What Happens to Patients Who Can't Go Home? Missing Morbidity and Determinants of Outcomes for Surgical and Trauma Patients Discharged to Skilled Nursing Facilities.

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Chapter One

Structure, Process, and Outcomes in Skilled Nursing Facilities: Understanding what happens to surgical patients when they can't go home. A systematic review

Background

Surgical interventions and care often reflect an acute insult and recovery phase. The post-acute phase of care and recovery is increasingly being provided in settings other than the traditional acute care hospital. More patients are being discharged to dedicated rehabilitation facilities and skilled nursing facilities (SNFs) for post-acute care (PAC), rehabilitation, and recovery. This need for PAC is growing as the population ages. The factors associated with increased risk of institutional discharge are advanced age, prior placement in a nursing home, functional dependence with 3 or more activities of daily living (ADLs), significant extremity injury, maximum head Abbreviated Severity Scale Score (AISS) ≥3, and lack of family or social support.[1–4] Medicare spending for PAC exceeded $25.5 billion in 2009.[5] The proportion of PAC paid for by Medicare has grown from 8.6% in 2000 to 12.7% in 2007.[6] Medicaid finances an even greater proportion of PAC, reimbursing over 40% of (SNF) charges in 2008.[7] The total spending on skilled nursing facility care was $150-160 billion in 2007, and 53-60% of this care is paid for by public tax-payer funded sources.[5] Adding to the cost, nearly one-quarter of PAC admissions to SNFs result in unplanned 30-day hospital readmissions at a considerable cost.[8–10]

PAC is a poorly understood but important aspect of our healthcare system. There is increasing evidence that the burden of disease related to acute surgical care extends well into the post-acute period. Many surgeons think of PAC as a transitional phase prior to returning home, but the increased mortality during this period challenges this assertion. Twenty-three percent of post-op deaths occur after discharge,[11] 59.3-74.4% of deaths after traumatic injury occur post-discharge,[12,13] and 85.7% of elderly trauma patient deaths occur after leaving the hospital.[14] Population and hospital-based cohort studies have consistently demonstrated worse survival for ICU, surgical, and trauma patients discharged to SNFs: risk of death is 1.6-3.9 times greater for patients discharged to SNF compared to those discharged home.[12,13,15–20]

A greater burden of disease and injury severity contributes to the increased mortality of SNF patients; however, it is unclear if these baseline differences in the population discharged to SNF and the population discharged home completely explain the discrepancy. The role of the care setting in contributing to patient outcome and survival has not been properly studied. This area of care currently represents something of a "black box." As surgeons we lack a full understanding of exactly what PAC in a SNF looks like for our patients. Without this knowledge, we cannot appreciate fully how this period of PAC contributes to outcomes.

How Quality is Measured?

The classic Donabedian paradigm for assessing quality is a widely accepted conceptual framework for outcomes research, and consists of three core elements: structure, process and outcome.[21] Although patient factors were not explicitly included in this paradigm, their inclusion in the overall measure of quality was implicit. "Outcomes reflect both the power of medical science to achieve certain results under any given set of conditions, and the degree to which "scientific medicine," as currently conceived, has been applied in the instances under study."[22] The "set of conditions" referenced in this statement indirectly include patient factors that are antecedent to the delivery of care. Therefore, for the purposes of this work we consider structure to encompass patient characteristics (demographics, disease/diagnosis, comorbidities, etc.) as well as the institutional characteristics (SNF size & volume, staffing patterns, hospital affiliation, business model, availability of specific care, etc.). The process is the actual care delivered to a patient (assistance with ADL's, physical therapy, medication monitoring and adjustment, counseling, etc.) and the outcome is the end result (mortality, readmission rates, changes in functional status, cost, etc.).

Because of the high cost of PAC and our limited understanding of discrepant patient outcomes, this systematic review is intended to evaluate the literature with regard to the structure, process, and outcome of PAC in SNFs.

The Minimum Data Set Resident Assessment Instrument (MDS, MDS-RAI) is one available resource with information related to each of these three elements, and it has been used extensively in research and by many of the papers reviewed below. Thus, a brief explanation of it is warranted. The MDS is part of the federally mandated process for assessment of all residents in Medicare or Medicaid certified SNFs. It was developed in response to the Nursing Home Reform Act in the Omnibus Budget Reconciliation Act of 1987. Since 1990, use of the MDS-RAI has been mandated in all SNFs and long-term care (LTC) facilities that receive Medicare or Medicaid reimbursement and transmission of data to the Centers for Medicare and Medicaid (CMS) has been mandated since 1998. [23]

The MDS contains approximately 400 data items and is 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 typically performed by licensed health care providers at the facility, and are required upon admission to the facility, after any clinically significant patient event, quarterly throughout the year and upon discharge.

Specific items from the MDS have been used to develop quality indicators across multiple domains of resident care. The initial candidate items were developed at the University of Wisconsin-Madison as part of the Nursing Home Case Mix and Quality project, funded by the Health Care Financing Administration (HCFA) (now known as the Centers for Medicare and Medicaid Services). Initial items and testing occurred using information from the MDS Version 1.0. Through a process of panel review and pilot validity testing over several years, the candidate items were reduced and are currently implemented as 30 indicators spanning 11 domains of care in the MDS 2.0. These indicators are available and reported as the average percentage of residents triggering a specific metric in a given quarter. This information is not publically available at a local or facility-specific level.

Methods

A comprehensive and systematic review of the literature was undertaken using PubMed. A medical librarian assisted in the construction and execution of the database searches. General inclusion criteria were as follows: English language full-text articles published between January 1990 and December 2011, publications reporting work with the clearly stated purpose of addressing elements of at least one of the three domains, and based on studies completed in the United States or Canada using the MDS-RAI Version 2.0. Published work addressing any of these issues as a secondary aspect of work, but not as the primary objective, were excluded, as were studies addressing these questions in the setting of a specific non-surgical disease process or in patients identified as having a terminal illness. Additional inclusion/exclusion criteria specific for each sub-domain, when necessary, were as follows. For research investigating the association between patient factors and outcomes, studies reporting models based solely on the use of other developed scores or indices were excluded. Investigations into the association between facility staffing characteristics and outcomes were limited to reports of work in the PAC population. Investigations addressing variability in outcomes were limited to studies attempting to make direct facility level comparisons. Articles on resident-reported outcomes were limited to those addressing the validity of currently used tools for assessing resident-reported outcomes or studies investigating the association between resident-reported outcomes and care quality. Studies investigating economic outcomes were limited to cost-effectiveness or cost-quality comparisons. Searches were conducted between 26 January 2012 and 25 February 2012. The search terms used are found in Table 1. This initial search yielded 3,379 entries. After removing duplicate results, 2,711 titles and abstracts were screened and 101 articles were retrieved and reviewed in full, and reference lists from these articles were also reviewed for additional articles. Review of the reference lists identified 2 additional articles, of which one met inclusion criteria. Figure 1 illustrates the article selection process.

Thirty-four relevant studies are discussed in this review and characteristics of these studies can be found in Table 2.

Results

Review of the literature illustrated a dearth of information specifically addressing surgical or trauma patients discharged to SNFs. The majority of SNFs provide care for both PAC and long-stay residents within the same facility. As such, in the absence of specific PAC literature, there is something to be learned about the structure, process, and outcomes of SNFs from these population-based studies.

Structure

Patient Characteristics Influencing Outcomes

There were six studies included that sought to develop or validate a model predicting mortality, readmission, or decrease in functional or health status for nursing home residents. One study reexamined and modified a predictive model previously developed by the same researchers. Table 3 summarizes the predictors of mortality or decline in functional status used in each model.

In 2003 Hirdes et al[24] developed the MDS-Changes in Health, End-stage disease, and Symptoms and Signs (MDS-CHESS) based on a retrospective cohort study of 28,495 patients admitted to complex continuing care hospitals in Ontario, Canada from July 1996 to May 1999. This population included both a large sub-group of PAC patients with an average length of stay (LOS) less than 90 days and a smaller sub-group of long-term residents with a LOS averaging one year. The purpose of their study was to develop a measure of health instability using data available from the MDS in order to identify residents at increased risk for mortality. Items from the MDS indicating a change in health status in the last 90 days, and items indicating chronic disease and clinical signs and symptoms were included as candidate items for the CHESS score. Bivariate analysis with proportional hazards models were used to identify items associated with mortality (HR >1.5 and $p \leq 0.05$). The final CHESS included a sub-scale for clinical signs and symptoms, which was then summed with those for deterioration in status and chronic

diseases resulting in a 6 point scale (min=0, max=5) with higher scores indicating increased health instability. Logistic regression of the CHESS score with age, gender, do-not-resuscitate (DNR) status, the MDS-Cognitive Performance Scale[25] (MDS-CPS) and MDS Hierarchical Activities of Daily Living Scale (MDS-ADL)[26] showed that the CHESS score retained independent effect on mortality, with an adjusted HR of 1.60 for each point difference in CHESS score. The MDS-CHESS proved to be a strong predictor of overall mortality, independent of other factors.

In 2003 Flacker and Kiely[27] performed a retrospective cohort study of nursing home residents from 643 nursing homes in the state of New York between June 1994 and December 1997. The purpose of their study was to identify factors associated with one-year mortality in newly admitted and long-term care cohorts of residents, and use these factors to develop a tool to estimate risk of mortality at one year. Using full MDS assessments they identified 100,669 newly admitted residents and 36,125 long-term residents (defined as LOS in the facility >1 year). Each of these cohorts was sub-divided into development and validation sub-groups with approximately 60% being used for tool development and 40% used for validation. Subject data was cross-referenced to both future MDS assessments greater than one year from initial assessment and to the National Death Index to ascertain mortality. The MDS-CPS, MDS-ADL, and MDS Social Engagement Scale (MDS-SES)[28] were also included as variables. They identified 11 variables in the newly-admitted cohort and 11 variables in the long-stay cohort. The Mortality Risk Index Score (MRIS) was calculated by summing the hazard ratio associated with each risk factor. This produced a 20-point scale (0-19) for each cohort which estimated one-year mortality risk. The model was then tested on the validation cohorts and found to yield similar results with good overall accuracy. There was evidence of a strong positive association between increasing MRSI score and overall risk of 1-year mortality in both newly admitted and long-stay cohorts.

In 2005 Porock et al[29] developed the Minimum Data Set Mortality Risk Index (MMRI) based on a retrospective cohort study including 43,510 long-term care residents from 522 nursing homes in the

state of Missouri. The purpose of the study was to identify MDS indicators that best predicted six-month mortality in nursing home residents, excluding those with terminal disease. The research team identified 50 factors recorded in the MDS that had potential association with mortality, either from clinical experience or prior research. There were four broad categories for the factors identified: demographics, disease process, clinical signs & symptoms, and adverse events. The researchers identified 14 final variables, and then tested for all possible interactions between these variables. Two significant interactions — between cancer and age, and between admission and deterioration — were identified. The final weighted model included 14 variables and 2 interactions. The model was validated in the separate validation sub-population with a final *c-statistic* of 0.753, indicating good predictive properties.

The MDS-CPS[25] and the MDS-ADL[26] are difficult to calculate without a computer and have not been widely integrated into clinical decision making. The timing of data collection does not lend itself to point of care use, as by the time formal data is returned to the SNF, the residents being reported on have often already been discharged or died. In response, Porock et al.[30] sought to reevaluate the MMRI and determine if the model could be simplified using simpler calculations while still retaining its predictive value. The researchers substituted the MDS-ADL Short Form[26] for the full hierarchical ADL scale. The MDS-CPS was replaced with a single variable from the MDS that indicated a decrease in cognitive status. The variable indicating "deterioration" was removed due to concern for vague definition and potential for poor inter-rater reliability. Finally, the variable indicating the diagnosis of Alzheimer's was removed because the actual change in cognitive status was felt to be more predictive for short-term mortality than the diagnosis. The new model was tested and validated, using similar methodology, against the population from the original study. The resulting MMRI-Revised (MMRI-R) correlated very closely with the original MMRI (Spearman correlation = 0.95) and was found to be as accurate in identifying residents with a high risk of six-month mortality. The MMRI-R was also easily

completed without the need for complex calculations. It could also be performed based on information found in the MDS 2.0, but be calculated before a formal assessment was fully documented. Therefore, it could more easily be incorporated in decision-making and discussion with the resident and family on admission to the nursing facility.

In 2005 Van Dijk et al.[31] reported on a retrospective cohort study using the same study population and methods as Porock et al.[29] in order to evaluate the effects of chronic diseases on mortality in elderly residents of nursing homes, paying specific attention to potential synergistic effects of different chronic diseases. The presence of chronic diseases was ascertained from information in the MDS 2.0 initial assessments. Analysis of association between specific disease states and mortality resulted in a model with age, gender, and seven disease states: cancer, heart failure, renal failure, COPD, dementia, diabetes mellitus (DM), and anemia. Although there was no final aggregate predictive score, the OR calculated for each of the chronic diseases ranged from 1.034 to 2.14, with the unadjusted OR for cancer being an outlier at 374. This data could be used to identify patients at elevated risk for one-year mortality upon admission to a nursing facility.

In 2006, Wallace and Prevost[32] reported a retrospective cohort study of 21,852 residents admitted from January to June 2003 to 111 nursing facilities from 12 states. The purpose of the study was to develop two different methods for predicting six-month mortality based on information from the MDS and to compare the relative utility of the two methods. A summative index score was created by identifying the number of assessments with multiple variables present, and stratifying the six-month mortality rate by number of variables present on the assessment. The summative index score ranged from 1-10, with the integer value corresponding to the number of predictor variables found on a resident's MDS assessment. The researchers found a uniform positive association between mortality rates and the number of predictor variables present on an assessment. Assessments with a single predictor variable were associated with a 27.1% risk of six-month mortality and those with ten or more

predictors were associated with 80% risk of mortality. The researchers then developed a Probability of Death Index (PDI) score by identifying variables associated with death. Logistic regression identified 28 variables that had a significant association with six-month mortality (p=0.01). The regression coefficients of these variables, when available, were combined to yield a PDI score ranging from 0-0.99, with higher values corresponding with increased risk of death. The PDI scores were then compared to actual mortality data for the cohort and increasing scores were found to be strongly associated with increased risk of mortality ranging from 22% for scores of ≥0.1 to 100% mortality for scores ≥0.9. A PDI score of ≥0.4 was associated with a 48% six-month mortality.

In 2008, Lee and Rantz[33] reported a retrospective cohort study of 38,591 Medicare beneficiaries admitted to 458 short-stay SNFs in the Midwest region of the United States during a 3-year period from July 2002 through June 2005. All residents were admitted following an acute-care hospital admission. The purpose of the study was to evaluate health-related admission characteristics that could be used to estimate post-hospital physical function at 3, 6, 9, and 12 months. The information gathered included age, gender, current physical function, pressure ulcers, urinary continence, malnutrition, pain, history of falls, cognition, and chronic medical comorbidities. Physical functional status was assessed using the MDS-ADL long-form[26]. Pressure ulcers were evaluated using the MDS Skin Condition Scale (MDS-SCS).[34] Urinary continence was assessed using the MDS bladder continence scale. Cognitive status was assessed using the MDS-CPS.[25] Pain was assessed using the MDS pain scale. Weight loss, history of falls, chronic medical comorbidities, age, and gender were assessed using the relevant items in the MDS. These variables were analyzed for their age and gender-adjusted effect on physical function at three month time intervals using regression analysis. The comorbidities that had significant, or near significant, effects on physical function were diabetes mellitus, cancer, stroke, renal insufficiency, and neuropathy. Of these, diabetes mellitus and cancer only had trends towards significant effects. Of the variables analyzed, urinary incontinence and pressure ulcers had the most significant effect on the post-

discharge physical function across all time intervals. Higher scores on the MDS-ADL indicate worse physical function. The presence of urinary incontinence on admission was associated with a 4.20 (95% CI = 3.92-4.47) increase in the MDS-ADL at three months, and a 5.72 (95% CI = 5.30-6.13) increase at 12 months. The presence of pressure ulcers on admission was associated with a 3.69 (95% CI = 3.39-4.04) increase in the MDS-ADL at three months, and a 4.66 (95% CI = 4.16-5.16) increase at 12 months. The authors stressed that both urinary incontinence and pressure ulcers were potentially preventable and/or treatable upon admission and thus also represented areas with a high potential to improve physical function outcomes.

Comparison of these studies shows significant areas of overlap in predictors of mortality. Patient factors identified most frequently were cancer, CHF, declines in cognitive, functional or ADL status, poor nutritional status, dehydration, and the presence of renal failure. It is important to note that many of these are potentially treatable or preventable. Tight coordination of care between medical and surgical teams for optimizing treatment of disease processes such as CHF and renal failure is of paramount importance as these diagnoses increase both the risk of discharge to an institutional care facility as well as the risk of mortality as shown hear. These findings also reinforce the importance of carefully weighing a patient's nutritional status prior to surgery.

Infrastructure Characteristics Influencing Outcomes

Studies examining infrastructural characteristics of SNF care that correlated with outcome measures fell into two broad categories: those that examined the role of nurse staffing and those that examined other aspects with or without investigating staffing levels. Studies investigating outcome associations with nurse staffing levels have had mixed results, but the majority of studies have supported the positive association between increased nurse staffing and improved outcomes.[35–39] Additionally, multiple studies have investigated the relationship between staffing levels and quality of care. Castle and Anderson[40] reported significantly improved outcomes as measured by the MDS Quality

Indicators (QIs) for pressure ulcers, urinary catheter use, physical restraint use, and pain management, associated with increased levels of nurse staffing, increased ratios of registered nurse (RN) to nursing assistants (NA) and licensed practicing nurse (LPN) staffing, and decreased RN turnover. In 2004, Weech-Maldonado et al.[41] reported increased RN staffing was associated with decreased rates of pressure ulcers, improved resident cognitive function, and decreased use of restraints. In 2005, Horn et al.[42] reported that increased RN time spent on patient care was associated with reductions in the incidence of pressure ulcers, urinary tract infections (UTI), and catheterization. Increased RN time was also associated with decreased hospitalizations and deterioration in self-performance of ADL's.

The studies previously mentioned looked at long-stay nursing home residents. Only recently has literature emerged examining the relationship between staffing and outcomes for short-stay residents admitted for PAC. In 2008, Decker[43] performed a retrospective cohort analysis of 6,623 discharges from the 1999 National Nursing Home Survey (NNHS). The purpose of the research was to investigate the relationship between nursing staffing levels and discharge outcomes for residents admitted from hospitals versus those not admitted from hospitals. Among the group admitted from the hospital, the incidence of discharge from SNF to hospital was higher when compared to the group admitted to a SNF from home. After controlling for patient demographics, clinical, and facility characteristics they reported that greater RN staffing, as measured by hours of RN time per facility bed, was positively associated with more stabilized/recovered discharges for residents admitted from hospitals, as well as for residents not admitted from the hospital whose stay was ≤ 30 days. They found no association for long-stay residents not admitted from a hospital.

In a follow-up study, Decker[44] performed a retrospective cohort analysis using data from the NNHS between 1997 and 1999 for 4,086 Medicare beneficiaries discharged from a post-acute admission. The purpose of the study was to completely investigate the relationship between discharge status and nursing home staffing, further delineating the role of NAs, RNs, and physical therapists (PTs).

After controlling for patient demographics, primary and secondary diagnoses, and other facility characteristics, regression analysis identified significant relationships between higher RN staffing levels and decreased LOS and decreased hospitalizations. Higher PT staffing levels were associated with increased rehabilitated/recovered outcomes at discharge, decreased LOS, and decreased deaths.

The literature examining facility characteristics other than nurse staffing is more varied. We identified five studies that examined characteristics including volume of PAC, intensity of therapy, non-nurse staffing levels, facility size, setting, business model (for-profit vs. not-for-profit), hospital affiliation, and whether facilities were independent or part of a regional or national chain of facilities.

In 2011, Li et al.[45] reported a retrospective cohort analysis of all PAC Medicare admissions to SNFs in the United States between January and September of 2008. By cross-referencing the data with the Online Survey, Certification and Reporting file (OSCAR) they stratified nursing homes into tertiles based on the volume of PAC admissions. The primary outcome of interest was re-hospitalization at 30 and 90 days. Controlling for patient demographics and clinical characteristics, as well as other facility characteristics, they reported that SNFs in the upper tertile (>108 PAC admission) had 15% and 25% lower 30 and 90-day re-hospitalization rates respectively, compared to facilities in the lower tertile (<45 PAC admissions).

Harrington et al.[46] investigated the relationship between deficiency citations and ownership of nursing facilities. They compared deficiency citation information for the year 1998 from 13,953 distinct facilities in the United States. They used multivariate regression techniques controlling for case-mix, location, staffing, proportion of residents paid for by Medicaid, and ownership model. They found investor-owned nursing facilities had 46% more deficiencies, and more deficiencies in each category, than non-profit facilities. They also noted that investor-owned facilities had lower staffing levels, but they did not explore for interaction or confounding between these two. Thus, the deficiencies seen

could represent mixed-effects of ownership and staffing, or simply represent decreased quality associated with lower staffing.

Zimmerman et al.[47] reported a 2.5-year prospective cohort study examining the rates of infection and hospitalization for infection in 2,315 nursing home admissions at 59 SNFs in Maryland. They reported that increased RN turnover rates were associated with both increased infection and hospitalization. Higher levels of LPN staffing, higher intensity of care, and interestingly, higher levels of physical therapist/occupational therapist staffing were also associated with higher rates of infection. The data did not include resident-level information regarding the amount of PT/OT provided, so it is unclear what this association represents. Facilities with a more debilitated resident population would be at higher risk for infections while also requiring greater PT/OT staffing in order to provide appropriate rehabilitative care for these residents. The researchers also reported higher rates of hospitalization for infection associated with for-profit facilities and facilities affiliated with a national or regional chain.

In 2010, Flynn et al.[48] reported a cross-sectional study that included 63 nursing homes in New Jersey. Surveys of nurses were used to describe the practice environment of each nursing home as assessed by the Practice Environment Scale (PES). These data were cross-referenced to MDS and OSCAR data. The primary outcomes of incidence of pressure ulcers among residents and number of facility deficiency citations were compared to the PES scores for the facilities, controlling for resident demographic and facility characteristics. They reported that higher PES scores, indicating a more supportive nursing environment, were inversely associated with the incidence of pressure ulcers. They also reported that for-profit status of the facility was associated independently with lower PES scores and higher adjusted incidences of pressure ulcers.

In 2004, Intrator et el.[49] examined the relationship between facility staffing and potentially preventable readmission rates using the list of Ambulatory Care-Sensitive (ACS) diagnoses as defined by Culler et al.[50] Facilities employing nurse practitioners or physician assistants had lower rates of re-

hospitalization for ACS diagnoses, but not for non-ACS diagnoses. They also reported higher re-hospitalization rates for both ACS and non-ACS diagnoses at facilities with a for-profit business structure. A trend towards lower re-hospitalization rates was found at facilities offering IV therapy.

In 2005, Jette et al.[51] reported a retrospective cohort study of 4,988 residents admitted to 70 SNFs for stroke, orthopedic, cardiovascular or pulmonary conditions. They examined the relationship between the intensity of physical, occupational, and/or speech/language therapy employed by the SNF and the outcomes LOS, and functional and mental status as measured by the Functional Independence Measurement Instrument (FIM). They reported that increased therapy intensity, after adjustment for case-mix and medical comorbidities, was significantly associated with decreased LOS and improvements in the ADL and executive control domains of the FIM. Although the researchers used comorbidities in their adjustment, they did not comment on whether there was an association between comorbidities and therapy intensity. It could be that the relationship observed between therapy intensity was confounded by the ability of patients with a decreased burden of disease to both participate in more therapy and be predisposed to shorter LOS.

Horn et al.[52] reported a retrospective cohort study of 147 SNFs owned by a single multi-facility organization. They examined the relationship between resident and facility characteristics and facility performance on three quality measures (QMs): high-risk pressure ulcers (HRPU), low-risk incontinence (LRI), and decline in ADL function. Several resident characteristics were associated with facility performance on these QMs. Higher rates of readmission—which could be indicative of facility population or facility referral patterns—were associated with better performance on the LRI QM. This association could have been because the resident was coded as short-stay upon readmission, or because upon readmission the resident was considered “high risk” for incontinence. Bladder incontinence upon admission was also associated with worse performance on the LRI metric. Similarly, higher rates of pressure ulcers on admission were associated with worse performance on the HRPU QM. The LRI and

HRPU metrics are not currently risk-adjusted for admission prevalence of bladder incontinence or pressure ulcers respectively. The researchers also reported that state location was associated with decline in ADL function. Specifically, states that utilized a case-mix adjustment to determine payment showed higher rates of declining ADL function. The researchers concluded that the CMS risk-adjustment for these publicly reportable QMs should be altered to potentially include these resident and facility characteristics. They contend that this would allow for more accurate comparison of facilities based on the reported quality measures.

Process

In 2011, Berkowitz et al.[53] published the results of a six-month pilot program to improve the discharge disposition of patients admitted to a single post-acute care SNF unit. Disposition was defined as discharge to community, transition to long-term care, death, or re-hospitalization. Specific care processes were implemented to improve disposition. Resident admission procedures were standardized,including aspects such as medication reconciliation, standard treatment protocols for common conditions, standardized goals of care discussion, and assessment of resident hospitalizations in the prior six months. An automatic palliative care consult was performed for residents with greater than three admissions in that time frame. Multi-disciplinary root-cause analysis of acute readmissions was used to identify problems and assess the processes of care. They compared the results during the experimental period to a historical cohort from the same unit. At the end of the trial period they reported a 20% decrease in acute readmissions, a 6% increase in discharges to the community, decreased transfers to long-term care, and increased use of palliative services among those who died in the facility.

Several investigators have assessed the reliability, validity, and use of the MDS QIs as markers for specific processes of care. Hutchinson et al.[54] completed a systematic review of this topic in 2010. They assessed the literature regarding the reliability and validity of the MDS QIs in measuring specific

process measures and their relationship to outcomes. However, several of the studies assessed not only the QI itself, but whether specific processes of care indicative of high-quality care were present and/or different between SNFs reporting different QI scores.[55–59] Our review of the literature did not identify additional studies not covered in that work and we will briefly summarize the body and conclusions of Hutchinson et al.[54]

In 2005 Hill-Westmoreland and Gruber-Baldini[60] evaluated the QI items for falls by comparing the MDS assessment data with data from the medical record. They reported a significant lack of concordance between the MDS and medical record, with 48% of residents documented as falling in the medical record, but only 28% in the MDS data. They recommended caution when interpreting the MDS QI for falls as an adequate marker for incidence of acute falls.

Simmons et al.[55] investigated the MDS weight loss QI in 2003. Comparing MDS assessment data to medical records and direct observation over a two-week period for residents at facilities in either the upper or lower quartile for prevalence of weight loss, the researchers showed that facilities in the lower quartile (better performing) consistently performed targeted interventions. They also found that facilities in the highest quartile had a population at greater risk for weight loss. They concluded that the weight loss QI was able to discriminate facilities based on prevalence of weight loss, and did have some concordance with care processes.

Schnelle et al.[57] investigated the MDS QI for urinary incontinence. Facilities from the lower quartile (better performance) had significantly higher documentation for toileting assistance and review of incontinence history. However, resident interviews showed no difference in the rates of toileting assistance between quartiles. When comparing residents recorded as having a toileting plan with assistance to residents without documentation of such a plan, the researchers found no difference in the rates of assistance. They concluded that the MDS incontinence QI was not associated with clinically significant differences in care.

Stevenson et al.[61] evaluated the MDS urinary tract infection QI in 2004,reporting that the MDS overestimated the prevalence of UTIs, with only 13% of MDS documented UTIs being verifiable. They did state that the UTI QI provided adequate screening for UTIs, as 98% of those documented as negative were verifiable as correct. Thus, the MDS QI for UTI was highly specific but had very poor positive predictive value for detecting UTIs. This study occurred prior to the 2008 revision of the instructions for completing the MDS 2.0, which was changed to specify symptomatic infections.

In 2004, Schnelle et al.[58] evaluated the MDS QI for use of restraints. Comparing MDS assessments to direct observation for facilities in the upper and lower quartile, they found higher rates of restraint use while residents were in bed for facilities in the highest quartile, but no difference in restraint use while the patient was out of bed, which importantly, is what the QI was intended to measure. They did note that residents from facilities in the highest quartile (worst performers) were in bed more hours of the day and had less assistance around meals. They concluded that the QI for restraint use reflected a difference in a process of care for which it was not intended and caution should be exercised if attempting to use it as a marker for restraint use out of bed.

Schnelle et al.[62] and Simmons et al.[59] evaluated the MDS depression QI first in 2001, and then again in 2004. Their 2001 study evaluated the sensitivity of the depression QI by comparing MDS data to expert assessments. They reported no differences in the rate of probable depression between facilities in the highest quartile (lower performance) and those in the lowest quartile for prevalence of depression. They concluded that the depression QI more accurately measured the ability of facility staff to identify depressive symptoms, rather than the actual prevalence of depression. In 2004 they repeated a similar study, but also assessed whether facilities that scored differently provide different depression-related care. They reported similar prevalence of depression in both high and low quartile facilities, and found that the MDS QI significantly underreported the prevalence of depression. They found no evidence in the medical record suggesting different implementation of depression-specific

care between high or low-ranking facilities. They concluded that the MDS depression QI should not be used to discriminate between facilities with high or low prevalence of depression or different depression-specific care processes.

Bates-Jensen et al.[56] evaluated the ability of the MDS pressure ulcer QI to discriminate facilities with better pressure ulcer related care processes. They compared MDS data to the medical record, direct observation, and wireless movement monitors for facilities in the highest and lowest quartile for pressure ulcer prevalence. The researchers noted higher use of pressure-reducing surfaces and more accurate and more frequent documentation of pressure ulcers for facilities in the highest quartile (lowest performing). They did not find differences in other care processes, but did note that despite documentation of 2-hour repositioning of residents in the medical record, this rarely happened according to the observational data in facilities from either quartile. They concluded that the MDS pressure ulcer QI did not reflect difference in care processes or quality for pressure-ulcer specific care. Based on this data, it appears that difference in facility scores on the MDS pressure ulcer QI may be representative of more accurate reporting and/or higher baseline prevalence of ulcers among

Outcomes

Assessment of Facility Specific Outcomes

In 1998, Porell and Caro[63] compared individual facility outcomes using four health-based outcomes and five quality-indicators at 550 nursing facilities in Massachusetts. They found that, after adjusting for case-mix, inter-facility and intra-facility quality varied widely, and that good performance at one time point was only modestly predictive of good performance at a future time point. They concluded that focus on specific measures of quality may be misleading since strong performance on one often coexisted with poor performance on another.

This work dovetails temporally with the development of the MDS QIs and the establishment of the Nursing Home Compare (NHC) program. The quality of specific SNFs receiving reimbursement

through the Centers for Medicare and Medicaid is reported through the Nursing Home Compare (NHC) program, which began reporting deficiency citations in 1998 (www.medicare.gov/nhcompare). This system now scores individual nursing homes on the basis of three aspects: staffing levels, health inspections, and self-reported quality metrics based on 21 MDS indicators. In each aspect, facilities in the top 10% receive five stars, the bottom 20% receive one star, and the remaining 70% are scored with 23.67% each getting two, three, or four stars. Several of the studies from the previous section independently assessed the incidence or prevalence of outcomes such as UTI's and pressure ulcers as part of their investigation of the related MDS QI metrics, and most found that the information from independent assessment and/or medical chart review were discordant from the associated MDS QI metric. However, outside of the NHC rating, which does not provide information on the individual QI metrics, there is no publicly available performance data for the MDS QIs. To our knowledge, there is no available method to compare facility-specific performance on many outcomes measures such as mortality, discharge disposition, or complication rates at nursing homes.

Resident-Reported Outcomes

Work to identify and measure outcomes as reported by the nursing home resident has been ongoing since the 1986 Institute of Medicine report instructing the development and use of resident-reported outcomes. However, very little work exists correlating these outcomes with quality of care or other clinical outcomes.

Resident satisfaction surveys have been used across facilities for decades. Hodlewsky and Decker[64] administered satisfaction interviews to 265 residents of 21 nursing facilities in North Dakota. The interviews were split evenly between independent consultants and facility staff. They reported that significant positive bias existed when the interviews were performed by facility staff, even for items not directly relating to staff responsibilities. This work cast significant doubt on the ubiquitous use of satisfaction surveys to assess and compare SNFs.

In 2004, Kane et al[65] used structured interviews of nursing home residents from 40 facilities in five states to assess resident reported quality of life (QoL). QoL was assessed using ten domains: comfort, functional competence, privacy, dignity, meaningful activity, food enjoyment, relationships, security, spiritual well-being, and autonomy. Data were aggregated at the facility level to create domain specific QoL scores. They reported a high degree of inter-domain consistency. When controlling for resident characteristics, the researchers still found a large degree of facility-specific effects. They concluded that resident self-reported QoL could reliably differentiate facilities. Although the researchers did not correlate their data with outcomes data, the validity of resident self-reported QoL in differentiating facilities makes it an attractive metric for future research exploring the relationship between care quality and resident-reported outcomes.

In 2005, Kane et al.[66] reported on a community-based survey of nursing home staff to explore attitudes about the importance of various domains of resident quality of life. They examined the weighted importance of 17 QoL items, as reported by residents, residents' families, and facility staff. They reported consistent rank-ordering across respondents, and a consistent theme that resident QoL deserved more attention in practice and regulation.

Economics & Outcomes

A more important and nuanced consideration than simple cost, is the value of post-acute care, whereby the expense of the care is assessed against the realized outcomes. In 1998, Anderson et al.[67] reported on a cross-sectional analysis of nursing homes in Texas. They compared facilities based on 11 outcome measures, similar to several of the MDS QI metrics, and then stratified the facilities based on the average outcomes. Using multivariate regression techniques they found that facilities with the best average outcomes had higher RN staffing levels, and that this difference in staffing accounted for almost all of the observed difference in cost. When controlling for staffing, there were no differences in cost between the best and worst average outcomes facilities. They concluded that higher RN staffing was

associated with better outcomes, but also higher cost. Importantly, in ascribing higher cost to increased nursing staffing, the researchers were only discussing facility cost of care; they were not evaluating economic cost of care. Thus, it is possible that facility-level cost increased may be offset at the systemic level by decreased inpatient readmissions and associated cost of care.

In 2000, Mukamel and Spector[68] compared costs and outcomes for 525 nursing homes in New York. They used case-mix adjusted costs and three outcomes measures risk-adjusted for resident attributes. They reported that the relationship between cost and quality was not linear, but rather represented by an inverted U-shape, suggesting that some facilities had found ways to deliver higher quality care while also decreasing costs. They concluded that innovative care processes and efficiency of delivery could allow improvements in both cost and quality. They did note, however, that the relationship between quality and cost was modest when compared to overall costs.

In 2001, Grabowski and Angelelli[69] compared 13,736 nursing homes analyzing the relationship between Medicaid reimbursement rates and quality as measured by the risk-adjusted incidence of pressure ulcers. They inferred that a 10 percent increase in Medicaid reimbursement was associated with a 1.5 percent decrease in the incidence of risk-adjusted pressure ulcers. They found that this relationship was strongest in facilities with the highest proportion of Medicaid residents. Although their analysis was limited to evaluation of pressure ulcers, they concluded that higher Medicaid reimbursement rates may be associated with a higher overall quality of care delivered.

In 2003, Weech-Maldonando et al.[70] assessed the relationships of quality of care with revenues, private-pay market share, and costs. They reported that facilities with higher quality of care were able to operate with lower per-resident costs and actually generate higher profits. They concluded that facilities delivering higher quality care were more efficient—producing fewer errors, less waste, and maximizing staff resources—than facilities delivering lower quality care.

In 2004, Hicks et al.[71] reported on a study including 446 nursing homes in Missouri and compared the relationship between nursing home costs and four quality of care outcome measures felt to be directly related to clinical management: decline in ADLs, development of pressure ulcers, weight loss, and psychotropic drug use. Facilities, independent of size, consistently had lower costs when observed incidences were somewhat lower than expected. Costs dramatically increased as observed incidences deviated significantly from expected. However, these changes in cost were modest compared to overall costs variability explained by risk-adjusted patient days. This indicates that the largest cost-share occurs from care that is delivered regardless of facility quality. They concluded that poor quality care did not produce cost-savings and that high quality care could be delivered for less cost on the margin. .

Next Steps

It is often communicated to patients and family members that discharge to a SNF is simply another step in the process of care leading to return home. The growing body of literature has shown that for a large proportion of patients this is not the case and it is still unclear the degree to which SNF quality contributes to the outcomes. The bulk of literature examining care provided in SNFs has focused on long-term care residents and medical admissions. To our knowledge none have examined surgical or trauma patients specifically. Unfortunately, this report illustrates the paucity of data post-acute care in SNFs, and this area long the continuum of care remains somewhat of a "black box." Work to further define the natural history of surgical and trauma patients discharged to SNFs needs to be done in order to delineate the degree to which mortality, complications, and/or readmission rates vary based on diagnosis, procedure, or SNF characteristics.

The models developed to predict mortality in SNF residents were conducted primarily in the long-term care population for patients with chronic health conditions. Although some did incorporate recent admission as a risk factor[27,29,30], these were not specifically PAC residents in which short-term

rehabilitation and discharge was expected. These models need to be tested in the post-operative and post-trauma nursing facility populations to explore their validity. If the models do not exhibit adequate predictive capability in these new populations, then new models should be developed to aid in better informed clinician-patient decision making.

Finally, the assessment of quality with the MDS QIs by themselves has been shown to be quite limited. Further work to correlate these QIs with clinical outcomes such as mortality, readmission, and discharge needs to be done in the surgical and trauma population. If possible, hospitals should collaborate with SNFs in order to develop strategic partnerships and, if necessary, develop new metrics to measure and assess quality and outcomes. These metrics should include assessments of PAC resident quality of life, functional status, and other patient-centered outcomes such as return to independent life. The tools developed to measure quality and outcomes should be designed to allow site-to-site evaluation based on accurate, risk-adjusted comparisons of patient populations.

Table 1: Search Terms

Search Term	Results
"minimum data set" AND ("outcome" OR "mortality" OR "readmission" OR "death")	340
("nursing home" OR "skilled nursing facility") AND ("volume" OR "volume outcomes" OR "volume-outcomes" OR "characteristics" OR "staffing") AND ("outcome" OR "mortality" OR "readmission" OR "quality of care")	662
("nursing home" OR "skilled nursing facility") AND ("care process" OR "intervention" OR "process assessment") AND ("outcome" OR "mortality" OR "readmission" OR "quality of care")	619
("nursing home" OR "skilled nursing facility") AND ("outcomes assessment" OR "outcomes" OR "quality" OR "quality of care" OR "quality of health care" OR "quality indicators") AND ("variability" OR "facility-level" OR facility level")	193
("nursing home" OR "skilled nursing facility") AND ("resident reported outcomes" OR "resident-reported outcomes" OR "patient reported outcomes" OR "patient-reported outcomes" OR "quality of life") AND ("outcome" OR "mortality" OR "readmission" OR "quality of care" OR "quality")	983

Table 2: Characteristics of Studies

Author	Year	Study Size	Study Design	Outcomes Assessed
Structure				
Patient Characteristics				
Hirdes et al.	2003	28,495	Retrospective Cohort	Mortality
Flacker and Kiely	2003	136,794	Retrospective Cohort	Mortality
Porock et al.	2005	43,510	Retrospective Cohort	Mortality
Porock et al.	2010	43,510	Retrospective Cohort	Mortality
Van Dijk et al.	2005	43,510	Retrospective Cohort	Mortality
Wallace & Prevost	2006	21,852	Retrospective Cohort	Mortality
Lee & Rantz	2008	38,591	Retrospective Cohort	Physical Function
Facility Staffing				
Decker	2008	6,623	Retrospective Cohort	Discharge Outcome, Mortality
Decker	2008	4,086	Retrospective Cohort	Discharge Outcome, LOS, Mortality
Facility Characteristics				
Li et al.	2011	9,336#	Retrospective Cohort	Re-Hospitalization
Harrington et al.	2002	13,953#	Retrospective Cohort	Deficiency Citations
Zimmerman et al.	2002	2,315	Retrospective Cohort	Infection, Hospitalization
Flynn et al.	2010	63#	Retrospective Cohort	Pressure Ulcers, Deficiency Citations
Intrator et al.	2004	54,631	Retrospective Cohort	Preventable Readmission
Jette et al.	2005	4,988	Retrospective Cohort	LOS, Functional & Mental Status
Horn et al.	2010	147#	Retrospective Cohort	High-Risk Pressure Ulcer, Incontinence, Declining ADLs
Process				
Berkowitz et al.	2011	1#	Pre/Post Observational Cohort	Discharge Disposition, Mortality
Hill-Westmoreland & Gruber-Baldini	2005	462	Retrospective Cohort	Falls
Simmons et al.	2003	400	Cross-sectional Cohort	Weight loss & related care
Schnelle et al.	2003	779	Cross-sectional Cohort	Urinary incontinence & related care
Stevenson et al.	2004	6,947	Cross-sectional Cohort	Urinary tract infection
Schnelle et al.	2004	413	Cross-sectional Cohort	Restraint use
Schnelle et al.	2001	109	Cross-sectional Cohort	Depression
Simmons et al.	2004	396	Cross-sectional Cohort	Depression related care
Bates-Jensen et al.	2003	329	Cross-sectional Cohort	Pressure ulcers & related care
Outcomes				
Facility Variability				
Porell & Caro	1998	550#	Longitudinal Cohort	Mortality, ADLs, Incontinence, Cognitive Status, Pressure ulcers, accidents, restraint use, contractures, weight change
Resident-Reported Outcomes				
Hodlewsky & Decker	2002	265	RCT	Reliability of resident satisfaction surveys
Kane et al.	2004	40#	Mixed-Method	Quality of life scores

#= facility count

Table 3: Comparison of models predicting outcome based on patient factors

Authors	Tool	Outcome	Variables Included in Model

Hirdes et al.	MDS-CHESS	Mortality	Vomiting, dehydration, leaving food uneaten, shortness of breath, decline in cognitive or ADL status, end-stage disease
Flacker and Kiely	MRIS	Mortality	Cancer, shortness of breath, CHF, bedfast status, male sex, unstable condition, >25% food uneaten, low functional ability score, swallowing problem, bowel incontinence, BMI <23
Porock et al.	MDS-MMRI-R	Mortality	Cancer, sex, recent admission, shortness of breath, appetite, CHF, weight loss, renal failure, dehydration, age, cognitive deterioration, ADL status, interactions between cancer & age and between ADL & cognitive deterioration
Van Dijk et al.	*No model name*	Mortality	Cancer, dementia, heart failure, renal failure, emphysema/COPD, diabetes mellitus, anemia, and interactions between age & cancer
Wallace & Prevost	SDI & PDS	Mortality	Poor cognitive status, poor functional status, bedfast, weight loss, fall, bowel incontinence, indwelling catheter, unstable diagnosis, high-stage pressure ulcers, terminal illness, overall decline in status
Lee & Rantz	*No model name*	Functional Status	Admission physical function, pressure ulcers, urinary incontinence

#: The 28 MDS 2.0 items used have been categorized for ease of comparison with other studies

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Chapter Two

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

Background

Especially among older patients, hospitalization for trauma, surgery or acute medical conditions often involves a prolonged recovery. An increasing proportion of older patients are being discharged to dedicated rehabilitation and skilled nursing facilities (SNFs) for post-acute care (PAC), rehabilitation, and recovery. Factors associated with increased risk of discharge to an institutional care facility have been well-studied and include advanced age, prior placement in a nursing home, functional dependence with 3 or more activities of daily living (ADLs), significant extremity injury, maximum head Abbreviated Injury Severity Scale Score(AISS) ≥3, and lack of family or social support.[1–4]

The PAC healthcare arena is not often the focus of research and evaluation, but is an important aspect of our healthcare system. The total spending on skilled nursing facility care was $150-160 billion in 2007, and 53-60% of this care is paid for by public tax-payer funded sources, primarily Medicare and Medicaid.[5] Adding to the cost, nearly one-quarter of PAC admissions to SNFs result in unplanned 30-day hospital readmissions at a considerable cost.[6–8] There is increasing evidence that the burden of disease related to acute care extends well into the post-acute period. Many physicians and surgeons think of PAC as a transitional phase prior to returning home, but the increased mortality rates identified in SNFs.[9,11,12,14–18]and a lack of information about actual rates of transition to home have motivated an interest in evaluating PAC structure, process and outcomes as we would any other aspect of the healthcare system.

Higher than expected rates of death among those discharged to SNFs may relate to underlying health conditions, but might also represent an opportunity for quality improvement. For example, 23% of all post-operative deaths occur after hospital discharge,[13] 59.3-74.4% of deaths after traumatic injury occur post-discharge,[9,14]and 85.7% of elderly trauma patient deaths occur after leaving the hospital.[10] Population and hospital-based cohort studies have consistently demonstrated worse survival for ICU,

surgical, and trauma patients discharged to SNFs compared to those discharged home.[9,11,12,14–18] However, none of the prior studies reflecting adverse survival outcomes have had the capacity to describe in what setting (home or in the SNF) that death occurred, nor how many patients were successfully discharged back to the community. For clinicians interested in selecting SNFs for their patients based on risk-adjusted outcomes, and for those working to improve the quality of PAC, SNFs represents something of a "black box", with little information about the relevant structural and process measures that might improve outcomes. The objective of this work is threefold: 1) to better describe the features and outcomes of previously independent elderly patients discharged from an acute-care hospital to a SNF including discharge home, readmission, overall mortality, and death in SNF; 2) to identify risk-factors associated with failure to discharge home and long-term mortality; and 3) to develop a predictive tool for discharge home, readmission, and 1-year mortality that can be used by clinicians to inform discussions with patients.

Methods

We performed a retrospective cohort study of all Medicare beneficiaries who were treated in acute-care hospitals for surgical, trauma, or non-trauma stroke diagnoses and subsequently discharged to a SNF between January 2007 and December 2009 in the states of California, Florida, New York, Texas, and Washington. All data were obtained from the Centers for Medicare and Medicaid (CMS) through the Research Data Assistance Center (ResDAC, University of Minnesota, MN). Claimant Master Beneficiary Summary Files (MBSF) were linked to Minimum Data Set (MDS) assessments from SNF stays and to the National Death Index (NDI). This study was reviewed and approved by the University of Washington Human Subject Division Institutional Review Board. The MDS is an approximately 400-point clinical assessment and is 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 at the facility, and are required upon admission to the facility, after any clinically significant patient event, quarterly throughout the year and upon discharge.

Specific exclusions for our study included patients who had an MDS assessment within 6 months prior to index hospitalization indicating prior 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 life expectancy. Patients discharged to a SNF prior to 1 July 2007 were excluded because we lacked antecedent data to exclude a SNF stay within 6 months prior to index hospitalization and admission.

Deaths among patients were ascertained by linkage of MBSF files with the NDI by CMS. Linkages were based on social security number. Mortality follow-up ended 3 years following last inpatient stay. We censored mortality at 3 years from initial admission to SNF.

There were three primary analyses in this study: 1) an analysis of first discharge disposition following SNF admission for PAC; 2) an analysis of post-discharge survival following SNF admission in relationship to diagnosis group and first discharge disposition from SNF, including setting of death; and 3) a comparison of long-term survival in relationship to clinical and patient characteristics ascertained upon admission to SNF. Data from these analyses were then used to develop an interactive tool to predict probability of discharge home, readmission, and 1-year mortality. (Available at www.becertain.org/SNFpredictivetool) There were no significant differences in demographic, clinical, or procedural characteristics between states, so data from the states of Washington, Texas, and Florida were used to develop the predictive tool, and the model was validated using data from the states of New York and California. We used Kaplan-Meier survival estimates from SNF admission stratified by

diagnosis group and disposition from first SNF admission. 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 following SNF admission for PAC. 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, this patients who were initially discharged home or readmitted to the hospital were still at risk to die in a SNF on subsequent admissions.

Patient and clinical characteristics found on univariate analysis to be associated with risk of mortality ($p \leq 0.10$) were included in multivariate models. The ICD-9 based Injury Severity Score (ICISS) was used to estimate injury severity among trauma patients.[19] We adjusted for age group, gender, Charlson comorbidity index, admission priority, length of stay (LOS), intensive care unit (ICU) stay, blood transfusion in hospital, MDS-ADL score,[20] cognitive status based on level of impairment in daily decision-making as documented on the MDS admission assessment, the use of parental nutrition at admission to SNF, and the presence of pressure ulcers at admission to SNF. Trauma and non-trauma stroke patients whose acute-care hospitalization was coded as elective were excluded because we would not expect elective stays associated with these diagnosis groups (Trauma=5,160 (5.8%), Non-trauma stroke=2,459 (8.9%)). 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, Texas).

Results

We identified 323,128 patients admitted to a SNF for the first time following admission to an acute care hospital. The overall mean age of the cohort was 78.5 years, and ranged from a mean age (SD) of 82.2 (9.8) years for patients with trauma diagnoses to 77.1 (10.8) years for those undergoing

surgical procedures (Table 1). From beginning to end of the study period there were no significant changes in statewide distribution, age, gender, number of admissions, admission priority, comorbidity indices, MDS-ADL scores, length of stay (LOS), intensive care unit (ICU) admission, or ICU LOS, percent of patients receiving parental nutrition or with pressure ulcers at SNF admission.

Disposition from Initial SNF Admission

Of the patients discharged to a 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% were still in a SNF at 6 months following admission (Table 2). Of all readmissions to an acute care hospital, 49.7% (95% CI 49.4-50.0%) occurred within the first 7 days post-discharge, 29.1% (95% CI 28.8-29.4%) occurred between 8 and 30 days post-discharge, and 21.2% (95% CI 21.0-21.5%) occurred greater than 30 days post-discharge. Patients readmitted within 7 days had shorter mean hospital length of stay compared to 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 based on the subsequent inpatient MEDPAR file. Of patients readmitted, 7% died during the subsequent rehospitalization, 3% discharged home from the hospital, and 90% returned to a SNF. These patients also had the highest 1-year mortality rates, and almost 20% of one-year deaths in this group occurred while the patient was in a SNF. By way of comparison, of patients that discharged home from the first SNF admission, less than 5% had a subsequent SNF stay, 1-year mortality was only 11%, and only 1.4% returned to, and died in, a SNF (Table 3). Patients discharged to a SNF following non-trauma strokes (compared to trauma and surgical patients) 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) for stroke, trauma and surgery, respectively (Table 3).

Risk of Death and Risk Factors for Death Following SNF Admission

The proportion of all patients discharged to a SNF that died within 1 year following discharge was 26.1%, and the proportion that died within 3 years was 31.3%(Table 3). Approximately 30% of all post-discharge deaths occurred in a SNF, this calculation of In-SNF mortality includes both patients who died during the index SNF admission (3.8%) and those who died on subsequent readmissions to a SNF, regardless of their first SNF discharge disposition. The risk of death at 1 year was highest among patients readmitted to an acute-care hospital from the SNF compared to patients discharged home, remaining in a 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. Male gender, increasing age or comorbid conditions, impaired functional or cognitive status, receiving nutritional support parentally at SNF admission, and the presence of pressure ulcers at admission to SNF strongly predicted death within 1 and 3 years as well as shortened time to death (Tables 4-6). Overall, the regression models based on these data demonstrated high levels of prediction, with a c-statistic of0.74 for trauma patients, 0.77 for surgical patients, and 0.69 for non-trauma stroke patients. Readmission to an acute care hospital was the strongest predictor of death over time (unadjusted HR 28.2; 95% CI 27.2-29.3, p<0.001). Multivariate regression using Cox proportional hazards models (adjusted for gender, age group, comorbid conditions, max head ICISS among trauma patients, procedure type among surgical patients, functional status, admission priority, LOS, ICU stay, nutritional support and pressure ulcers) demonstrated that patients readmitted within 7 days had the highest risk of death over time (HR 1.64; 95%CI 1.61-1.69, p=<0.001) compared to 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 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%, $p<0.001$).

Development of Predictive Tool

Patient and clinical characteristics associated with the adverse outcome (age group, gender, Charlson comorbidity index, MDS-ADL score, cognitive function, ICU stay, discharge on parental nutrition, the presence of pressure ulcers on admission to SNF, and procedure type for surgical patients) were used to create an interactive tool to compute estimated probability of discharge home, readmission, and 1-year death. For example, a 71 year-old male trauma patient who on transfer to the SNF has diabetes without end-organ damage, 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 parental 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 to 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, does not require parental nutrition, but has a pressure ulcer and 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 patients risk for events and may inform decision making. It remains to be determined if these event rates are modifiable by addressing patient or site characteristics.

Comments

In this 5-state evaluation of Medicare beneficiaries discharged to SNFs following acute care admission, for the first time we describes significant long-term mortality (26% of patients dying within the first year and 32% of patients dying in 3 years), high rates of death within the SNFs (8% of all

patients discharged to SNF died in a SNF within 1 year, with half of these deaths occurring during the index SNF admission) and the surprisingly large number of patients who never return home. Nearly 40% of previously independent patients discharged to a SNF did not successfully discharge back to home. This is the first report to describe the discharge disposition from the SNF, and shows that a significant proportion of patients never return to the community.

The risk of death during follow up was highest among patients who were readmitted to a hospital, and within this group, readmission within 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 pre-existing comorbid conditions. The underlying drivers for early readmissions cannot be defined by our current study but likely to involve problems in care transition. Our current research has been informed through close collaboration with SNF care stakeholders including several SNF medical directors. Our stakeholder advisors posit that many early readmissions are driven primarily by factors such as poor communication between the acute care and post-acute care team at time of discharge, errors in discharge instructions or medication reconciliation, or discharges prior to 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 LOS among patients readmitted early, may also suggest that these patients are being discharged more rapidly and, perhaps sometimes inappropriately, when compared to older patients with more comorbidities and poorer functional status. To be further explored is whether medical teams are prolonging acute care hospitalizations for higher risk patients and thus discharging them in more stable condition. Practice patterns among SNFs may also influence this association, and facility level analysis of long-term outcomes adjusting for patient and facility-level factors are planned to explore this

phenomenon more completely. 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 area ripe for quality-improvement.

The extension of this analysis into a decision support tool that can be used by care teams to provide individualized risk estimates for patients being discharged to SNFs is an important step towards better informed decision-making and more accurate expectations for patients and their families. The potential utility of this tool cannot be understated because our data illustrate the complex interaction of many patient and clinical characteristics in effecting probability of discharge, readmission, and mortality. This simple to use tool allows clinicians to easily view individualized risk profiles which would be otherwise prohibitively difficult to estimate. It is important to note that these models have not been validated in other states, and should serve only as an aid to support conversations about risk.

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 MBSF and MDS assessments allows a reasonable assessment of patient conditions while acknowledging that any future work involving linkage with other data sources such as trauma registries will prove valuable in further identifying patients at highest risk for poor outcomes. We were not able to assess many facility level characteristics for SNFs such as size, staffing, or mix of payment sources. Future work to link patient level assessments with facility level data such as that available in the Online Survey, Certification and Reporting system (OSCAR) may help identify factors associated with variable outcomes between SNFs. Our current study is also limited to Medicare beneficiaries, and thus we cannot know if similar patterns persist among younger patients and other non-Medicare beneficiaries admitted to SNFs. Despite these limitations, common to almost all

work with large national registries, our current study significantly adds to our understanding of long-term outcomes for patients discharged to SNFs.

It is often communicated to patients and families that discharge to a SNF is just another step in the process of recovery with a high expectation of a return to home. However, a growing body of literature and the current study suggest that this is an overly simplistic description of the process. A significant proportion (41%) never discharge back to home and the 1 and 3-year risk of death is much greater than population norms. It remains to be determined to what degree care delivery at the SNF contributes to these outcomes or the extent of outcome variability between SNFs. 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 to maximize long-term survival and improve rates of discharge to home. These results allow care providers to, for the first time, provide patients who are discharging to SNFs with information regarding long-term outcomes, and patient-level risk-adjusted probabilities for return to home, readmission, and long-term mortality.

Table 1: Demographic and Clinical Characteristics by Diagnosis Group

Characteristics		Trauma	Surgical	Stroke	Total
		83,810	308,016	25,171	323,128
Age (Mean (SD))		82.4 (9.7)	77.2 (10.7)	81.1 (9.7)	78.5 (10.7)
Age Category					
	<65	3,705 (4.2)	29,397 (9.5)	1,237 (4.9)	34,339 (8.2)
	65-74	11,235 (13.4)	78,317 (25.4)	4,339 (17.2)	93,891 (22.5)
	75-84	28.642 (34.2)	119,560 (38.8)	9,020 (35.8)	157,222 (37.7)
	≥85	40,228 (48.0)	80,742 (26.2)	10,575 (42.0)	131,545 (31.6)
Gender (% 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 (Median(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 (Median(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)
Parental Nutrition (%)		10.4	11.3	10.8	11.1
Tube Feeds (%)		1.8	6.8	5.1	5.7
Pressure Ulcers at SNF Admission		28.8	28.4	22.6	28.2

Legend: LOS- Length of stay; ICU- Intensive Care Unit; TPN- Total parenteral nutrition; PPN- Partial parenteral nutrition; 1- ICU LOS calculated only among patients with ICU stay.

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 Months
N (%)	229,974 (60.5)	108,857 (28.6)	14,546 (3.8)	21,229 (5.6)	5,462 (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 %)					
<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
Gender (% 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
LOS (Median(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 (Median(SD))[1]	4 (6.4)	6 (10.6)	5 (10.0)	4 (5.3)	4 (7.8)
TPN/PPN (%)	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

Legend: LOS- Length of stay; ICU- Intensive Care Unit; TPN- Total parenteral nutrition; PPN- Partial parenteral nutrition; 1- ICU LOS calculated only among patients with ICU stay.

Table 3: Mortality by Diagnosis Group, and First Disposition from SNF

Cohort	% Patients	1 Year Mortality, % (95% CI)	3 Year Mortality, % (95% CI)	1 Year In-SNF Mortality, % (95% CI)[#]	3 Year In-SNF Mortality, % (95% CI)[#]
Trauma		**23.3 (23.0-23.6)**	**29.7 (29.4-30.0)**	**7.3 (7.1-7.5)**	**8.8 (8.6-8.9)**
Died Index SNF Admission	3.7	-	-	-	-
Discharged Home	58.2	11.0 (10.7-11.3)	16.4 (16.1-16.8)	1.4 (1.3-1.5)	2.3 (2.1-2.4)
Readmitted	26.9	44.0 (43.3-44.6)	50.9 (50.2-51.6)	11.7 (11.2-12.1)	14.0 (13.5-14.5)
In SNF ≥ 6 Months	2.2	19.0 (18.0-19.9)	27.6 (26.5-28.7)	3.2 (2.7-3.6)	4.8 (4.3-5.3)
Assisted Living Facility	9.0	1.9 (1.3-2.6)	10.8 (9.3-12.3)	0.2 (0.01-0.4)	0.7 (0.3-1.1)
Surgical		**26.4 (26.2-26.5)**	**31.4 (31.3-31.6)**	**7.5 (7.4-7.6)**	**8.6 (8.5-8.7)**
Died Index SNF Admission	3.6	-	-	-	-
Discharged Home	62.0	12.2 (12.0-12.3)	16.5 (16.4-16.7)	1.4 (1.3-1.5)	2.1 (2.0-2.2)
Readmitted	28.9	48.8 (48.4-49.2)	54.6 (54.3-54.9)	11.2 (11.0-11.4)	12.8 (12.6-13.0)
In SNF ≥ 6 Months	1.1	21.4 (20.7-22.1)	29.8 (29.0-30.6)	3.8 (3.5-4.2)	5.7 (5.3-6.1)
Assisted Living Facility	4.5	2.9 (2.3-3.5)	10.9 (9.8-12.1)	0.5 (0.2-0.7)	1.1 (0.7-1.4)
Non-Trauma Stroke		**32.3 (31.8-32.9)**	**39.9 (39.3-40.5)**	**12.4 (11.9-12.8)**	**14.5 (14.1-14.9)**
Died Index SNF Admission	7.1	-	-	-	-
Discharged Home	49.6	16.5 (15.8-17.2)	23.5(22.7-24.3)	2.5 (2.2-2.8)	3.8 (3.5-4.2)
Readmitted	31.7	50.6 (49.4-51.7)	58.4 (57.2-59.5)	15.4 (14.6-16.3)	18.6 (17.7-19.5)
In SNF ≥ 6 Months	3.3	22.2 (20.2-24.1)	32.1 (29.9-34.2)	3.9 (3.0-4.8)	6.5 (5.3-7.6)
Assisted Living Facility	8.3	1.5 (0.6-2.4)	10.3 (8.1-12.5)	0.1 (0-0.4)	0.4 (0.0-0.8)
Overall		**26.1 (26.0-26.2)**	**31.6 (31.5-31.7)**	**7.8 (7.7-7.9)**	**9.0 (8.9-9.1)**
Died Index SNF Admission	3.8	-	-	-	-
Discharged Home	60.5	12.2 (12.0-12.3)	16.8 (16.7-17.0)	1.4 (1.4-1.5)	2.2 (2.1-2.3)
Readmitted	28.6	48.0 (47.7-48.3)	54.2 (53.9-54.5)	11.6 (11.4-11.7)	13.4 (13.2-13.6)
In SNF ≥ 6 Months	1.4	20.7 (20.2-21.3)	29.3 (28.7-29.9)	3.6 (3.4-3.9)	5.5 (5.2-5.8)
Assisted Living Facility	5.6	2.4 (2.0-2.8)	10.8 (10.0-11.6)	0.4 (0.2-0.5)	0.9 (0.6-1.1)

Legend: #: In-SNF mortality includes patients that died in a SNF both during index SNF admission and on subsequent SNF admissions.

Table 4: Mortality for Trauma Patients Discharged to Skilled Nursing Facilities

	HR (95% CI)	
	Unadjusted	**Adjusted**
Age Group		
<65 Years	1 [Reference]	1 [Reference]
65-74 Years	1.42 (1.29-1.55)	1.33 (1.17-1.51)
75-84 Years	1.62 (1.48-1.76	1.18 (1.04-1.34)
≥85 Years	2.67 (2.45-2.91)	1.77 (1.56-2.01)
Male gender	1.59 (1.55-1.64)	1.85 (1.78-1.92)
Comorbidity Index		
0	1 [Reference]	1 [Reference]
1	2.05 (1.96-2.15)	1.65 (1.52-1.78)
2	3.52 (3.34-3.72)	2.57 (2.35-2.80)
≥3	4.63 (4.03-5.32)	3.31 (2.67-4.11)
Max Head ICSSS Score	1.84 (1.13-3.01)	1.01 (0.89-1.13)
Cognitive Function		
Independent	1 [Reference]	1 [Reference]
Modified Independence		1.61 (1.54-1.68)
Moderately Impaired	1.18 (1.06-1.30)	2.43 (2.33-2.54)
Severely Impaired		3.71 (3.42-4.02)
Length of Stay (Day)	1.01 (1.01-1.02)	1.01 (1.01-1.01)
ICU Stay	1.39 (1.35-1.43)	1.29 (1.24-1.34)
Transfusion	1.06 (0.99-1.13)	0.93 (0.86-1.00)
MDS-ADL at SNF Admission		
0	1 [Reference]	1 [Reference]
1	1.02 (0.67-1.58)	1.18 (0.68-2.02)
2	1.37 (0.94-2.00)	1.43 (0.88-2.31)
3	1.72 (1.19-2.50)	1.58 (0.98-2.55)
4	2.41 (1.66-3.49)	2.08 (1.29-3.36)
5	3.30 (2.28-4.78)	2.62 (1.63-4.23)
6	7.46 (5.13-10.84)	4.44 (2.73-7.21)
PPN/TPN	1.20 (1.15-1.25)	1.11 (1.06-1.17)
Tube Feeds	2.62 (2.44-2.81)	0.99 (0.86-1.12)
Pressure Ulcers	1.71 (1.67-1.76)	1.57 (1.52-1.64)

Abbreviations: ICISS—ICD-9 Based Injury Severity Score; MDS-ADL-Minimum Data Set Activities of Daily Living Score; PPN – Partial Parental Nutrition; TPN – Total Parental Nutrition

Table 5: Mortality for Elderly Surgical Patients Discharged to Skilled Nursing Facilities

	HR (95% CI)	
	Unadjusted	**Adjusted**
Age Group		
<65 Years	1 [Reference]	1 [Reference]
65-74 Years	1.07 (1.04-1.10)	1.12 (1.08-1.16)
75-84 Years	1.28 (1.24-1.31)	1.15 (1.11-1.19)
≥85 Years	1.56 (1.50-1.62)	1.37 (1.32-1.43)
Male gender	1.50 (1.48-1.52)	1.31 (1.30-1.33)
Comorbidity Index		
0	1 [Reference]	1 [Reference]
1	2.04 (2.00-2.08)	1.57 (1.52-1.62)
2	3.82 (3.73-3.90)	2.33 (2.24-2.41)
≥3	5.17 (4.90-5.46)	2.91 (2.66-3.19)
Procedure Type		
Neurosurgical	1.35 (1.31-1.40)	2.00 (1.86-2.17)
Head & Neck	1.80 (1.72-1.88)	2.16 (1.99-2.35)
Cardiothoracic	1.33 (1.29-1.36)	2.17 (2.02-2.33)
Abdominopelvic	1.76 (1.72-1.81)	2.17 (2.03-2.33)
Orthopedic	0.26 (0.25-0.27)	0.78 (0.73-0.84
Spine	0.44 (0.41-0.46)	0.99 (0.88-1.13)
Vascular	1.62 (1.58-1.67)	2.35 (2.19-2.52)
Endovascular	1.19 (1.13-1.25)	1.76 (1.60-1.94)
Skin & Soft Tissue	1.30 (1.26-1.34)	1.73 (1.63-1.84)
Non-Elective Admission	3.33 (3.28-3.39)	1.88 (1.84-1.93)
Length of Stay (Day)	1.01 (1.01-1.01)	1.01 (1.01-1.01)
ICU Stay	1.55 (1.53-1.57)	1.01 (0.99-1.03)
Transfusion	1.11 (1.07-1.14)	0.97 (0.92-1.02)
MDS-ADL at SNF Admission		
0	1 [Reference]	1 [Reference]
1	1.05 (0.95-1.16)	1.09 (0.97-1.24)
2	1.30 (1.19-1.41)	1.32 (1.19-1.47)
3	1.71 (1.57-1.86)	1.61 (1.45-1.79)
4	2.15 (1.98-2.34)	1.97 (1.77-2.18)
5	3.55 (3.26-3.86)	2.75 (2.48-3.05)
6	7.27 (6.67-7.92)	3.59 (3.22-4.01)
Cognitive Status		
Independent	1 [Reference]	1 [Reference]
Modified Independence		1.44 (1.41-1.47)
Moderately Impaired		1.77 (1.73-1.82)
Severely Impaired		2.64 (2.51-2.77)
PPN/TPN	1.26 (1.23-1.28)	1.14 (1.11-1.73)
Pressure Ulcers	2.02 (2.00-2.05)	1.65 (1.62-1.69)

Table 6: Mortality Risk-Factors for Elderly Non-Trauma Stroke Patients Discharged to Skilled Nursing Facilities

	Non-Trauma Stroke HR (95% CI)	
	Unadjusted	**Adjusted**
Age Group		
<65 Years	1 [Reference]	1 [Reference]
65-74 Years	1.56 (1.36-1.80)	1.50 (1.24-1.82)
75-84 Years	1.92 (1.68-2.19)	1.77 (1.47-2.13)
≥85 Years	3.02 (2.65-3.45)	2.91 (2.41-3.50)
Male gender	1.11 (1.07-1.16)	1.34 (1.26-1.42)
Comorbidity Index		
0	1 [Reference]	1 [Reference]
1	1.39 (1.25-1.54)	1.15 (0.95-1.38)
2	2.02 (1.82-2.25)	1.43 (1.18-1.73)
≥3	2.87 (2.51-3.29)	2.07 (1.64-2.63)
Length of Stay (Day)	1.01 (1.01-1.01)	1.00 (0.99-1.01)
ICU Stay	1.08 (1.04-1.13)	1.05 (0.98-1.12)
MDS-ADL at SNF Admission		
0	1 [Reference]	1 [Reference]
1	1.24 (0.80-1.91)	1.17 (0.74-1.84)
2	1.58 (1.07-2.34)	1.39 (0.92-2.09)
3	2.21 (1.49-3.26)	1.82 (1.20-2.76)
4	2.85 (1.94-4.19)	2.22 (1.47-3.36)
5	3.80 (2.58-5.59)	2.86 (1.889-4.31)
6	7.19 (4.87-10.60)	4.80 (3.16-7.30)
Cognitive Status		
Independent	1 [Reference]	1 [Reference]
Modified Independence		1.28 (1.18-1.39)
Moderately Impaired		1.84 (1.70-1.99)
Severely Impaired		3.39 (3.02-3.82)
PPN/TPN	1.35 (1.26-1.44)	1.20 (1.09-1.32)
Tube Feeds	1.88 (1.74-2.04)	1.00 (0.86-1.14)
Pressure Ulcers	1.71 (1.63-1.79)	1.40 (1.33-1.48)

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