLaughlin, MD, Dempsey Springfield, MD, Elton Strauss, MD, Marvin Gilbert, MD, Arthur Aufses, MD, Jason Wang, Camille Cohen, Allison Cooperman, Patricia Formisano, and Ellen McConway-Vespe); the Hospital for Joint Diseases, New York, New York (Gina Aharonoff and Joseph

Zuckerman, MD); Maimonides Medical Center, Brooklyn, New York (Samuel Kopel, MD, Ronald Grelsamer, MD, Lillian Reilly, Sameh Samy, and Allan Strong-water, MD); Phelps Memorial Hospital, Sleepy Hollow, New York (George Burak, MD, Linda Dutcher, and Lawrence Faltz, MD); and State University of New York at Albany, Albany, New York (Edward Hannan, PhD).

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Figure 1.

Patterns of relocation after hip fracture for patients who lived at home prefracture. All figures are n (% of those originating at home).

Table 1
 Characteristics of Patients with Hip Fracture (N = 562)

Characteristic	Value
Demographic	
Female, %	81.5
Age, mean $\pm$ SD	81.9 $\pm$ 8.9
White, %	92.5
Prefracture living situation, %	
At home without assistance	52.5
At home with paid assistance	35.6
Long-term nursing home resident	11.9
Function, mean $\pm$ SD	
Prefracture Functional Independence measure locomotion score	9.8 $\pm$ 3.7
Comorbidity	
RAND comorbidity score, mean $\pm$ SD	2.3 $\pm$ 2.2
Dementia, %	25.1
Acute Physiology and Chronic Health Evaluation score, mean $\pm$ SD	2.7 $\pm$ 2.1
Fracture type, %	
Femoral neck	48.8
Intertrochanteric	50.0
Subtrochanteric	1.2
Initial discharge location, %	
Home	15.7
Hospital rehabilitation unit	22.1
Nursing home rehabilitation unit	47.5
Nursing home long-term care	14.4

SD = standard deviation.

Table 2
Relationship between Patient Characteristics and Number of Relocations by Poisson Regression (N = 532)

Characteristic	Parameter Estimate	Standard Error	P-value*
Demographics			
Male	0.14	0.09	.128
Age	-0.003	0.005	.586
White	-0.22	0.13	.084
Prefracture living situation			
At home with paid assistance	0.04	0.08	.604
At home alone	-0.23	0.11	.041
Prefracture function			
FIM locomotion score	0.004	0.02	.816
FIM transfer score	0.004	0.02	.844
FIM self care score	-0.0002	0.01	.985
FIM continence score	-0.006	0.02	.709
Comorbidity			
RAND comorbidity score	0.03	0.02	.116
Acute Physiology and Chronic Health Evaluation score	0.02	0.02	.356
Dementia*	-0.45	0.11	<.001
Advance directive			
Do not resuscitate	-0.26	0.17	.134
Hospital course			
Delirium	0.21	0.09	.019
Major postoperative complication	-0.12	0.12	.356
New impairments at discharge	0.19	0.06	.001
Active clinical issues at discharge	0.01	0.08	.879
Initial discharge home	-0.78	0.13	<.001

* Significant association ($P \leq .05$).

FIM = Functional Independence Measure.