

Frequency and Impact of Active Clinical Issues and New Impairments on Hospital Discharge in Patients With Hip Fracture

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Background: Hip fracture is associated with significant mortality and disability. Patients who are discharged from the hospital with active clinical problems may have worse outcomes than those patients without active clinical problems.

Objective: To assess the frequency and impact of clinical problems at discharge on clinical and functional hip fracture outcomes.

Methods: Detailed clinical data were collected from 559 patients in a prospective, multicenter observational cohort study. Active clinical issues (ACIs) on discharge included the following: temperature of 38.3°C or higher, heart rate of more than 100/min or less than 60/min, systolic blood pressure higher than 180 mm Hg or lower than 90 mm Hg, diastolic blood pressure higher than 110 mm Hg or lower than 60 mm Hg, respiratory rate of more than 24/min, oxygen saturation of less than 90%, altered mental status, no oral intake, shortness of breath, chest pain, arrhythmias, or wound infection. New im-

pairments (NIs) included bowel and bladder incontinence, inability to get out of bed, and decubitus ulcer. Outcomes were deaths, readmissions, and functional mobility 60 days after discharge.

Results: Overall, 94 patients (16.8%) had 1 or more ACIs, and 229 (41.0%) had 1 or more NIs on discharge. Both ACIs and NIs on discharge were associated with increased risk-adjusted rates of death (odds ratio, 1.8; 95% confidence interval, 1.2-2.8) or readmission (odds ratio, 1.7; 95% confidence interval, 1.2-2.3). The NIs on discharge were also associated with worse functional mobility ($P < .004$). These relationships persisted in multivariate analyses that controlled for a previously validated, hip fracture-specific risk adjustment measure.

Conclusions: Clinicians should consider information about ACIs and NIs when deciding readiness for discharge and planning post-acute care.

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HIP FRACTURES are common, costly, and clinically serious. Approximately 350 000 hip fractures occur annually in the United States, accounting for nearly \$6 billion per year in hospital costs.¹ Most patients who fracture their hips are elderly and frail and are at high risk for death, medical complications, and loss of function.²⁻⁴ Because most patients often have numerous underlying comorbid illnesses, the risk of developing cardiopulmonary, thromboembolic, infectious, urologic, and neurologic complications is substantial.⁵

Despite this risk profile, physicians are under increasing pressure to shorten the duration of hospitalization as a means of containing costs. The average length of stay for hip fracture has decreased from 20.1 days in 1981 to 6.5 days in 1999.^{6,7} Previous work^{6,8} has shown that the de-

crease in length of stay that accompanied the introduction of the Prospective Payment System for Medicare beneficiaries in the mid-1980s resulted in a higher proportion of patients being discharged "sicker and quicker." In that study,⁸ patients with hip fracture experienced the greatest increase in the risk of instability on discharge associated with shorter hospital stays. This is clinically important because patients who are discharged before becoming medically stable have higher rates of death, readmission, and poor functioning.^{8,9}

With the duration of hospital stays becoming even shorter throughout the 1990s, many physicians, policy analysts, and politicians have expressed concern that patients are being sent home too soon.¹⁰⁻¹³ Investigating the frequency and severity of this phenomenon will require objective criteria for judging sickness on discharge.

Therefore, we sought to develop and validate a set of explicit, condition-specific criteria that could be used to characterize clinical stability and readiness for discharge in patients with hip fracture. We focused on 2 main classes of medical problems. The first category, called active clinical issues (ACIs), includes acute, potentially dangerous, problems that clinicians would want addressed before discharge in the absence of extenuating circumstances. These include basic indicators of clinical instability, such as vital sign abnormalities, altered mental status, and inability to eat, as well as worrisome symptoms, such as acute chest pain or shortness of breath, which often reflect serious complications.^{8,9} We also focused on a group of functional impairments that may not be quickly resolved and would not necessarily delay discharge but may carry a worse prognosis and dictate a higher level of post-acute care treatment. We refer to these as new impairments (NIs), and they include bowel and bladder incontinence, inability to get out of bed, and the presence of decubitus ulcers.

The specific aims of this study were to (1) describe rates and types of ACIs and NIs on discharge, (2) examine associations between ACIs and NIs on discharge and a range of posthospital outcomes, and (3) determine if ACIs and NIs on discharge influence the risk of adverse events even after adjusting for other previously identified prognostic factors. Our hypothesis was that the greater the number of ACIs and NIs on discharge, the greater the risk of adverse outcomes.

METHODS

STUDY PATIENTS AND SITES

Consecutive patients hospitalized for hip fracture between August 4, 1997, and August 3, 1998, in 4 hospitals in the New York metropolitan area were prospectively enrolled in an observational cohort study. Details of the study design and cohort characteristics were described previously.² Exclusion criteria were age younger than 50 years, fracture occurring as an inpatient, transfer from another hospital, sustained concurrent major internal injuries, pathologic fractures, fractures 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. A total of 804 patients presented with hip fracture at the 4 hospitals. Of these patients, 650 (81%) met the eligibility criteria, and 571 (88%) of those patients gave informed consent for participation in the study. This study describes 559 patients who were discharged alive from the 4 participating hospitals. The study was approved by the institutional review board of all participating institutions.

DATA COLLECTION AND MEASUREMENTS

Information on prefracture sociodemographic characteristics, living arrangements, functional mobility, mental status, ability to eat, and urinary and bowel functioning was collected from medical records and patient or proxy interviews during the index admission. Medical records were also used to ascertain comorbid conditions, vital signs, laboratory values, physical examination findings, and type of fracture on admission. From these data, we calculated a modified RAND comorbidity score¹⁴ and a modified Acute Physiology and Chronic Health Evaluation (APACHE) score¹⁵ as summary measures of illness burden and sickness on admission. As part of this study, we collected supplemental data on a variety of clinical status parameters

on the last 2 days of hospitalization, including vital signs, mental status, ability to eat, do-not-resuscitate (DNR) status, and other active clinical problems.

ACIs AND NIs ON DISCHARGE

The ACIs were defined as any of the following in the 24 hours before discharge: temperature of 38.3°C (101°F) or higher, heart rate of more than 100/min or less than 60/min, systolic blood pressure higher than 180 mm Hg or less than 90 mm Hg, diastolic blood pressure higher than 110 mm Hg or less than 60 mm Hg, respiratory rate of more than 24/min, poor oxygenation (oxygen saturation, <90%; PaO₂, <60 mm Hg; need for mechanical ventilation or supplemental oxygen), altered mental status (different from prefracture baseline), no oral (or feeding tube) intake, or other active medical problems (new shortness of breath, chest pain, arrhythmias, or wound infection). These indicators of clinical instability have been previously identified as predictive of outcomes in both hip fracture and non-hip fracture populations.^{8,9} The NIs were defined as any of the following in the 24 hours before discharge: inability to eat, bowel or bladder incontinence, bed-bound status, and having a decubitus ulcer (all different from a patient's prefracture baseline). Incontinence was one of the original RAND instability markers.⁸ The study team thought that being bed bound and having a decubitus ulcer were factors that would have prognostic and clinical impact on recovery following hip fracture.

OUTCOMES

Information about deaths, readmissions, and functional mobility 60 days after hospital discharge was obtained by telephone interview. For cognitively compromised patients, alternate respondents who were most familiar with the patient (usually a spouse or close relative) were identified and interviewed. Prior studies indicate that proxies can provide reliable estimates for the areas of physical function measured in this study.^{16,17} The date of death was confirmed by checking public death registries. We also searched for and confirmed readmissions within 60 days of discharge by querying each hospital's administrative databases and New York's Statewide Planning and Research Cooperative System (SPARCS) hospital discharge database. When dates of first hospital readmission from multiple sources did not agree, we regarded same hospital administrative data as most reliable followed by SPARCS data, with self-reported dates last. Any death or readmission within 60 days of discharge was considered a major event. Patients who died after being readmitted were counted as having only one major event.

Functional mobility (ability to walk and climb stairs) was measured using a modified version of the locomotion subscale of the Functional Independence Measure (FIM), which rates the patient's independence in walking 150 ft and going up and down 12 to 14 stairs. The interrater reliability, face validity, predictive validity, and construct validity have been previously established for the FIM,¹⁸⁻²⁰ and it has been used in previously published studies of hip fracture functional outcomes.^{2,21-24} Each of the measures in the FIM locomotion subscale (walking, climbing stairs) is scored from 1 to 7, where 1 indicates the need for total assistance and 7 indicates complete independence. Thus, the total FIM locomotion score ranges from 2 to 14, with higher scores being indicative of better mobility functioning.

STATISTICAL ANALYSES

We present means with SDs and medians with interquartile ranges (IQRs) as appropriate. We used χ^2 tests, Cochran-Mantel-Haenszel tests for trend, and logistic regression to examine the association between the number of ACIs and NIs on

discharge and the risk of death, readmission, and major events. Linear regression was used to assess the relationship between the number of ACIs and NIs on discharge and functional mobility at 60 days as measured by the FIM locomotion subscale. Secondary analyses that examined different combinations of ACIs and NIs as predictors produced similar results to those reported.

In multivariable analyses, we used our previously validated risk adjustment model to control for covariates known to influence clinical and functional hip fracture outcomes, including age, sex, functional status (locomotion subscale of FIM), dementia, admission from a nursing home, paid help required to care for the patient, modified RAND comorbidity score,¹⁴ and modified APACHE score.¹⁵ This risk adjustment model has good discrimination and calibration and is a robust predictor of mortality and FIM locomotion scores among patients with hip fracture.² Logistic regression was used for analyses of mortality, readmissions, and major events, and linear regression was performed for the FIM locomotion models.

In additional analyses, we explored whether our primary findings could be explained by the choice of discharge destination or intentionally less aggressive care (as reflected by DNR status). Although discharge destination was not retained in the final multivariate model, we present the final results stratified by posthospital location. Findings for patients discharged to a nursing home were similar to those for patients sent to an acute care rehabilitation hospital, so the results we present have been collapsed into the binary category of discharged to home or to an institution. We also forced DNR status into the best multivariate model, but this was not retained in the final risk model and did not influence our results. Interaction terms between ACIs or NIs and discharge location and DNR status were also investigated but not found to be significant. We also performed a series of secondary analyses to confirm our findings. Controlling for hospital site produced results similar to those reported with the best multivariate model. Time-to-event analyses examining the association between ACIs and NIs on discharge and the time to death, readmission, and major events within 60 days using Kaplan-Meier and Cox proportional hazards regression corroborated the logistic regression results. Analyses of outcomes at 30 and 90 days after discharge produced similar findings to the primary 60-day results reported herein. All analyses used 2-tailed significance levels of $P < .05$ and were conducted using SAS statistical software (version 6.12; SAS Institute Inc, Cary, NC).

RESULTS

PATIENT CHARACTERISTICS

Characteristics of the hip fracture patients in the study are displayed in **Table 1**. The average patient was 81.9 years old with 2.3 comorbid illnesses before their fracture. The overall mean hospital length of stay was 8.5 days (median, 7.0 days) and varied from 8.3 to 10.0 days among the 4 sites ($P < .007$).

ACIs AND NIs ON DISCHARGE

Among the ACIs, the most common vital sign abnormalities on discharge were diastolic blood pressure less than 60 mm Hg (5.2%), temperature of 38.3°C (101°F) or higher (2.1%), and heart rate of more than 100/min (1.4%). Alteration in mental status (different from prefracture baseline) was the most frequent clinical problem on discharge, occurring in 4.5% of patients. The fre-

Table 1. Characteristics of 559 Patients Hospitalized With Hip Fracture Who Survived to Hospital Discharge*

Characteristic	No. (%)
Age, y	
<75	106 (18.9)
75-84	210 (37.6)
≥85	243 (43.5)
Female	455 (81.4)
White race	517 (92.5)
Use of long-term care services	
Nursing home	66 (11.8)
Paid helper in home	198 (35.4)
Neither of the above	295 (52.8)
Prefracture locomotion	
Independent or used device	281 (50.3)
Used personal assistance	278 (49.7)
Dementia	125 (22.4)
Type of fracture	
Femoral neck	273 (48.8)
Intertrochanteric	279 (49.9)
Subtrochanteric	7 (1.3)
Type of procedure	
Open reduction and internal fixation	353 (64.8)
Hemiarthroplasty	160 (29.4)
Closed reduction	21 (3.9)
Other	11 (1.9)
RAND comorbidity score, mean ± SD	2.3 ± 2.2
APACHE score, mean ± SD	2.7 ± 2.1

Abbreviation: APACHE, Acute Physiology and Chronic Health Evaluation.
*Data are given as number (percentage) unless otherwise indicated. Data on procedure type were missing for 14 patients.

quency of the other ACIs on discharge are given in **Table 2**. Overall, 94 patients (16.8%) had 1 or more ACIs on discharge. Among the NIs on discharge, the most common ones were bladder incontinence (different from baseline) (23.8%), the presence of a decubitus ulcer (6.8%), and bed-bound status (6.4%). Overall, 229 patients (41.0%) had 1 or more NIs on discharge.

OUTCOMES

In the 60 days after discharge, 21 patients (3.8%) died. The median time to death was 31 days (IQR, 21-41 days). One hundred five patients (18.8%) were readmitted to the same or a different acute care hospital within 60 days. The median time of readmission was 20 days (IQR, 7-34 days). In total, 113 patients died or were readmitted within 60 days of discharge (major adverse events rate, 20.2%). Eight patients died after readmission to the hospital. We had data on functional mobility for 473 (87.9%) of the 538 patients who survived 60 days. Among these patients, the average ± SD FIM locomotion score was 6.6 ± 3.8 (range, 2-14). Overall, 15.6% had returned to modified independence or better (FIM score, ≥12) and 39.1% were completely dependent (FIM score, ≤4).

ASSOCIATIONS BETWEEN ACIs ON DISCHARGE AND OUTCOMES

The greater the number of ACIs on discharge, the greater the risk of death, readmissions, and major events ($P < .05$ for all) (**Figure 1**). For example, 18.5% of patients with

Table 2. Frequency of Active Clinical Issues (ACIs) and New Impairments (NIs) on Discharge for 559 Patients

Variable	No. (%)
ACIs on discharge	
Temperature $\geq 38.3^{\circ}\text{C}$ (101°F)	12 (2.1)
Heart rate $>100/\text{min}$	8 (1.4)
Heart rate $<60/\text{min}$	2 (0.4)
Systolic blood pressure >180 mm Hg	5 (0.9)
Systolic blood pressure <90 mm Hg	1 (0.2)
Diastolic blood pressure <60 mm Hg	29 (5.2)
Respiratory rate $>24/\text{min}$	3 (0.5)
Hypoxemia (oxygen saturation $<90\%$)*	3 (0.5)
Altered mental status†	25 (4.5)
Inadequate or no oral intake	4 (0.7)
Shortness of breath	4 (0.7)
Electrocardiogram changes	2 (0.4)
Chest pain	1 (0.2)
No. of ACIs per patient	
0	465 (83.2)
1	84 (15.0)
≥ 2	10 (1.8)
NIs on discharge†	
Bladder incontinence	133 (23.8)
Bowel incontinence	8 (1.4)
Bed bound	36 (6.4)
Decubitus ulcer	38 (6.8)
No. of NIs per patient	
0	330 (59.0)
1	183 (32.7)
2	38 (6.8)
≥ 3	8 (1.4)

*Defined as room air oxygen saturation less than 90% or PaO_2 less than 60 mm Hg, oxygen saturation less than 92% while receiving 2 L/min or more nasal cannula oxygen, or use of face mask oxygen or mechanical ventilation.
 †Defined as different from prefracture baseline.

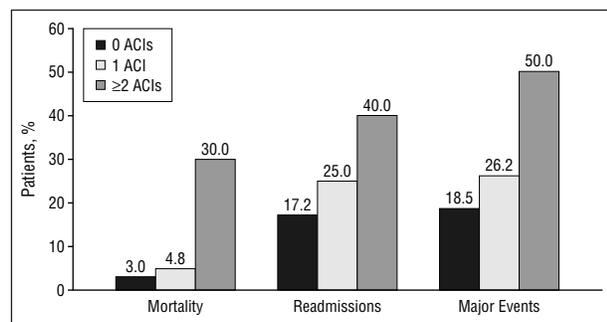


Figure 1. Active clinical issues (ACIs) on discharge and rates of adverse events within 60 days after discharge in patients with hip fractures ($n=559$). Major events are defined as death or readmission within 60 days of discharge. $P<.05$ (test for trend) for readmissions and major events. $P<.001$ (test for trend) for mortality.

no ACIs on discharge died or were readmitted within 60 days compared with 26.2% of those with 1 ACI and 50.0% of those with 2 or more ACIs ($P<.03$). The ACIs on discharge appeared to be most strongly associated with mortality (odds ratio [OR], 2.8 per ACI; 95% confidence interval [CI], 1.4-5.7) (Table 3). The risk of death, readmission, or major events in those patients discharged with 2 or more ACIs was striking (30%, 40%, and 50%, respectively). The ACIs on discharge remained significantly associated with death, readmissions, and major events even after controlling for other

Table 3. Effects of Active Clinical Issues and New Impairments on Discharge on Unadjusted and Risk-Adjusted 60-Day Outcomes*

Outcome	OR (95% CI)	P Value
Active Clinical Issues†		
Death		
Unadjusted	2.8 (1.4-5.7)	$<.003$
Adjusted	3.6 (1.6-7.9)	$<.001$
Readmission		
Unadjusted	1.7 (1.1-2.6)	$<.02$
Adjusted	1.6 (1.0-2.6)	$<.03$
Major event		
Unadjusted	1.8 (1.2-2.7)	$<.008$
Adjusted	1.8 (1.2-2.8)	$<.009$
Functional mobility		
Unadjusted	1.5 (0.6-3.4)	.37
Adjusted	1.3 (0.6-2.6)	.48
New Impairments‡		
Death		
Unadjusted	2.0 (1.2-3.2)	$<.005$
Adjusted	1.6 (0.9-2.8)	.09
Readmission		
Unadjusted	1.6 (1.2-2.3)	$<.004$
Adjusted	1.7 (1.2-2.3)	$<.006$
Major event		
Unadjusted	1.7 (1.3-2.2)	$<.001$
Adjusted	1.7 (1.2-2.3)	$<.001$
Functional mobility		
Unadjusted	0.2 (0.1-0.4)	$<.001$
Adjusted	0.5 (0.3-0.8)	$<.004$

*Odds ratios (ORs) and 95% confidence intervals (CIs) are per number of active clinical issues or number of new impairments. Major events are deaths or readmissions. Functional mobility was measured using the Functional Independence Measure (FIM) locomotion scale. Odds ratios for the functional mobility are per 1-point increase in FIM score (higher is better; see "Methods" section for details). New impairments decreased the odds of functional independence. Adjusted ORs control for age, sex, dementia, RAND comorbidity index, Acute Physiology and Chronic Health Evaluation score, prefracture functional mobility, nursing home residence, and paid help at home.

†Model fit for the final multivariate models were $c = 0.84$ for mortality, $c = 0.61$ for readmissions, $c = 0.63$ for major events, and $R^2 = 0.34$ for functional mobility.

‡Model fit for the final multivariate models were $c = 0.81$ for mortality, $c = 0.64$ for readmissions, $c = 0.65$ for major events, and $R^2 = 0.35$ for functional mobility.

important prognostic factors, including age, sex, nursing home residence, baseline dementia, modified RAND comorbidity index, modified APACHE score, prefracture mobility (FIM) score, and paid help in the home. Patients with 1 or more ACIs on discharge had 80% greater risk-adjusted odds of death or readmission within 60 days (OR, 1.8; 95% CI, 1.1-3.0). The ACIs on discharge were not associated with 60-day FIM scores ($P=.37$).

ASSOCIATIONS BETWEEN NIs ON DISCHARGE AND OUTCOMES

We found a similar relationship between NIs on discharge and increased rates of death, readmissions, and major events (Figure 2). The unadjusted and adjusted odds of adverse outcomes increased by 60% to 100% for each NI on discharge (Table 3). Patients sent home with 1 or more NIs had 2-fold greater risk-adjusted odds of

major events (OR, 2.1; 95% CI, 1.4-3.3). The NIs on discharge were also associated with low functional mobility (FIM scores) at 60 days in both adjusted and unadjusted analyses ($P < .004$).

INFLUENCE OF POSTDISCHARGE LOCATION

One of our secondary hypotheses was that the patients with ACIs or NIs on discharge would be more likely to be discharged to a nursing home or acute rehabilitation facility and thus would be at lower risk of the adverse consequences of being discharged sicker compared with patients who were returning to their homes. Although only 11.8% of patients lived in a nursing home before their hip fracture, 84.4% were discharged to a nursing home or rehabilitation facility (62.0% to a nursing home and 22.2% to an acute rehabilitation facility). Only 87 patients (15.6%) were discharged home. We found no evidence that patients with 1 or more ACIs on discharge were more likely to be sent to a post-acute care institution (nursing home or rehabilitation hospital) than to their homes (16.9% vs 16.1%; $P = .84$). Analyses that stratified by discharge location indicated that ACIs on discharge were associated with increased risk of major events for all patients. In addition, ACIs on discharge remained significant independent predictors of poor outcomes when discharge location was forced into the final multivariate models.

In contrast, we found a relationship between NIs and discharge location. Patients with 1 or more NIs on discharge were twice as likely to be sent to a nursing home or rehabilitation hospital (43.4% vs 27.6%; OR, 2.02; 95% CI, 1.22-3.33; $P < .001$). However, stratified analyses and alternate multivariate regression models revealed that the increased risk of major events associated with being discharged with NIs was not influenced by discharge destination.

COMMENT

In this multicenter, prospective cohort study of patients hospitalized with hip fractures, 16.8% of patients were discharged with ACIs, and 41.0% were discharged with NIs. Leaving the hospital with these active problems had important clinical consequences because the greater the number of problems, the greater the risk of death or readmission. Patients with 1 or more ACIs on discharge had 80% increased odds of death or readmission in the 60 days after discharge, even after adjusting for other important prognostic factors and potential confounding variables. Patients with any NIs on discharge had 200% increased odds of death or readmission. Although both ACIs and NIs on discharge were associated with major adverse events, only NIs seemed to influence functional mobility outcomes. This may reflect the fact that NIs take longer to resolve and are more likely to interfere with aggressive physical therapy and mobilization.

We hypothesized that discharge to an acute rehabilitation facility or nursing home might ameliorate the adverse consequences of ACIs or NIs on discharge. To our surprise, our data did not bear this out. Discharge to a post-acute care institution did not protect against the increased hazards of discharge with active problems. In addition, there were no differences in the consequences of ACIs or NIs

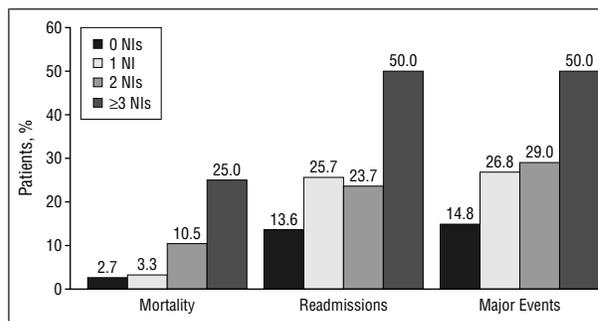


Figure 2. New impairments (NIs) on discharge and rates of adverse events within 60 days after discharge in patients with hip fracture (n=559). Major events are defined as death or readmission within 60 days of discharge. $P < .001$ (test for trend) for readmissions and major events. $P < .001$ (test for trend) for mortality.

between patients going to acute rehabilitation facilities compared with those going to nursing homes. There are probably several reasons for this. First, although only a small proportion of patients were discharged to their homes, nearly all of them received home health services, so most had some level of nurse monitoring and support. Second, information about the presence or severity of ACIs and NIs and acute treatment needs may be incomplete or missing on transfer to an acute care facility or may take a few days before the new staff focus on these problems.

What degree of ACIs and NIs are clinically important and should influence discharge decision making? Given the high rates of poor outcomes among patients with 2 or more ACIs, clinicians should carefully consider whether such patients are truly ready for discharge. If they are discharged, it seems prudent that these patients receive close posthospital monitoring and treatment. Whether patients with just 1 ACI following hip fracture surgery ought to have their discharge delayed is less clear, since the risk of adverse events associated with a single unstable factor was more modest. Our measure of NIs may be more useful from a prognostic standpoint because problems such as incontinence and decubitus ulcers are often not reasons in themselves for delaying discharge. Indeed, some of these complications are common in hip fracture patients and may be more effectively treated in the post-acute care setting. Nonetheless, physicians should be aware that patients with NIs on discharge are at higher risk of adverse outcomes and poor functioning. Our data also highlight the need for more focused, timely communication between hospital and post-acute care practitioners to clearly articulate information about ACIs or NIs and the type of further immediate treatment and monitoring that is necessary. Discharging a patient into the care of another institution did not seem to be enough on its own to protect patients from the adverse consequences of ACIs and NIs.

Our study confirms and extends the findings of previous studies of clinical stability on discharge and outcomes. Despite the differences in definitions of clinical problems on discharge, period, and patient population studied, the Prospective Payment Study⁸ also reported a similar magnitude association between instability on discharge and short-term mortality in Medicare beneficiaries with hip fracture. In our previous work, we also demonstrated that the presence of abnormal vital signs, altered

mental status, and inability to maintain oral intake on discharge were associated with increased risk-adjusted death or readmission in patients hospitalized with community-acquired pneumonia.⁹ The data we present herein demonstrate that even when you distinguish problems that require acute inpatient management (ACIs) from ones that may be not resolved with continued hospitalization (NIs), both types of problems increase the risk of both mortal and nonmortal adverse outcomes.

Our study had several strengths, including its multihospital, prospective nature, measurement of both clinical and functional outcomes, and use of validated disease-specific and generic risk adjustment measures. Some limitations are worth noting. Because this was an observational study, we do not know what would have happened if patients we identified as having ACIs and NIs on discharge had stayed in the hospital longer. There may have been some patients who were discharged with active problems because the physician and patient desired intentionally less aggressive care. However, we found similar associations between ACIs and NIs and outcomes even after controlling for DNR status. Ultimately, additional studies will be needed to test whether interventions to treat ACIs and NIs before or after discharge result in improved outcomes.

From a patient safety standpoint, physicians should carefully factor the presence of ACIs and NIs into their assessments of readiness for hospital discharge and appropriate level of post-acute care treatment and monitoring. Information about ACIs or NIs may also be useful as means of identifying patients who experience iatrogenic complications. From a policy perspective, the proportion of patients discharged with ACIs or NIs may be a candidate quality indicator with which to compare clinician or health plan performance and stimulate quality improvement initiatives.

CONCLUSIONS

Physicians should be aware that ACIs and NIs in the 24 hours before discharge are common and increase the risk of poor posthospital outcomes. Discharge to a nursing home or rehabilitation hospital by itself did not seem to mitigate this increased hazard. Therefore, hip fracture patients with these types of active problems following surgery may benefit from more intensive observation and treatment than they currently receive in most traditional post-acute care settings. Although directly addressing ACIs and NIs during hospitalization or in the post-acute care setting makes sense clinically, the ultimate proof of the usefulness of these criteria will depend on evidence that shows that intervening on these measures improves health outcomes.

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