Geriatric nursing home falls: A single institution cross-sectional study

Isadora Botwinick[a,*], Joshua H. Johnson[b], Saman Safadjou[c], Wayne Cohen-Levy[b],
Srinivas H. Reddy[c], John McNelis[c], Sheldon H. Teperman[c], Melvin E. Stone Jr.[c]

[a] Montefiore Medical Center, Albert Einstein College of Medicine and Jacobi Medical Center, Department of Surgery, 111 East 210th Street, Bronx, NY 10467, United States
[b] Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461, United States
[c] Albert Einstein College of Medicine and Jacobi Medical Center, Department of Surgery, 1400 Pelham Parkway South, Bronx, NY 10461, United States

ABSTRACT

Background: Falls are the leading cause of fatal injury in geriatric patients. Nursing home falls occur at twice the rate of community falls, yet few studies have compared these groups. We hypothesized that nursing home residents admitted for fall would be sicker than their community counterparts on presentation and have worse outcomes.
Methods: Records of 1708 patients, age 65 years and older with a documented nursing home status, admitted to our center between 2008 and 2012 were reviewed. Clinical data including injury severity score (ISS), admission Glasgow coma scale (GCS), in-hospital complications, length of stay (LOS), and in-hospital mortality were collected. Continuous data were analyzed using Mann–Whitney tests and categorical data using Fisher exact tests. Variables in the univariate tests were analyzed in a multivariate logistic regression.
Results: Nursing home patients were older than community patients, presented with lower GCS, lower hemoglobin, higher international normalized ratio (INR) and a higher percentage of patients with body mass index (BMI) < 18.5. LOS for nursing home patients was longer, and they suffered higher rates of in-hospital complications. ISS, rates of traumatic brain injury, operative intervention and mortality were not significantly different. In a multivariate logistic regression, ISS, GCS and age, but not nursing home status, were significant predictors of in-hospital mortality.
Conclusions: In comparison to their community counterparts, nursing home patients presenting after fall are more debilitated and have increased morbidity as evidenced by more in-house complications and increased LOS. However, nursing home residency was not a significant predictor of mortality.

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1. Background

One in every three adults over 65 years of age will fall each year, making falls a significant problem in the geriatric population (Tromp et al., 2001). In addition to being the leading cause of traumatic brain injury (TBI) and bony fracture, falls are the leading cause of fatal injuries in the elderly (Rubenstein, Josephson, & Robbins, 1994). Consequently, geriatric falls result in significant cost to the United States healthcare system. In the year 2000, $12 billion was spent on hospitalizations for adults over 65 years of age who fell (Stevens, Corso, Finkelstein, & Miller, 2006). As the elderly population grows in the United States, this financial burden continues to increase with geriatric falls exacting $30 billion in 2010 in direct medical costs (Stevens et al., 2006). Nursing home falls occur at twice the rate of community falls, causing further disability in an already dependent population (Rubenstein et al., 1994). However, it remains unclear if the more dependent nursing home population has different outcomes when compared to their community counterparts. While there are multiple studies focusing on fall risk and prevention in both community and nursing home patients, surprisingly, there is scant literature that directly compares the post-fall outcomes of these two disparate populations. The aim of our study was to directly compare the outcomes between elderly patients who fall in the nursing home and their community counterparts after presentation to a Level

* Corresponding author at: Montefiore Medical Center, 182 E 210th Street, Lower Level Bronx, NY 10467, United States. Fax: +1 718 918 5567.
E-mail addresses: Isadora.Botwinick@gmail.com (I. Botwinick), Joshua.Johnson@med.einstein.yu.edu (J.H. Johnson), Saman.Safadjou@NBHN.net (S. Safadjou), Wayne.Cohen-Levy@med.einstein.yu.edu (W. Cohen-Levy), Srinivas.H.Reddy@NBHN.net (S.H. Reddy), John.McNelis@NBHN.net (J. McNelis), Sheldon.Teperman@NBHN.net (S.H. Teperman), Melvin.Stone@NBHN.net (M.E. Stone).

1 trauma center. We hypothesized that nursing home residents admitted for a fall would would have more comorbidities and would present with greater physiologic derangements than their community counterparts on presentation and would therefore have worse outcomes—specifically, in regards to mortality and complication rate.

2. Methods

We obtained Institutional Review Board approval for a cross-sectional study. We included all patients age 65 years or older who presented after a fall, for whom information on nursing home status was available. If we could not clearly identify whether a patient was living in the community or in a nursing home, then that patient was excluded from the study. The trauma registry was queried to identify all ground level fall patients age 65 years and older who presented to Jacobi Medical Center, a Level 1 trauma facility, from 2008 to 2012. Patient clinical characteristics at admission were then collected after review of the medical chart. Clinical data collected included: age, sex, body mass index (BMI), injury severity score (ISS), admission Glasgow coma score (GCS), along with admission systolic blood pressure (SBP) and hemoglobin. We chose to analyze BMI, GCS and INR in a dichotomous fashion to emphasize the most relevant parameters: those which would be considered "abnormal" by a practicing clinician. For BMI, we chose 18.5 because this is defined as underweight by the NIH. We chose GCS < 15 because we felt that any alteration in mental status was a clinically relevant finding. We chose an INR > 1.2 because this is considered abnormal by our laboratory standards and might merit clinical investigation and and possible treatment if an invasive procedure were planned. Additionally, platelet count and coagulation parameters at admission were also collected. Outcome data of interest included: in-hospital complications, including transfusion requirements, length of stay (LOS), operative intervention, and in-hospital mortality. Patient co-morbidities and in-hospital complications were based on those defined by the National Trauma Data Bank (NTDB). Co-morbidities included: alcoholism, bleeding disorder, chronic renal failure, congestive heart failure, current smoker, cancer and/or chemotherapy, cerebrovascular incident, dementia, diabetes, drug abuse, history of myocardial infarction, hypertension, obesity, respiratory disease and steroid use. In-hospital complications included: acute kidney injury (AKI), Clostridium difficile colitis, sepsis, decubiti, deep vein thrombosis, respiratory failure (defined as tracheotomy and/or need for mechanical ventilation), and urinary tract infections. Traumatic brain injury (TBI) on presentation was also included as a post-fall outcome variable. TBI was strictly defined as any patient with CT findings of intracranial hemorrhage upon admission. The total cohort was then divided into two groups for comparison: nursing home and community patients. A nursing home patient was defined as a patient residing in nursing home at the time of the fall; community patients were defined as all patients not residing in a nursing home at the time of the fall. Continuous nonparametric data and categorical data were analyzed using Mann–Whitney test and Fisher's exact test, respectively. In order to identify variables independently associated with mortality, a multivariate logistic regression analysis was performed using variables in the univariate analysis with $p < 0.02$; in addition, nursing home residency (yes/no) and ISS were included. Statistical significance for all analyses was set at $p < 0.05$. Inclusion criteria are shown in Fig. 1. In total, 1765 fall patients were identified, of which 1708 patients had nursing home status data available. These 1708 patients were included in the univariate analysis. For the multivariate analysis, only patients with complete data for each of the variables were included, for a total of 1296 patients.
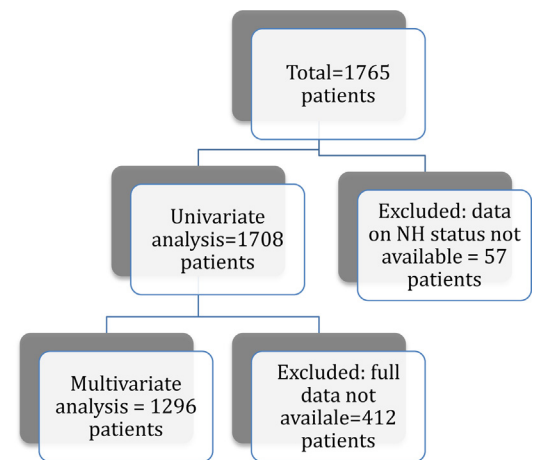
*NH: nursing home

Fig. 1. Inclusion by analysis.
*NH: nursing home.

3. Results

In the five-year study period, 1765 patients 65 and older (age range 65–102 years) were admitted to our institution for ground level fall. Of the total cohort included in the analysis, 9.5% (163/1708) were nursing home residents. Clinical data and patient characteristics are shown in Tables 1a–d. Nursing home patients were older than community patients, and presented with lower systolic blood pressure, lower hemoglobin and higher international normalized ratio (INR) (Table 1a). The percentage of patients with an abnormal GCS on presentation was significantly higher in the nursing home group, as was the percentage of patients who had a body mass index (BMI) less than 18.5. ISS was not significantly different between both groups, nor was the rate of traumatic brain injury (TBI.) Additionally, there was no difference in the need for an operative intervention between the two groups; frequency of specific fall-associated injuries such as operative hip fractures was not significantly different either.

Individual comorbidities are shown in Table 1b. Nursing home patients had significantly higher rates of cerebrovascular disease and dementia, while community patients had a slightly higher rate of diabetes when compared to the nursing home cohort. Our Trauma Registry is not currently designed to collect all data required for a Charlson comorbidity score, but based on our results as shown in Tables 1a and 1b, we calculated an average Charlson comorbidity score for the nursing home patients at 5.2 compared to an average score of 4.8 for the community patients. Outcome data are shown in Tables 1c and 1d. Median LOS was one day longer in nursing home patients compared to community patients. As mentioned, admission GCS was lower for the nursing home group; however, the incidence of TBI on presentation was similar between both groups. Nursing home patients also had a significantly higher overall rate of complications.

Individual complication rates are shown in Table 1d. Patients from nursing homes had significantly higher rates of pneumonia, sepsis, unplanned intubation, and urinary tract infections, when compared to patients admitted from home. However, length of stay in intensive care was similar between groups.

Notably, in-hospital mortality was not significantly different between the two groups. In the logistic regression model of the total cohort (Table 2a) ISS, admission GCS, systolic blood pressure, and age were significant independent predictors of in-hospital mortality after fall. Odds ratio for in-hospital mortality was lower with increasing systolic blood pressure and higher admission GCS,