Published in final edited form as:

Med Care. 2015 October ; 53(10): 879–887. doi:10.1097/MLR.0000000000000419.

An examination of the first 30 days after patients are discharged to the community from hip fracture post-acute care

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Conflicts of Interest: Drs. Gozalo, Wetle, Teno, are affiliated with the Warren Alpert School of Medicine at Brown University none of these relationships pose a conflict of interest or potential conflict of interest. Dr. Bynum is affiliated with Dartmouth Medical School & Dartmouth Institute for Health Policy and Clinical Practice neither of these relationships pose a conflict of interest or potential conflict of interest. Dr. Leland was affiliated with the Warren Alpert School of Medicine at Brown University at the time of the study and is now affiliated with the T.H. Chan Division of Occupational Science and Occupational Therapy in the Herman Ostrow School of Dentistry & Davis School of Gerontology at University of Southern California, none of these relationships pose a conflict of interest or potential conflict of interest. Dr. Christian was affiliated with the Warren Alpert School of Medicine at Brown University at the time of the study and is now affiliated with Abt Associates.

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No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

Abstract

Background—Post-acute care (PAC) rehabilitation aims to maximize independence and facilitate a safe community transition. Yet little is known about PAC patients' success in staying home post-discharge or differences on this outcome across PAC providers.

Objectives—Examine the percentage of PAC patients who remain in the community at least 30 days after discharge (i.e., successful community discharge) following hip fracture rehabilitation and describe differences among PAC facilities based on this outcome.

Research Design—Retrospective observational study.

Subjects—Community-dwelling, Medicare fee-for-service beneficiaries 75 years of age and older who experienced their first hip fracture between 1999–2007 (n=880,779). PAC facilities admitting hip fracture patients in 2006.

Measures—Successful community discharge, sites of readmission after PAC discharge.

Results—Between 1999 and 2007, 57% of patients achieved successful community discharge. Black were less likely (adjusted odds ratios=0.84, 95% confidence interval 0.82–0.86) than similar whites to achieve successful community discharge. Among all who re-entered the community (n=581,095), 14% remained in the community fewer than 30 days. Acute hospitals (67.5%) and institutional PAC (16.8%) were the most common sites of re-entry. The median proportion of successful community discharge among facilities was 49% (IQR: 33%–66%). Lowest-quartile facilities admitted older (85.9 vs. 84.1 years of age), sicker patients (e.g., higher rates of hospital complications 6.0% vs. 4.6%), but admitted fewer annually (7.1 vs. 19.3), compared to the highest quartile.

Conclusions—Re-entry into the healthcare system after PAC community discharge is common. Due to the distinct care needs of the PAC population there is a need for a quality measure that complements the current 30-day hospital readmission outcome and captures the objectives of PAC rehabilitation.

Keywords

hip fracture; rehabilitation; post-acute care; 30-day readmission

In the United States, more than 90% of Medicare beneficiaries utilize post-acute care (PAC) after an acute hip fracture hospitalization.^{1,2} PAC rehabilitation has two distinct care priorities: 1) facilitating the patient's medical recovery and 2) maximizing the patient's independence by equipping both the patient and caregiver with skills to safely manage new functional limitations after discharge. Thus, the objective of rehabilitation is successful community discharge—facilitating a safe return to the community, thereby minimizing the likelihood of long-term institutionalization or reentry into the healthcare system. Despite this care focus, little is known about the rates at which rehabilitation patients successfully remain in the community after discharge from PAC.

The two most common settings for PAC after a hip fracture are inpatient rehabilitation facilities (IRF) and skilled nursing facilities (SNF); although the majority of patients receive care in a SNF.^{2,3} Rehabilitation in an IRF requires patients to participate in three hours of

therapy daily, whereas a SNF does not have a minimum requirement for therapy services. The average length of stay for hip fracture rehabilitation in an IRF or SNF ranges from 15–27 days.⁴ Hip fracture patients discharged to a SNF are often older and more likely to have cognitive impairment whereas IRF patients are more likely to have a greater number of comorbidities.^{4,5}

The 30-day hospital readmission measure is currently used as an indicator of the quality of an acute care hospital's care transition process.⁶ However, due to the extended timeframe in which PAC patients are in the healthcare system, this measure is limited in its ability to capture quality of the PAC rehabilitation patient's transition back to the community. Rehabilitation patients are at an increased risk of adverse events following discharge from PAC, such as accidental falls,^{7, 8} which can result in rehospitalization and long-term institutionalization. As an example, a hip fracture patient receiving PAC in a SNF is discharged home on day 27. If this patient falls and is rehospitalized on day seven in the community—34 days after the acute care hospital discharge—they would not be categorized as a failed transition on the existing 30-day hospital readmission clock.

Currently, there are a limited number of publicly reported measures that reflect the quality of care being delivered in PAC, leaving patients, their families, payers, and providers ill-equipped to make effective care decisions based on provider performance. To ensure all stakeholders have the necessary information about the quality of PAC care, indicators are needed that capture the focus and objectives of PAC rehabilitation transitions. Since rehabilitation aims to maximize independence and facilitate a safe community discharge, examining the success of rehabilitation patients' transitions back to the community is a fundamental to evaluating PAC quality. Thus, the objective of this study is to examine the percentage of PAC patients who remain in the community at least 30 days after discharge (i.e., successful community discharge) following hip fracture rehabilitation, identify the sites of reentry among those unable to remain in the community, assess patient characteristics that are associated with successful community discharge, and describe differences among PAC facilities based on this outcome. Exploration of this outcome from the facility perspective will include categorizing PAC providers based on their quartile ranking of successful community discharge and describing the patient case-mix of facilities by their quartile ranking.

METHODS

Data Source

This study is a retrospective secondary data analysis using 100% Medicare Administrative data for the years 1999 through 2007. We linked beneficiaries' Medicare enrollment file, Part A claims—consisting of inpatient, SNF, hospice, and home health services—plus their Medicare outpatient claims. The Part A inpatient file contains claims from short-term acute hospitalizations, long-term acute care hospitalizations (LTCH), and IRF hospitalizations, all with their admission and discharge dates. From these data, the residential history file methodology was then used to construct a person-level longitudinal record of Medicare utilization and location of residence (i.e. community, hospital, LTCH, IRF, SNF, or a non-SNF nursing home) over time.⁹ The longitudinal patient-level record created by the

residential history file⁹ was used to identify the first discharge from PAC to the community within 90-days of the acute hospital discharge date. This study was approved by the Institutional Review Boards at Brown University and the University of Southern California.

Patient-level Hip Fracture Cohort

To examine the first three objectives of this study, a hip fracture cohort derived from the 100% Medicare files was created. The intent was to describe the proportion of hip fracture patients who were discharged to the community from PAC between 1999 and 2007, examine readmissions occurring within 30 days of PAC community discharge, and examine the demographic and medical indicators of these hip fracture patients that are associated with achieving successful community discharge. We included all fee-for-service Medicare beneficiaries 75 years of age and older experiencing their first hip fracture between 1999 and 2007. Details of the process we undertook to identify the first hip fracture diagnosis have been described elsewhere.¹⁰ Construction of the cohort for this study began with the entire hip fracture cohort (n= 1,412,119). To create a cohort of older adults experiencing their first hip fracture in the US while living in the community, we implemented a series of exclusion criteria (Figure 1). Patients were excluded if they were in a nursing home (n=193,353), or receiving hospice at the time of the fracture (n=17,845); admitted to a hospital in outlying territories (e.g., Guam, Puerto Rico, n=184); hospitalized for the index hip fracture between October 1, 2007 and December 31, 2007 (n=27,814); or did not undergo surgical repair within 30 days of the fracture^{10,11} (n=84,231). These exclusions resulted in a community-living hip fracture cohort (n=1,062,880). In order to examine the patients' return to the community after institutional PAC, we further limited our sample to those patients discharged from the acute care hospital to either a SNF (59.1%, n=628,162) or an IRF (23.7%, n=251,903). This resulted in the exclusion of those patients who died during the acute care hospitalization (2.7%, n=28,698), were discharged to another healthcare setting such as psychiatric hospital (3.4%, n=36,138), or were discharged directly to the community either with (4.6%, n=48,892) or without home care (6.5%, n=69,087). These additional exclusions resulted in final cohort of 880,339 institutional PAC patients.

Dependent measures—Those that were not discharged to the community at any point in the 90-day follow-up period were characterized as either remaining in a healthcare institution or having died. Among patients discharged from PAC to the community, the succeeding 30-days were examined. Patients remaining in the community 30-days were categorized as achieving successful community discharge. Those not staying in the community 30-days were classified as re-entering the healthcare system or dying.⁹ For all re-entries, the admission site was identified (i.e., acute care hospital, SNF/IRF, hospice, nursing home for custodial care, or other). After describing each of the patient sub-groups a dichotomized outcome was created to indicate those patients that achieved successful community discharge compared to all others in the cohort that did not.

Independent measures—Demographic and clinical variables incorporated in the model were guided by existing research. Older age, being male, and race/ethnicity have been associated with hospital readmissions from inpatient rehabilitation.¹² Therefore, patient demographics included: age, defined in years and operationalized into categories (i.e., 75–

80, 81–84, 85–90, 91+) for the multivariable models; sex (Female); and race/ethnicity categorized as Black, Hispanic, White, and other race (i.e., Asian, North American Native, Pacific Islander, other, or unknown). Chronic medical conditions, acute medical status, and length of stay have been associated with poor rehabilitation outcomes.^{13–15} Thus, a count of the patients comorbidities was operationalized according to the Elixhauser comorbidity score.^{16,17} Characteristics of the hip fracture hospitalization were derived from Medicare Part A claims and included: the type of hip fracture (petrochanteric, femoral neck fracture), duration of hospitalization (in days), the occurrence of any hospital complications¹⁸ (e.g., postoperative deep venous thrombosis and pulmonary embolism, myocardial infarction, or hemorrhage), and any ICU use during the index hospitalization. Annual hospital hip fracture volume was determined for each index event at the admitting hospital as an indicator of the provider's experience with this population. The first PAC site was coded as a dummy variable (SNF, not SNF). A continuous indicator for the year of the hip fracture was included to control for temporal trends.

Analysis—Descriptive statistics were used to depict the distribution of outcomes and patient characteristics for participants across all nine years of the study. To evaluate between-group differences, Student's t-tests were used for continuous variables and Chi-square tests were used for categorical covariates. We examined correlations and found no evidence of multicollinearity. A three-level hierarchical model that nested patients within facilities within states was used to examine the degree to which providers and states explained variation in the successful discharge binary outcome, adjusting for the independent measures. After running the hierarchical model, we tested and confirmed that the random intercepts for provider and state were significantly different than zero. The variation explained by the provider and state is presented in the results. State was included to explore variations highlighted in the Institute of Medicine report,²³ which identified PAC as a driver of geographic variation in healthcare spending. Similarly, the inclusion of providers was guided by a MEDPAC report²⁴ that identified variations in PAC provider outcomes. The analysis of the hierarchical models were carried out using the generalized linear latent and mixed model (GLLMM) program run in STATA 12.0.^{25,26} GLLMM modeling can be used for estimating multi-level models of non-continuous dependent variables.²⁷ The GLLMM eform command in STATA was used to produce the exponentiated parameters of the model, which are presented as adjusted odds ratios in the results section and Table 2.

PAC Provider Cohort

Our final study objective was to explore successful community discharge among providers and examine the patient case-mix for one year of hip fracture admissions. Drawing from the multi-year patient-level cohort (described in the previous section), our provider cohort was constructed by extracting those patients experiencing a hip fracture in 2006 (Figure 1). This year was selected because it was the most recent year of data that would allow the inclusion of all hip fracture admissions in the calendar year without censoring patient outcomes in the follow-up time period (first 90-days of 2007). In that single year, 98,596 hip fracture patients were admitted to 11,923 IRFs or SNFs from the acute care hospital after surgical repair. Of these, we excluded those facilities in the lowest 10% of the hip fracture

admissions distribution (n=5,448 facilities that served 9,589 patients). Excluded facilities admitted fewer than four hip fracture patients during the 2006 calendar year. This decision was based on the premise that exploring successful community discharge in facilities with low hip fracture admission rates may lead to unreliable results. Furthermore, these facilities may have a different patient composition than facilities with higher rates of treating patients with a hip fracture. This criterion resulted in a final provider sample of 6,475 facilities providing PAC rehabilitation to 89,007 hip fracture patients in 2006. Patient-level data was then aggregated at the facility-level to characterize successful community discharge and case-mix (e.g., demographics, hospital stay medical indicators).

Analysis—PAC facility outcome was calculated by identifying the number of patients achieving successful community discharge and dividing it by the total number of PAC community-living hip fracture patients admitted during 2006. Quartile cut-points were then determined based on the performance of all facilities in the sample (n=6,475). Lastly, facilities were categorized by their quartile ranking, and descriptive statistics were calculated for each quartile to reflect the patient demographics and health characteristics from the index hospitalization. The evaluation of between-group differences relied on ANOVA for continuous variables and Chi-square tests for categorical covariates.

RESULTS

Patient Characteristics

Between 1999 and 2007, 880,339 patients were discharged to an IRF or SNF after their first hip fracture (Table 1). These patients were predominantly female (77.9%) and white (94.4%). The average hospital stay was 6.3 (± 3.8) days, with 71.4% being discharged from the hospital to a SNF and 28.8% discharged to an IRF. Patients spent an average of 26.3(± 23.2) days in the first institutional PAC setting. Compared to those not achieving the outcome, patients achieving successful community discharge were younger (83.8 vs. 85.9) and healthier as indicated by fewer hospital complications (4.2% vs. 7.1), less ICU utilization (14.1% vs. 19.7%), and fewer comorbidities (2.2 vs. 2.5). The between group differences were statistically significant ($p < 0.001$).

Sites of Readmission

Sixty-six percent (n=581,024/880,339) of PAC hip fracture patients were discharged to the community from PAC. Among those discharged from PAC to the community, 14% remained in the community for fewer than 30 days, with a higher proportion remaining less than two weeks. Specifically, 5% were in the community less than seven days, 4% 8–14 days, 2.5% 15–21 days, and the remaining 2.5% 22–29 days. These results illustrate the need to stratify the existing community discharge outcome by distinguishing between patients who remain at least 30 days from those patients who do not.

Figure 2 presents a modified version of the traditional three-category rehabilitation outcome (i.e., community discharge, death, and institutionalization), including a fourth category to indicate successful community discharge for the cohort (n=880,339). In this approach, 57% of patients achieved successful community discharge, 9% remained in the community less

than 30 days, 7% died while still in a healthcare institution, and 27% were still in an institution at the end of the 90-day follow-up window (Figure 2). Among those re-entering the healthcare system within 30-days of PAC community discharge, the three most common sites of readmission were an acute care hospital (68%), an IRF or SNF (17%), and a nursing home for long-term care (5%).

Predictors of Successful Community Discharge

The relationships among demographic and clinical characteristics and the outcome were examined for the patient-level cohort (Table 2). Younger patients (i.e., 75–80 years of age) compared to their older peers (i.e., 90+ years of age) were more likely to achieve successful community discharge (adjusted odds ratios [AOR]=2.45; 95% Confidence Interval [95% CI] 2.41–2.48). Females were 23% (95% CI 1.21–1.23) more likely than similar males to achieve the outcome, while Blacks were 16% less likely to achieve the desired outcome when compared to their White peers (95% CI 0.82–0.86). Sicker patients, including those with an ICU stay (AOR=0.89; 95% CI 0.88–0.91) or who experienced any hospital complications (AOR=0.89; 95% CI 0.87–0.91), were less likely to achieve the outcome. For each year after 1999, patients were 2% less likely to achieve the outcome (AOR=0.98; 95% CI 0.97–0.98). Of the variance in the outcome that could be explained by the model, 2.5% was explained at the provider-level and 0.5% at the state-level.

Provider Cohort

In 2006, the median proportion of successful community discharge among providers was 49% (interquartile range 33%–66%). Facilities in the lowest-performing quartile had a lower volume of hip fracture patients in 2006 as compared to the highest-performing quartile (7.1 vs. 19.3 hip fracture patient admissions). Patients in lower-quartile facilities had a longer hospital stay (6.8 vs. 5.7 days), greater ICU utilization during the index event (20.5% vs. 17.5%), and higher rates of hospital complications (6.8% vs. 5.7%) than the patients in the highest-quartile facilities. Furthermore, patient demographics varied among the quartiles. A higher proportion of Black patients were admitted to facilities in the lowest quartile than to facilities in the highest quartile (3.5% vs. 2.6%).

DISCUSSION

A key objective of rehabilitation is to provide patients and caregivers with the knowledge and skills to ensure a safe transition to the community, avoiding long-term institutionalization or re-entry into the healthcare system. This study found only 57% of older adults who experienced a hip fracture achieved successful community discharge after spending an average of 26 days in PAC after acute hospital discharge. Further, PAC patients in this study re-entered the healthcare system through multiple entry points within that first 30 days of community discharge. Given the national focus on readmissions and the trajectory of PAC patients, the overarching goal of this study was to introduce the concept of successful community discharge by translating the concept of 30-day hospital readmissions to PAC. Thus, by integrating the findings of this study with the goals of PAC rehabilitation, future PAC quality measure development around readmissions should account for the extended time spent in the healthcare system and the multiple sites of re-entry.

In an effort to identify the patient characteristics associated with successful community discharge, we found younger, healthier patients (e.g., no ICU utilization or hospital complications) were more likely to achieve the outcome. These findings were consistent with previous rehabilitation community discharge research.^{3,4,12–14} Data from this hip fracture study denotes that Blacks were less likely to achieve the outcome compared to similar whites. This result aligns with the literature that has documented racial differences in rehabilitation outcomes.^{3,12,19} These patient-level findings suggest that there are opportunities for providers to engage in quality improvement initiatives targeting patients at risk of not successfully transitioning back to the community after a hip fracture. Our study was limited in the ability to control for differences in patient abilities (e.g., functional status, cognition) that may have impacted the observed differences in successful community discharge across patients and providers. However, since most readmissions were to acute care hospitals, this suggests that observed differences might be more related to how patients' medical comorbidities were managed during the transition, which we could not capture in this data.

Of those patients discharged to the community, we found that 14% did not successfully remain in the community for 30 days after PAC discharge. Among these patients, readmission to an acute care hospital was the most common outcome. Less than 1% of all patients discharged to the community died within 30 days, suggesting that these patients were not facing life-threatening medical conditions. Further, some patients were readmitted to SNFs and IRFs, signifying there are ongoing functional as well as medical needs for some patients who fail to successfully remain in the community.

An important contribution of our study to the PAC hip fracture rehabilitation literature is our sub-analysis of provider performance. We found a 34% difference in PAC provider performance between the lowest and highest quartile cutoffs with respect to successful community discharge. Patients receiving care in facilities that were ranked in the lower quartiles had higher ICU utilizations and longer acute hospital stays for the index hip fracture event. However, lower quartile PAC providers also admitted fewer hip fracture patients per month and may not have been as prepared to deliver the complex discharge planning services required by rehabilitation patients with both medical and functional needs. Key components of discharge planning in PAC rehabilitation include home safety assessments prior to discharge and caregiver training that encompasses the patient's (1) medical needs, (2) current functional abilities, (3) areas of ongoing limitation in which they will need assistance, (4) and signs and symptoms of functional decline and exacerbation of medical condition(s) to be aware of after discharge from rehabilitation.^{8,20–22} Therefore, there is a need to further evaluate the volume-outcome relationship in the context of PAC.

Given the systematic differences between IRFs and SNFs, there is a need to examine this outcome in the context of these PAC settings. This includes expanding the knowledge base of SNF/IRF performance with respect to their care processes and the unmeasured covariates not captured in this study (e.g., functional status, cognition). The passage of the IMPACT act and its mandate to integrate standardized measures across PAC settings will provide researchers with new opportunities to compare patient case-mix and outcomes across IRFs and SNFs. Additionally, the emergence of electronic health records provides a rich data

source for future research to examine the quality and quantity of evidence-based practice among PAC providers. Further there is a need to better understand the broader system of care with respect to PAC rehabilitation. Using this perspective to examine the PAC community transition can provide insight into the broad range of services that are necessary for ensuring a successful community discharge.

Cumulatively, the findings from this study indicate that achieving community discharge by no means guarantees that patients will be successful in remaining in the community beyond 30 days. Only about half of hip fracture rehabilitation patients achieve this goal. These findings potentially translate into significant additional costs to Medicare for hip fracture patients who do not achieve successful community discharge. In addition, patients who have an unsuccessful community discharge have already experienced at least three transitions since the hip fracture hospitalization and are likely to face at least two more (e.g., hospital to PAC, PAC to community). Although it is likely that multiple strategies will be required to enhance successful community discharge, the development of a quality measure reflecting the needs and goals of this PAC population is a clear priority. Such a measure would not only provide an incentive for PAC providers to enhance the success of transitions from PAC to the community but also provide stakeholders with a tool to make informed decisions about PAC.

To this end, initial efforts are being taken to examine 30-day readmissions after PAC discharge to the community. A recent MEDPAC report identified variations in 30-day hospital readmissions after SNF discharge.²⁴ Further, action has been taken to address hospital readmissions post IRF discharge. A Centers for Medicare & Medicaid Services quality measure of this outcome recently received endorsement by the National Quality Forum (2014), which accompanied the integration of this measure in the Fiscal Year 2014 IRF Prospective Payment System final rule.^{28, 29} However both of these indicators are focusing on hospital readmissions, which does not capture the multiple doors a PAC patient can re-enter after a failed community transition.

Furthermore, the existing 30-day hospital readmission measure does not sufficiently encapsulate the goals and timeframe needed to capture the quality of PAC transitions for hip fracture patients. Unlike the population included in Jencks et al.'s seminal 30-day readmission paper,⁶ PAC hip fracture patients have a different care trajectory through the healthcare system. While Jencks et al.'s cohort was discharged home immediately after the acute hospitalization,⁶ we found hip fracture patients spend an average of 26 days in PAC. This results in a limited number of days to capture a failed community transition in the context of the existing 30-day hospital readmission measure. In translating the concept of community care transitions to PAC, it is important to keep in mind the key objectives of PAC rehabilitation, including: (1) facilitating patients' recovery from an acute medical event, (2) helping patients (and caregivers) learn to engage in activities of daily living with functional capabilities that may be quite different than prior to hospitalization, and (3) returning to full participation in their home and community environments. Thus, when preparing hip fracture patients for successful community discharge following rehabilitation, PAC providers must attend to both facilitating the prevention of adverse medical events and providing patients and caregiver(s) with the skills and knowledge needed to manage new

functional limitations so they may fully participate, long-term, in their home and community environments.^{30–33} Due to the unique care needs of hip fracture PAC patients and the distinctive focus of rehabilitation services, an additional quality measure, complementary to the 30-day readmission rate measure, is needed to better reflect the quality of PAC.

As with any secondary data analysis, this study had limitations. It relied on Medicare administrative data and as a result was unable to distinguish discharges to assisted living facilities or other non-Medicare covered services from discharges to the community. In addition, this study was part of a larger inquiry and thus the cohort was limited to fee-for-service Medicare beneficiaries aged 75 and older. While the majority of hip fractures occur in the 75 and older population,³⁴ the findings may not be generalizable to those under age 75. This study was also limited to patients experiencing a hip fracture between 1999 and 2007. Thus, findings may not reflect the outcomes of other PAC diagnostic groups, such as individuals with a stroke or those experiencing a hip fracture after 2007. Moreover, an important set of variables related to PAC care processes that may contribute to successful community discharge were unavailable in the administrative files utilized. Thus, we were unable to examine the quality or the quantity of care. Future research utilizing electronic health records and utilizing standardized measures mandated by the IMPACT Act can provide additional insight into the care associated with achieving successful community discharge. Finally, we were unable to quantify social supports, cause of readmission, and functional status at PAC admission and discharge. Notwithstanding these limitations, this research makes an important contribution by being the first to explore the first 30 days after discharge from institutional PAC among a cohort of hip fracture patients.

The goal of PAC rehabilitation is to facilitate a safe, successful transition back to the community. Regrettably, the findings of this study illustrate that being discharged does not guarantee a successful community discharge in which hip fracture patients remain at home beyond 30 days. Because of the different care trajectories of PAC rehabilitation patients, the current 30-day hospital readmission measure inadequately captures these patients' community transitions. The findings of this study highlight the need for a quality measure that is complementary to the 30-day hospital readmission measure and quantifies the extent to which PAC providers are able to facilitate a successful community discharge.

Acknowledgments

This research was supported by the Shaping Long Term Care in America Project funded by the National Institute on Aging (1P01AG027296), the Agency for Healthcare Research and Quality (AHRQ) National Research Services Awards (NRSA) (5T32HS000011-24), and The Rehabilitation Research Career Development (RRDC) Program, National Center for Medical Rehabilitation Research (NICHD), National Institutes of Health (K12 HD055929).

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Figure 1.
Patient and Provider Cohort Construction
PAC= post-acute care; SNF=skilled nursing facility; IRF=inpatient rehabilitation facility

Figure 2.**90 Day Outcomes Among Hip Fracture Patients (n=880,339)**

The pie chart presents the 90-day outcomes for all hip fracture patients between 1999 and 2007 (n=880,339), of which 57% (n=501,793) of the cohort achieved successful community discharge, 27% (n=237,692) were still in a healthcare institution, 9% (n=79,231) were in the community less than 30 days, and 7% (n=61,624) died before returning to the community.

The bar graph presents the distribution of patients that remained in the community less than 30 days (n=79,231). Of these individuals, 68% (n=53,877) were readmitted to an acute care hospital, 17% (n=13,469) were admitted to an IRF/SNF, 5% (n=3,962) entered a nursing home, 5% (3,962) died in the community, 3% (n=2,377) transitioned to hospice care, and the remaining 2% (1,585) were admitted to another healthcare setting (e.g., psychiatric hospital, long term care hospital).

Successful community discharge was defined as being discharged to the community from post-acute care and remaining in the community at least 30 days, within the first 90 days after the acute care hospital discharge.

SNF/IRF= skilled nursing facility or inpatient rehabilitation facility

Table 1

Patient Cohort Characteristics, 1999–2007

Characteristics and Measures	Hip Fracture Cohort (N = 880,339)	Achieved Successful Community Discharge (N=499,394)	Did Not Achieve Successful Community Discharge (N=380,945)
Patient characteristics			
Age, mean (SD)	84.7 (5.6)	83.8(5.4)	85.9(5.7)
Female (%)	77.9	79.3	76.1
Race (%)			
White	94.4	94.5	94.2
Black	3.2	2.7	3.3
Hispanic	1.2	1.1	1.0
Other	1.2	1.7	1.5
Acute care hospital stay characteristics			
Any hospital complications (%)	5.5	4.2	7.1
Intensive care unit (ICU) utilization (%)	16.5	14.1	19.7
Elixhauser comorbidity score, mean (SD)	2.3 (1.3)	2.2	2.5(1.4)
Femoral neck fracture (%)	50	54	45
Length of stay in days, mean (SD)	6.3 (3.8)	5.8(2.9)	6.9(4.6)
Hip fracture hospital characteristics			
# of hip fracture admissions/year, mean (SD)	84.3 (55.0)	84.7(54.9)	83.8(55.2)
First PAC site after hospital discharge (%)			
Inpatient rehabilitation facility (IRF)	28.6	37	17.7
Skilled nursing facility (SNF)	71.4	63	82.3
Length of stay in first PAC setting in days	26.3 (23.2)	19.5(12.7)	32.9(28.8)

Note: **Successful community discharge was defined as being discharged to the community from post-acute care and remaining in the community at least 30 days.**

Not achieving successful community discharge included those patients that were still in a healthcare institution 90-days after hospital discharge, those who died before discharge to the community, and those who were discharged to the community but did not remain in the community at least 30 days.

SD= standard deviation

PAC=post-acute care

Occurrence of hospital complications during index hip fracture acute care stay includes: postoperative deep venous thrombosis and pulmonary embolism, postoperative myocardial infarction, or postoperative hemorrhage.

T-tests/Chi Square analysis comparing patients that achieved successful community discharge from those that did not achieve the outcome were all significant at P<0.001

Table 2

Predictors of Successful Community Discharge among Hip Fracture Patients, 1999–2007 (N = 880,339)

Characteristics and Measures	Adjusted Odds Ratios (AOR)	95% CI
Age		
75–80	2.45	(2.41–2.48)
81–84	1.91	(1.88–1.94)
85–90	1.47	(1.45–1.49)
91+		Reference Group
Female	1.23	(1.21–1.23)
Race/ethnicity		
Black	0.84	(0.82–0.86)
Hispanic	1.07	(1.02–1.12)
Other race	1.12	(1.07–1.16)
White		Reference Group
Acute care hospital stay characteristics		
Elixhauser comorbidity score	0.91	(0.91–0.92)
Intensive care unit (ICU) utilization	0.89	(0.88–0.91)
Femoral neck fracture	1.36	(1.35–1.37)
Any hospital complications	0.89	(0.87–0.91)
Acute care hospitalization (days)	0.92	(0.92–0.93)
# of hip fracture admissions/year	1.00	(1.00–1.00)
First PAC site after hospital discharge		
Skilled nursing facility	0.31	(0.31–0.32)
Year of hip fracture	0.98	(0.97–0.98)

Note: **This table presents the adjusted odds ratios from a multivariate** GLAMM model that clustered patients within PAC facilities within states.

The dependent variable successful community discharge was defined as being discharged to the community from post-acute care and remaining in the community at least 30 days.

PAC= post-acute care

95% CI= 95% confidence interval

Data includes patients experiencing a hip fracture between 1999 and 2007. There were 226,910 patients in the 75–80 years of age category; 216,198 in the 81–84 age category; 254,104 in the 85–90 age group, and 183,127 in the 91+ age group.

Post-Acute Care Facility-level Hip Fracture Rehabilitation Patient Characteristics, Stratified by Facility Performance on Successful Community Discharge, by Quartile, in 2006

Table 3

Characteristics and Measures	Q1 (n =1,454)	Q2 (n=1,207)	Q3 (n=1,952)	Q4 (n=1,862)
PAC facility performance				
% of successful community discharges	<33	33–49	50–66	>67
# of hip fracture admissions, mean (SD)	7.1 (4.4)	11.0 (6.7)	15.1 (14.0)	19.3 (19.3)
# of patients achieving outcome, mean (SD)	1.3 (1.3)	4.5 (3.1)	8.7 (8.7)	14.7 (14.4)
Hip fracture patient demographic characteristics				
Age, mean (SD)	86.1 (2.5)	85.6 (2.1)	85.1 (2.1)	84.4 (2.0)
Female (%)	77.7	77.8	77.9	77.3
Race (%)				
White	93.9	95.4	94.8	94.3
Black	3.5	2.4	2.6	2.6
Hispanic*	1.1	0.8	1.1	1.1
Other	1.5	1.4	1.5	2.0
Acute care hip fracture hospitalization characteristics				
Occurrence of any hospital complications (%)	7.0	6.6	6.0	5.3
Length of hospital stay in days, mean (SD)	6.8 (2.1)	6.4 (1.6)	6.1 (1.5)	5.7 (1.3)
Elixhauser comorbidity score, mean (SD)	2.7 (0.6)	2.6 (0.5)	2.6 (0.5)	2.6 (0.5)
ICU utilization (%)	20.5	19.6	18.9	17.5
Distribution of first PAC site				
IRF	1%	3%	16%	40%
SNF	99%	97%	84%	60%

Note: Successful community discharge was defined as being discharged to the community from post-acute care and remaining in the community at least 30 days.

Q1= Lowest quartile
Q2= Second quartile
Q3= third quartile
Q4= highest quartile
PAC=post-acute care

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SD= standard deviation

IRF=inpatient rehabilitation facility

SNF=skilled nursing facility

Occurrence of hospital complications during index hip fracture acute care stay includes: postoperative deep venous thrombosis and pulmonary embolism, postoperative myocardial infarction, or postoperative hemorrhage.

Provider level analysis was limited to those facilities that had at least 4 hip fracture admissions in 2006.

ANOVA and Chi square analysis were conducted to evaluate whether or not there was a statistically significant differences between quartile groups. All variables were significantly different across groups ($p<0.01$) with exception of one variable indicated with an *

* there was no statistical difference between quartile groups for this variable