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Outcomes of Patients Discharged to Skilled Nursing Facilities After Acute Care Hospitalizations

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Abstract

Objectives—To evaluate previously independent older patients discharged to skilled nursing facilities (SNFs) and identify risk factors for failure to return home and death and development of a predictive tool to determine likelihood of adverse outcome.

Background—Little is known about the likelihood of return to home, and higher than expected mortality rates in SNFs have recently been described, which may represent an opportunity for quality improvement.

Methods—Retrospective cohort of older hospitalized patients discharged to SNFs during 2007 to 2009 in 5 states using Centers for Medicare & Medicaid Services linked minimum data set data from SNFs. We assessed mortality, hospital readmission, discharge to home, and logistic regression models for predicting risk of each outcome.

Results—Of 416,997 patients, 3.8% died during the initial SNF stay, 28.6% required readmission, and 60.5% were ultimately discharged home. Readmission to a hospital was the strongest predictor of death in the years after SNF admission (unadjusted hazard ratio, 28.2; 95% confidence interval, 27.2–29.3; $P < 0.001$). Among all patients discharged to SNFs, 7.8% eventually died in an SNF and overall 1-year mortality was 26.1%. Risk factors associated with mortality and failure to return home were increasing age, male sex, increasing comorbidities, decreased cognitive function, decreased functional status, parenteral nutrition, and pressure ulcers.

Conclusions—A large proportion of older patients discharging to SNFs never return home. A better understanding of the natural history of patients sent to SNFs after hospitalization and risk factors for failure to return to home, readmission, and death should help identify opportunities for interventions to improved outcome.

Keywords

post–acute care outcomes; skilled nursing facility; trauma

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INTRODUCTION

For older patients, acute health care crises—trauma, surgery, and cerebrovascular accident (CVA)—can have a devastating impact on functional capacity, often involving a prolonged recovery extending beyond an acute care hospitalization. Increasing proportions of older patients are discharged to skilled nursing facilities (SNFs) for post–acute care (PAC) after such events, but little is known about their outcomes or factors that predict return to independent living.

The PAC setting is an important—though not well studied—component of our health care system. Total spending on SNF care was $180 to $200 billion in 2011, and 53% to 60% of this care is paid for by taxpayer-funded sources, primarily Medicare and Medicaid.[1] Adding to the cost, nearly one-quarter of PAC admissions to SNFs result in unplanned 30-day hospital readmissions.[2–4] Many physicians think of PAC as a transitional phase before returning home and counsel patients and families about this as such. In actuality, little is known about the likelihood of transition to home, and increased mortality rates identified in patients transferred to SNFs have motivated an interest in evaluating PAC structure, process, and outcomes.[5–12]

An evidence gap related to the likelihood of transition to home or independent living and factors associated with worse outcomes has limited informed decisions by patients, families, and clinicians. Population and hospital-based cohort studies have consistently demonstrated worse survival for intensive care unit (ICU), surgical, and trauma patients discharged to SNFs compared with those discharged home.[5–12] For example, 23% of all postoperative deaths occur after hospital discharge,[13] 59.3% to 74.4% of deaths after traumatic injury occur postdischarge,[5,6] and analysis of 1-year mortality among elderly trauma patients has shown that 85.7% of deaths occur after leaving the hospital.[14] Certainly, higher than expected rates of death among those discharged to SNFs may relate to underlying health conditions, but they may also represent an opportunity for quality improvement. However, none of the prior studies reflecting adverse survival outcomes have had the capacity to describe in what setting (home, hospital, or in the SNF) that death occurred, nor how many patients were successfully discharged back to the community. For clinicians working in acute care hospital environment, SNFs represent a “black box,” with little information about the relevant structural and process measures that might improve outcomes. The objective of this work was to (1) describe the features and outcomes of previously independent elderly patients discharged from an acute care hospital to an SNF including discharge home, readmission, overall mortality, and death in SNF; (2) identify risk factors associated with failure to discharge home and long-term mortality; and (3) develop and test a predictive tool for discharge home, readmission, and 1-year mortality that might be used to inform discussions with patients.

METHODS

We performed a retrospective cohort study of all Medicare beneficiaries who were treated in acute care hospitals for nontrauma surgical, trauma, or CVA diagnoses and subsequently discharged to an SNF between January 2007 and December 2009 in the states of California,

Florida, New York, Texas, and Washington. These states were selected for their combination of population size, diversity, and geographic distribution. All data were obtained from the Centers for Medicare & Medicaid Services through the Research Data Assistance Center (ResDAC, University of Minnesota, MN). Claimant master beneficiary summary files were linked to minimum data set (MDS) assessments from SNF stays and to the National Death Index. This study was approved by the University of Washington Human Subject Division Institutional Review Board. The MDS is an approximately 400-point clinical assessment intended to be a comprehensive assessment of each SNF resident's demographic information, baseline functional capabilities, delivered care, and progress during the stay. MDS assessment forms must be completed for all residents in Medicare-/Medicaid-certified SNFs, regardless of reimbursement source. These assessments are performed by licensed health care providers and are required upon admission to the facility, after any clinically significant event, quarterly and upon discharge.

Specific exclusions for our study included patients who had an MDS assessment within 6 months before index hospitalization indicating a prior, recent stay in a nursing home, patients receiving hospice care either as an inpatient or within 7 days of admission to SNF, and those indicated by MDS assessment to have terminal disease with less than 6 months of life expectancy. Patients discharged to an SNF before July 1, 2007, were excluded because we lacked antecedent data to exclude an SNF stay within 6 months before index hospitalization and admission.

There were 3 primary analyses in this study: (1) an analysis of first discharge disposition after SNF admission for PAC; (2) an analysis of postdischarge survival after SNF admission in relationship to diagnosis group and first discharge disposition from SNF, including death and setting of death (SNF, hospital, community); and (3) a comparison of long-term survival in relationship to clinical and patient characteristics ascertained upon admission to SNF. In SNF, mortality includes both patients who died during the index SNF admission and those who died on subsequent readmissions to an SNF, regardless of their first SNF discharge disposition. We used Kaplan-Meier survival estimates from SNF admission stratified by diagnosis group and disposition from first SNF admission. Deaths among patients were ascertained by linkage of master beneficiary summary files with the National Death Index by Centers for Medicare & Medicaid Services. Linkages were based on social security number. Mortality was censored at 3 years after hospital discharge. The time variable for survival analysis was person-days of observation, defined as the interval between date of SNF admission and date of death or 3 years. Logistic regression using Cox proportional hazards model, accounting for clustering at the SNF level, was performed to estimate relative risk of mortality after SNF admission for PAC. Departures from the proportional hazards assumption were assessed with log survival plots. Deaths occurring in SNFs were defined using last available MDS discharge assessment indicating death. This could occur at any time or on any SNF admission; the patients who were initially discharged home or readmitted to the hospital were still at risk to die in an SNF on subsequent admissions.

Patient and clinical characteristics associated with an increased risk of death on univariate analysis ($P \leq 0.10$) were included in multivariate models. The *International Classification of Diseases, Ninth Revision* (*ICD-9*)–based Injury Severity Score (ICISS) was used to estimate

injury severity among trauma patients.[15] We adjusted for age group, sex, Charlson Comorbidity Index, admission priority, length of stay, ICU stay, blood transfusion in hospital, Minimum Data Set Activities of Daily Living score,[16] cognitive status based on level of impairment in daily decision making as documented on the MDS admission assessment, the use of parenteral nutrition at admission to SNF, and the presence of pressure ulcers at admission to SNF. Trauma and CVA patients whose acute care hospitalization was coded as elective were excluded because we would not expect elective stays associated with these diagnosis groups [trauma = 5160 (5.8%), CVA = 2459 (8.9%)]. The sample was split by state, and because there were no significant differences in demographic, clinical characteristics, or raw outcomes (mortality, readmission rates) between states, data from the states of Washington, Texas, and Florida were used to develop the predictive tool. This model was validated using data from the states of New York and California by calculating the test statistic using analysis of receiver operating characteristic curves for prediction of 1-year mortality, readmission, and discharge home. The Hosmer-Lemeshow goodness-of-fit test was used to assess model calibration ($P \leq 0.05$ indicating poor fit) by comparing observed versus expected mortality, readmission, and discharge home within each decile derived from the logistic regression modeling. Two-sided tests of significance were used when appropriate and results were considered significant with a P value of less than 0.05. All statistical analyses were performed using Stata software version 12.0 (Stata-Corp, College Station, TX).

RESULTS

We identified 416,997 patients admitted to an SNF for the first time after admission to an acute care hospital with the diagnoses of interest (Table 1). During the study period, there were no significant changes in statewide distribution or of demographic and clinical characteristics. There were no differences between states in raw mortality rates, readmission rates, or discharge disposition. Similarly, these rates did not significantly change over the study period.

Disposition From Initial SNF Admission

Of the patients discharged to an SNF, 3.8% died during the index SNF admission, 28.6% were readmitted to an acute care hospital, 60.5% were discharged back to home, 5.6% transitioned to assisted-living facilities, and 1.6% remained in an SNF at 6 months after admission (Table 2). Of all readmissions to an acute care hospital, 49.7% occurred within the first 7 days postdischarge, 29.1% occurred between 8 and 30 days postdischarge, and 21.2% occurred greater than 30 days postdischarge. Patients readmitted within 7 days had shorter mean hospital length of stay than patients readmitted between 8 and 30 days or those readmitted after 30 days (13.9 vs 15.5 vs 16.9 days, $P = 0.01$) Less than 1% of readmissions were defined as elective on the basis of the subsequent inpatient CMS Medicare Provider Analysis and Review file. Of patients readmitted to the hospital from their initial SNF stay, 7% died during the subsequent rehospitalization, 3% discharged home from the hospital, and 90% returned to an SNF. These readmitted patients also had the highest 1-year mortality rates, with 48% of 1-year deaths occurring in this group while the patient was in an SNF. In contrast, of patients who were discharged home from the first SNF admission, less than 5%

had a subsequent SNF stay, 1-year mortality was 11%, and only 1.4% returned to, and died in, an SNF (Table 3). Patients discharged to an SNF after a CVA (compared with trauma and surgical patients, respectively) had higher rates of death during index SNF admission (7.1% vs 3.7% vs 3.6%, $P < 0.001$), lower rates of discharge home (49.6% vs 58.2% vs 62.0%, $P < 0.001$), and higher rates of SNF stays longer than 6 months (3.3% vs 2.2% vs 1.1%, $P < 0.001$) (Table 3).

Risk Factors for Death After SNF Admission

The proportion of all patients discharged to an SNF who died within 1 year after discharge was 26.1%, and the proportion of patients who died within 3 years was 31.6% (Table 3). Approximately 30% of all postdischarge deaths occurred in an SNF. Male sex, increasing age or comorbid conditions, impaired functional or cognitive status, receiving nutritional support parenterally at SNF admission, and the presence of pressure ulcers at admission to SNF strongly predicted death within 1 and 3 years and shortened time to death (Table 4).

The risk of death at 1 year was highest among patients readmitted to an acute care hospital from the SNF compared with patients discharged home, remaining in an SNF at 6 months, or transitioned to assisted living facilities, respectively (48.0% vs 12.2% vs 20.7% vs 2.4%, $P < 0.001$). Similar trends were observed for 3-year mortality. Readmission to an acute care hospital was the strongest predictor of death over time [unadjusted hazard ratio (HR) 28.2; 95% confidence interval (CI), 27.2–29.3, $P < 0.001$], but this is not included in the predictive model as readmission status cannot be known at the time of hospital discharge. Patients readmitted within 7 days had the highest adjusted risk of death over time (HR, 1.64; 95% CI, 1.61–1.69, $P < 0.001$) compared with patients discharged between 8 and 30 days [HR 1.0 (reference)] or readmitted after 30 days (HR, 0.77; 95% CI, 0.71–0.83). Patients with a greater number of comorbid conditions and lower functional status were at significantly lower risk of early readmission but at significantly higher risk of readmission after 30 days. Patients who were readmitted within 7 days were younger, had fewer comorbid conditions, and better functional status than patients readmitted between 8 and 30 days or after 30 days but had equal or higher mortality rates at 1 year (48.1% vs 49.0% vs 41.1%, $P < 0.001$).

Predictive Model Discrimination and Calibration

Patient and clinical characteristics associated with the adverse outcome (age group, sex, Charlson Comorbidity Index, Minimum Data Set Activities of Daily Living score, cognitive function, ICU stay, discharge on parenteral nutrition, the presence of pressure ulcers on admission to SNF, and procedure type for surgical patients) were used to create an interactive tool to estimate probability of discharge home, readmission, and 1-year mortality (available at http://www.becertain.org/hospitals/inform). Overall, the regression models based on these data demonstrated high levels of prediction with a c-statistic in the validation states of 0.74 (95% CI, 0.66–0.82) for trauma patients, 0.77 (95% CI, 0.70–0.84) for surgical patients, and 0.69 (95% CI, 0.59–0.79) for CVA patients when predicting 1-year mortality. The c-statistic when assessing risk of readmission was 0.76 (95% CI, 0.69–0.83) for trauma patients, 0.75 (95% CI, 0.69–0.81) for surgical patients, and 0.68 (95% CI, 0.58–0.78) for CVA patients. Finally, The c-statistic when assessing likelihood of discharge home was 0.77

(95% CI, 0.71–0.83) for trauma patients, 0.76 (95% CI, 0.70–0.82) for surgical patients, and 0.69 (95% CI, 0.60–0.78) for CVA patients. Model calibration was assessed using the Hosmer-Lemeshow goodness-of-fit test, and the predictive model showed good calibration for 1-year mortality, readmission, and discharge home in each group, with nonsignificant differences between predicted and observed outcomes across deciles within each group (Table 5).

As an example of use, using this predictive algorithm, a 71-year-old male trauma patient, who upon discharge from the hospital to an SNF with a diagnosis of diabetes without end-organ damage, who requires non–weight-bearing assistance for ADL tasks, whose daily decision making is independent and reliable, had an ICU stay, and is not discharging with pressure ulcers or on parenteral nutrition, is estimated to have an 86% probability of discharge home from SNF, a 12% probability of readmission, and an 9% risk of 1-year death. This compares with an 86-year-old female trauma patient, who has similar comorbid conditions but requires extensive or weight-bearing assistance for ADL tasks, has some difficulty with daily decision making in new situations, had an ICU stay, and does not require parenteral nutrition but has a pressure ulcer. That patient is estimated to have a 74% chance of discharge home, a 30% probability of readmission, and a 22% risk of 1-year death. The developed predictive tool can be used by clinicians to gauge their patient's risk for events and may inform decision making.

DISCUSSION

In this 5-state evaluation of Medicare beneficiaries discharged to SNFs after acute care admission, we describe high rates of 1- and 3-year death (26% of patients dying within the first year and 32% of patients dying in 3 years) and high rates of death within the SNFs (8% of all patients discharged to SNF died in an SNF within 1 year, with half of these deaths occurring during the index SNF admission). Nearly 40% of previously independent patients discharged to an SNF did not successfully discharge back to home. This is the first study we know of highlighting the significant proportion of patients who never return home from an SNF despite being at home before their acute hospitalization. Although surgical, trauma, and CVA patients are distinct populations, in this analysis, they all represent patient populations that were previously independent but share a common final pathway in discharge to SNF, and similar trends in mortality, readmission, and discharge back to community are seen across cohorts. These findings may highlight an opportunity for quality improvement surrounding PAC hospitalization.

The risk of death during follow-up was highest among patients who were readmitted to a hospital. Within this group, readmission in the first 7 days was a strong predictor of death after controlling for patient and clinical characteristics. Interestingly, increasing comorbid conditions and decreasing functional status were negatively associated with early readmission but were strongly predictive of readmission after 30 days. This suggests that readmissions after 30 days are more likely to be related to a patient's preexisting comorbid conditions. The underlying drivers for early readmissions cannot be defined by our current study but may involve problems in care transition. A small proportion of readmissions may be planned, particularly in the trauma population where orthopedic and craniofacial injuries

are often repaired in a delayed fashion. We cannot reliably identify planned readmissions with the current data. However, we do not believe that planned readmissions represent a significant proportion of observed readmissions and we would not expect to see a strong correlation between poor outcomes and readmission for this population. Our current research has been informed through close collaboration with SNF care stakeholders including several SNF medical directors, who hypothesize that many early readmissions are driven primarily by factors such as poor communication between the acute care and PAC team at the time of discharge, errors in discharge instructions or medication reconciliation, or discharges before full stabilization of acute problems. The negative correlation we observed between increasing comorbidity, worse functional status, advancing age, and early readmission, in conjunction with the shorter observed inpatient length of stay among patients readmitted early, may also suggest that these patients are being discharged more rapidly than older patients with more comorbidities and worse functional status. Because of the high frequency of early readmissions, the associated mortality, and costs associated with readmission, work to decrease early readmissions and improve long-term outcomes is an appropriate focus for quality improvement.

There are several limitations to the current study. Foremost is the limited information available about clinical characteristics and details of care delivered during the acute care hospitalization. However, the combination of data from both the master beneficiary summary files and MDS assessments allows an assessment of patient conditions. We were not able to assess many facility-level characteristics for SNFs such as size, staffing, or mix of payment sources. Identifying modifiable facility level factors that impact a patient's disposition is a focus of ongoing research. Our current study is also limited to Medicare beneficiaries, and similar patterns may not persist among younger patients and other non-Medicare beneficiaries admitted to SNFs. Despite these limitations, our current study significantly adds to our understanding of long-term outcomes for patients discharged to SNFs.

CONCLUSIONS

The focus of quality improvement and research in the PAC period has been primarily hospital based, surrounding readmission and death and complications after discharge. Although these outcomes drive cost and clearly matter to patients, the role of SNFs in helping patients return to home has not been well studied or considered as a QI target. It is often communicated to patients and families that discharge to an SNF is a step in the process of recovery, and because clinicians have very limited evidence about the natural history of patients discharged to SNFs, patients may be given an unreasonable expectation of return to home. This study demonstrates that a significant proportion (41%) never returns to home, and the 1- and 3-year risk of death is much greater than that in the general population. Given the increasing regularity that patients are discharged to SNFs for PAC, further work to describe and assess care practices at SNFs and facility-level variability in outcomes is important. The predictive model derived and tested herein may be used in supporting decisions and to provide risk estimates for patients being discharged to SNFs; however, further testing is warranted to better understand clinical utility. This may be important in setting expectations, individualizing risk profiles to target resources, and help in

comparisons of SNF quality. Future work should aim to identify interventions and facility-level factors that alter the proportion of patients successfully discharged home and avoiding other adverse events.

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TABLE 1

Demographic and Clinical Characteristics by Diagnosis Group

Characteristics	Trauma	Surgical	CVA	Total
	83,810	308,016	25,171	416,997
Age [Mean (SD)]	82.4 (9.7)	77.2 (10.7)	81.1 (9.7)	78.5 (10.7)
Age category, yr				
<65	3705 (4.2)	29,397 (9.5)	1237 (4.9)	34,339 (8.2)
65–74	11,235 (13.4)	78,317 (25.4)	4339 (17.2)	93,891 (22.5)
75–84	28.642 (34.2)	119,560 (38.8)	9020 (35.8)	157,222 (37.7)
≥85	40,228 (48.0)	80,742 (26.2)	10,575 (42.0)	131,545 (31.6)
Sex (% male)	27.8	39.9	39.6	37.5
ZIP code income (mean)	$57,172	$55,643	$54,727	$55,918
Admission priority [N (%)]				
Emergency/urgent	83,810 (100)	200,210 (65.0)	25,171 (100)	225,381 (69.7)
Elective	—	107,806 (35.0)	—	107,806 (30.3)
ICISS [mean (SD)]	9.2 (4.5)	—	—	—
Comorbidity Index (%)				
0	15.4	26.5	6.4	23.1
1	72.7	60.4	53.3	62.4
2	11.3	12.3	37.0	13.6
≥3	0.5	0.8	3.3	0.9
Hospital LOS [mean (SD)]	5 (7.1)	7 (12.8)	6 (7.5)	7 (10.2)
ICU stay (%)	23.1	34.7	32.6	32.3
ICU LOS [mean (SD)]*	4 (6.6)	5 (7.9)	4 (4.4)	5 (7.4)
MDS-ADL [mean (SD)]	4.1 (1.0)	3.7 (1.3)	4.0 (1.3)	3.8 (1.3)
Parenteral nutrition at SNF admission (%)	10.4	11.3	10.8	11.1
Tube feeds at SNF admission (%)	1.8	6.8	5.1	5.7
Pressure ulcers at SNF admission	28.8	28.4	22.6	28.2

*Calculated only among patients with ICU stay.

LOS indicates length of stay; MDS-ADL, Minimum Data Set Activities of Daily Living.

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TABLE 2

Demographic and Clinical Characteristics by Disposition From First SNF Admission

Characteristics	Discharged Home	Rehospitalized	Died During Index SNF Admission	Assisted Living	In SNF ≥ 6 mo
N (%)	252,283 (60.5)	119,261 (28.6)	15,846 (3.8)	23,352 (5.6)	5,838 (1.4)
Age [Mean (SD)]	77.6 (10.1)	78.5 (11.2)	83.6 (9.8)	82.1 (10.4)	79.1 (11.3)
Age group (row%), yr					
<65	60.6	32.5	1.6	4.2	1.1
65–74	67.8	26.9	2.2	2.4	0.8
75–84	64.4	26.9	3.1	4.4	1.3
≥85	50.5	31	6.6	9.8	2.2
Sex (% male)	35.2	42.9	44.1	28.0	38.0
Admission priority (row%)					
Emergency/urgent	53.5	33.1	4.9	6.8	1.8
Elective	78.2	17.4	1.3	2.6	0.5
Comorbidity Index (row%)					
0	71.1	24.0	1.6	2.7	0.7
1	59.9	28.6	3.7	6.2	1.6
2	46.2	36.2	7.8	7.8	2.1
≥3	39.4	39.5	11.7	7.5	2.0
Hospital LOS [mean (SD)]	6 (7.8)	10 (16.4)	9 (14.9)	7 (13.7)	7 (11.7)
ICU stay (%)	28.3	40.5	36.3	29.8	26.1
ICU LOS [mean (SD)]*	4 (6.4)	6 (10.6)	5 (10.0)	4 (5.3)	4 (7.8)
TPN/PPN at SNF admission (%)	55.1	27.1	3.7	5.9	1.5
Pressure ulcers at SNF admission (%)	45.3	42.5	6.3	4.6	1.4

*ICU LOS calculated only among patients with ICU stay.

LOS indicates length of stay; TPN, total parenteral nutrition; PPN, partial parenteral nutrition.

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TABLE 3

Mortality by Diagnosis Group and First Disposition From SNF

Cohort	% Patients	1-yr Mortality, %	3-yr Mortality, %	1-yr in-SNF Mortality, %*	3-yr in-SNF Mortality, %*
Trauma		23.3	29.7	7.3	8.8
Died index SNF admission	3.7	—	—	—	—
Discharged home	58.2	11.0	16.4	1.4	2.3
Readmitted	26.9	44.0	50.9	11.7	14.0
In SNF ≥ 6 mo	2.2	19.0	27.6	3.2	4.8
Assisted living facility	9.0	1.9	10.8	0.2	0.7
Surgical		26.4	31.4	7.5	8.6
Died index SNF admission	3.6	—	—	—	—
Discharged home	62.0	12.2	16.5	1.4	2.1
Readmitted	28.9	48.8	54.6	11.2	12.8
In SNF ≥ 6 mo	1.1	21.4	29.8	3.8	5.7
Assisted living facility	4.5	2.9	10.9	0.5	1.1
CVA		32.3	39.9	12.4	14.5
Died index SNF admission	7.1	—	—	—	—
Discharged home	49.6	16.5	23.5	2.5	3.8
Readmitted	31.7	50.6	58.4	15.4	18.6
In SNF ≥ 6 mo	3.3	22.2	32.1	3.9	6.5
Assisted living facility	8.3	1.5	10.3	0.1	0.4
Overall		26.1	31.6	7.8	9.0
Died index SNF admission	3.8	—	—	—	—
Discharged home	60.5	12.2	16.8	1.4	2.2
Readmitted	28.6	48.0	54.2	11.6	13.4
In SNF ≥ 6 mo	1.4	20.7	29.3	3.6	5.5
Assisted living facility	5.6	2.4	10.8	0.4	0.9

* In-SNF mortality includes patients who died in an SNF both during index SNF admission and on subsequent SNF admissions.

TABLE 4

Risk of Mortality for Trauma Patients Discharged to Skilled Nursing Facilities

	Adjusted HR (95% CI)		
	Trauma	**Surgical**	**CVA**
Age group, yr			
<65	1 (reference)	1 (reference)	1 (reference)
65–74	1.33 (1.17–1.51)	1.12 (1.08–1.16)	1.50 (1.24–1.82)
75–84	1.18 (1.04–1.34)	1.15 (1.11–1.19)	1.77 (1.47–2.13)
≥85	1.77 (1.56–2.01)	1.37 (1.32–1.43)	2.91 (2.41–3.50)
Male sex	1.85 (1.78–1.92)	1.31 (1.30–1.33)	1.34 (1.26–1.42)
Comorbidity Index			
0	1 (reference)	1 (reference)	1 (reference)
1	1.65 (1.52–1.78)	1.57 (1.52–1.62)	1.15 (0.95–1.38)
2	2.57 (2.35–2.80)	2.33 (2.24–2.41)	1.43 (1.18–1.73)
≥3	3.31 (2.67–4.11)	2.91 (2.66–3.19)	2.07 (1.64–2.63)
Procedure type			
Neurosurgical	—	2.00 (1.86–2.17)	—
Head and neck	—	2.16 (1.99–2.35)	—
Cardiothoracic	—	2.17 (2.02–2.33)	—
Abdominopelvic	—	2.17 (2.03–2.33)	—
Orthopedic	—	0.78 (0.73–0.84	—
Spine	—	0.99 (0.88–1.13)	—
Vascular	—	2.35 (2.19–2.52)	—
Endovascular	—	1.76 (1.60–1.94)	—
Skin and soft tissue	—	1.73 (1.63–1.84)	—
Nonelective admission	—	1.88 (1.84–1.93)	—
Max head ICSSS score	1.01 (0.89–1.13)	—	—
Cognitive function			
Independent	1 (reference)	1 (reference)	1 (reference)
Modified independence	1.61 (1.54–1.68)	1.44 (1.41–1.47)	1.28 (1.18–1.39)
Moderately impaired	2.43 (2.33–2.54)	1.77 (1.73–1.82)	1.84 (1.70–1.99)
Severely impaired	3.71 (3.42–4.02)	2.64 (2.51–2.77)	3.39 (3.02–3.82)
Length of stay (d)	1.01 (1.01–1.01)	1.01 (1.01–1.01)	1.00 (0.99–1.01)
ICU stay	1.29 (1.24–1.34)	1.01 (0.99–1.03)	1.05 (0.98–1.12)
Transfusion	0.93 (0.86–1.00)	0.97 (0.92–1.02)	—
MDS-ADL at SNF admission			
0	1 (reference)	1 (reference)	1 (reference)
1	1.18 (0.68–2.02)	1.09 (0.97–1.24)	1.17 (0.74–1.84)
2	1.43 (0.88–2.31)	1.32 (1.19–1.47)	1.39 (0.92–2.09)
3	1.58 (0.98–2.55)	1.61 (1.45–1.79)	1.82 (1.20–2.76)
4	2.08 (1.29–3.36)	1.97 (1.77–2.18)	2.22 (1.47–3.36)
5	2.62 (1.63–4.23)	2.75 (2.48–3.05)	2.86 (1.889–4.31)

	Adjusted HR (95% CI)		
	Trauma	**Surgical**	**CVA**
6	4.44 (2.73–7.21)	3.59 (3.22–4.01)	4.80 (3.16–7.30)
PPN/TPN	1.11 (1.06–1.17)	1.14 (1.11–1.73)	1.20 (1.09–1.32)
Tube feeds	0.99 (0.86–1.12)	1.00 (0.92–1.08)	1.00 (0.86–1.14)
Pressure ulcers	1.57 (1.52–1.64)	1.65 (1.62–1.69)	1.40 (1.33–1.48)

ICISS indicates *ICD-9*–Based Injury Severity Score; MDS-ADL, Minimum Data Set Activities of Daily Living Score; PPN, partial parenteral nutrition; TPN, total parenteral nutrition.

TABLE 5

Validation and Calibration of a Predictive Tool for 1-Year Mortality, Readmission, and Successful Discharge Home From Skilled Nursing Facilities After Acute Care Admission

Patient Group	C-Statistic (95% CI)	Hosmer-Lemeshow *P* Value (χ^2 *df*)
Surgery		
1-yr mortality	0.77 (0.70–0.84)	0.42 (5.66, 7)
Readmission	0.75 (0.69–0.81)	0.39 (5.41, 7)
Discharge home	0.76 (0.70–0.82)	0.43 (5.74, 7)
Trauma		
1-yr mortality	0.74 (0.66–0.82)	0.37 (4.35, 6)
Readmission	0.76 (0.69–0.83)	0.39 (4.50, 6)
Discharge home	0.77 (0.71–0.83)	0.44 (4.88, 6)
Nontrauma CVA		
1-yr mortality	0.69 (0.59–0.79)	0.18 (2.91, 6)
Readmission	0.68 (0.58–0.78)	0.22 (3.23, 6)
Discharge home	0.69 (0.60–0.78)	0.20 (3.07, 6)