



Evaluation of one-year mortality after geriatric ankle fractures in patients admitted to nursing homes



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ABSTRACT

Introduction: The incidence of geriatric ankle fractures will undoubtedly increase as the population continues to grow. Many geriatric patients struggle to function independently after such injury and often require placement into nursing homes. The morbidity and mortality associated with nursing homes is well documented within the field of orthopaedic surgery. However, there is currently no study examining the mortality associated with nursing home placement following hospitalization for an ankle fracture. Therefore, the purpose of this study was to determine if geriatric patients admitted to nursing homes following an ankle fracture experience elevated mortality rates.

Methods: Patients were identified using diagnosis codes for ankle fractures from all 2008 part A Medicare claims, and those admitted to nursing homes were identified using a Minimum Data Set (MDS). The Medicare database was also analyzed for specific variables including over-all one year mortality, length of stay, age distribution, certain demographical characteristics, incidence of medical and surgical complications within 90 days, and the presence of comorbidities. Multivariate logistic regression analysis was used to determine if patients admitted to nursing homes had elevated mortality rates.

Results: 19,648 patients with ankle fractures were identified, and 11,625 (59.0%) of these patients went to a nursing home after hospitalization. Patients who went to a nursing home had higher Elixhauser and Deyo–Charlson comorbidity scores ($p < 0.0001$). Nursing home patients also had significantly increased rates of postoperative medical and surgical complications. One year mortality was 6.9% for patients who did not go to a nursing home and 15.4% for patients who were admitted to a nursing home ($p < 0.0001$). However, multivariate logistic regression analysis demonstrated no significant difference in one year mortality between patients admitted to nursing homes and those who were not (OR = 1.1; 95% CI 0.99–1.24, $p > 0.05$).

Discussion: Although admission to nursing home was significantly associated with increased mortality in a bivariate statistical model, this significance was lost during multivariate analysis. This suggests that other patient characteristics may play a more prominent role in determining one year mortality following geriatric ankle fractures.

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Introduction

It is currently estimated that Americans 65 and older account for nearly 13% of our population, and this proportion is projected to steadily increase yearly. By 2050, older Americans will account for one fifth of our nation's population [1]. Geriatric patients can be challenging to manage because they have unique disease presentations, different ideologies for management, and important social considerations. Although the most common reasons for hospitalization within the elderly population are cardiac or

pulmonary in origin, orthopaedic injuries are also a frequent cause of hospital admission [2].

The management of an orthopaedic geriatric patient is often complicated both preoperatively by medical comorbidities and postoperatively by challenging dispositions. Following orthopaedic surgery, elderly patients frequently require additional assistance and care at home. Unfortunately, not all patients have the social support structure to return home and consequently require placement into nursing homes. Although nursing homes can be a safe and supportive environment, they can also carry significant mortality and morbidity risks. Studies have estimated that the rate of nursing home acquired pneumonia is ten times greater than community acquired pneumonia, and the fatality rate of influenza is greater than 50% in this patient population [3,4]. The rate of falls amongst nursing home residents is nearly twice the rate of falls in individuals living in the community, and it is estimated that a quarter of falls in nursing homes require admission to the hospital [5,6]. Given these statistics, it is reasonable to assume that patients admitted to nursing homes after ankle fractures may be at increased risk for complications. In fact, a few studies have examined the negative impact nursing home disposition can have on a patient's recovery following orthopaedic injuries. For example, several studies have shown that patients discharged to nursing homes after hospitalization for hip fractures have higher mortality rates [7]. Bini et al. found that patients discharged to nursing homes after primary total joint arthroplasty are more likely to be readmitted to the hospital within 90 days of surgery [8].

Ankle fractures are the third most common type of fracture seen in the geriatric population, and the incidence of geriatric ankle fractures continues to increase [9–11]. There is currently no literature on the impact of discharge disposition in the geriatric population following admission for ankle fracture. Accordingly, the purpose of this study is to determine if there is increased mortality risk when patients are admitted to a nursing home following hospitalization for an ankle fracture.

Methods

This study was approved by the institutional review board (IRB) prior to initiation of data collection. Complete (100%) data from the US Centers for Medicare were obtained, and all claims from the Medicare Provider Analysis and Reviews (MedPar) File that involved International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) codes for ankle fractures (824.0–824.9) were assessed. All 2008 part A Medicare claims were searched for diagnosis codes for ankle fractures. Any patients younger than 65 as of January 1, 2008 or who had sustained an ankle fracture in the preceding year were excluded from data analysis. Only patients admitted to the hospital were included in data analysis.

In addition to the ICD-9-CM associated with the diagnosis, each claim included unique identifiers linked to the Medicare denominator file allowing determination of age, age distribution, length of stay, and discharge status. Patients who were admitted to nursing homes were identified using the Minimum Data Set (MDS), which is a federally mandated assessment completed for each nursing home resident. The MDS is stored in a national database at the CMS [12]. To stratify the overall health of each group, average Elixhauser and Deyo–Charlson scores were determined using co-morbidities listed in the MedPar file [14]. Whether the patient underwent operative fixation of their fracture within one month of their initial injury was also collected from the database.

The primary outcome evaluated was 1-year post-injury mortality, which was determined by analysis of the Medicare denominator file analyzing for a date of death within one year of the initial ICD-9-CM diagnosis code. Secondary outcomes include

the incidence of the following complications within 90 days of the injury: post-operative infection, deep venous thrombosis (DVT), pulmonary embolism (PE), congestive heart failure (CHF), pneumonia (PNA), urinary tract infection (UTI), pressure ulcers, myocardial infarction (MI), *C. difficile* infection, and gastrointestinal bleeds. The prevalence of these complications was determined by identifying the relevant ICD-9-CM codes in claims within 90 days of definitive treatment. Readmissions within 30 days of hospitalization were also collected for analysis and included in the statistical model.

Statistical analysis

The mortality from any cause within 1 year from the fracture was measured and Kaplan–Meier survival curves were generated for patients admitted to a nursing home and those who were not admitted to a nursing home. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using logistic regression analysis. Candidate variables were selected by the bivariate models or by their clinical implications. Covariates included in the final model for one-year mortality were age at time of the ankle fracture, operative treatment within one month of admission, complications (DVT, PE, CHF, MI and infection) within 90 days from the fracture, Elixhauser and Deyo–Charlson scores at time of the ankle fracture and readmission within 30 days from the fracture. All statistical analysis was performed using SAS version 9.3 (SAS Institute, Cary, NC).

Results

19,648 patients with ankle fractures were identified using the inclusion and exclusion criteria discussed above. 11,625 (59.0%) of these patients were admitted to a nursing home. Descriptive characteristics of both groups are demonstrated in Table 1. The mean age for patients who went to a nursing home and those who did not was 79.8 and 74.2 ($p < 0.0001$). The average length of hospital stay was 3.7 days for patients who did not go to a nursing home and 5.2 days for patients who went to nursing homes. Patients who went to a nursing home had a mean Elixhauser score of 2.5, and those that did not had a score of 2 ($p < 0.0001$). The mean Deyo–Charlson score was 1.2 for patients who went to a nursing home and 0.8 for those that did not ($p < 0.0001$).

One year mortality was 6.9% for patients who were not admitted to a nursing home and 15.4% for patients who were admitted to a nursing home ($p < 0.0001$). (Table 2). The Kaplan–Meier one-year survival curve comparing each group is seen in Fig. 1.

The comparative incidences of complications between the two study groups within ninety days of hospitalization are shown in Table 3 along with statistical analysis. Although the rate of DVT

Table 1
Patient and clinical characteristics of the study population (N = 19,648).

	Admitted to nursing home (N = 11,625; 59%)	Not admitted to nursing home (N = 8023; 41%)
Age in years, mean (SD)	79.8 (7.9)	74.2 (7)
Sex		
Male (%)	2062 (17.7%)	2179 (27.2%)
Female (%)	9563 (82.3%)	5844 (72.8%)
Average length of hospital stay, days (SD)	5.2 (4.1)	3.7 (4)
Mean Elixhauser score (SD)	2.5 (1.3)	2 (1.3)
Mean Deyo–Charlson score (SD)	1.2 (1.3)	0.8 (1.1)
Died within one year of ankle fracture (%)	1786 (15.4%)	552 (6.9%)

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