The American Journal of Surgery (2014) 208, 249-253

The American Journal of Surgery®

Clinical Science

Falls in the elderly: a modern look at an old problem

Rondi Gelbard, M.D., Kenji Inaba, M.D., F.R.C.S.C., F.A.C.S.*, Obi T. Okoye, M.D., Michael Morrell, B.S., Zainab Saadi, B.S., Lydia Lam, M.D., Peep Talving, M.D., Demetrios Demetriades, M.D., Ph.D.

Division of Trauma Surgery and Surgical Critical Care, University of Southern California, Los Angeles, CA, USA

KEYWORDS:
Falls;
Geriatric trauma;
Injury prevention

Abstract

BACKGROUND: Falls are a leading cause of unintentional injury among adults, especially those over 65 years of age. With increasing longevity and improving access to health care, falls are affecting a more mobile senior citizen population that does not fit the typical profile. We set out to evaluate the current nature of these falls in the elderly.

METHODS: This is a 2-year retrospective chart review of all falls in patients 65 years or older at an urban Level I trauma center. Demographics, location and height of fall, associated injuries, and outcomes were obtained from chart review.

RESULTS: There were 400 patients meeting inclusion criteria. The cohort had a mean age of 78.3 ± 8.8 years, 50% were male, and 72.5% had at least 1 comorbidity. Non–ground level falls (Non-GLF) were recorded in 56 patients (14%). These patients suffered a significantly higher injury burden. Non-GLF were associated with significantly higher intensive care unit length of stay (2.6 ± 5.6 vs 4.6 ± 6.7 days, $P = .016$) and a trend toward higher mortality than GLF.

CONCLUSIONS: Falls remain a source of considerable healthcare expenditure, especially among the elderly. Non-GLF account for 14% of cases and are associated with a significantly higher burden of injury and morbidity. Fall prevention strategies should include these active older individuals at risk of high-level falls.

Falls are a leading cause of injury in the United States, affecting all age groups at an annual cost exceeding $20 billion.[1–3] Studies have shown that falls account for 10% to 15% of all emergency department (ED) visits.[4] According to the National Center for Injury Prevention and Control, falls are the leading cause of nonfatal injury in individuals over the age of 64 (62.9% in 2011).[5] Research has shown that the elderly have worse clinical outcomes after traumatic injury than their younger counterparts, likely due in part to age-related comorbidities.[6–8] In fact, falls are the leading cause of injury-related death in this age group.[9] The elderly have a higher mortality rate even after low impact falls as well as higher rates of hospitalization and longer lengths of stay than younger patients.[10]

The segment of society over the age of 65 has increased dramatically in the past 10 years and is expected to grow exponentially over the next several decades. This is in part because of the rising life expectancy, which is estimated to approach 80.7 years for men and 85.2 years for women by the year 2033.[6] In the past, the falls that affected this population have primarily been comprised of ground-level falls (GLF) occurring at home or in other familiar environments.[11] However, as this population of healthier, more

The authors declare no conflicts of interest.

* Corresponding author. Tel.: +1-323-409-8597; fax: +1-323-441-9907.
E-mail address: kinaba@surgery.usc.edu

Manuscript received May 7, 2013; revised manuscript November 1, 2013

0002-9610/$ - see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.amjsurg.2013.12.034

active elderly individuals continues to grow, they may be at risk of the same types of injuries as their younger counterparts, including non-GLF. The purpose of this study was to evaluate the current nature of falls in the elderly. We expected to find that a greater percentage of elderly individuals are more often injured by falls from heights and that this growing segment of society is experiencing a higher burden of injury and higher costs of care because of more frequent non-GLF.

Methods

After Institutional Review Board approval, the records of all patients presenting to the Los Angeles County + University of Southern California medical center after a fall between January 2009 and December 2010 were reviewed. Patients were included in the study if they were 65 years of age or older. Patients were excluded from the study if they were victims of assault or struck by automobiles or other vehicles. Patient variables extracted included age, sex, location of injury, height of fall, associated comorbidities, use of anticoagulant medication, and injury patterns. Patients were stratified into 2 groups based on the type of fall: GLF, which were defined as those occurring from heights less than 4 feet, versus non-GLF. Cost of hospital care was obtained by querying the billing records from patient financial services.

The primary outcome was mortality. Secondary outcomes studied include length of hospital stay, duration of mechanical ventilation, need for readmission, cost of hospitalization, and functional status on discharge. Categorical variables were described as percentages of the total population, while continuous variables were reported as mean ± standard deviation. Contingency tables were prepared for each dichotomous variable and Pearson's chi-square or Fisher's exact test was used to compare categorical variables where appropriate. Continuous variables were tested for normality using the Shapiro–Wilk test and the unpaired Student *t* test or the nonparametric Mann–Whitney *U* test was used for comparisons where appropriate. Variables were considered significant if *P* was less than .05. All statistical analyses were performed using SPSS for Windows version 17 (SPSS, Inc, Chicago, IL).

Results

During the study period, 3,885 patients with fall-related injuries were admitted to Los Angeles County + University of Southern California medical center. A total of 400 (10.3%) patients who were 65 years or older were included in this study. The cohort had a mean age of 78.3 ± 8.8 (range: 65 to 103) years with equal male-to-female ratio. In our population, 290 patients (72.5%) had one or more comorbidities, with hypertension and diabetes being the most common. Twenty-three patients (5.8%) were on some form of anticoagulation or antiplatelet agent (Aspirin, Clopidogrel, Coumadin) before admission and 13 patients (3.2%) arriving to the ED had a history of seizures in the prehospital setting.

A total of 56 (14.0%) patients had non-GLF, while the remaining 344 had GLF. Patients sustaining non-GLF injuries were younger (74.4 ± 6.4 vs 78.9 ± 8.9 years, $P < .001$) than those sustaining GLF. The majority of falls overall occurred at residential locations (82.0%), while the remainder occurred outdoors (12.0%), at healthcare-related buildings (4.8%), or sites of public transportation (1.0%). Patients sustaining non-GLF were also more likely to fall at home (91.1% vs 80.5%, $P < .001$). Half of all non-GLF occurred from stairs (>3 steps), while 37.5% occurred from ladders or rooftops. Patients arriving to the emergency room after non-GLF were more likely to be hypotensive (systolic blood pressure < 90 mm Hg, 3.3% vs 1.5%, $P = .007$), but mental status (Glasgow Coma Scale ≤ 8) on arrival to the ED was not affected (5.4% vs 4.2%, $P < .722$). Approximately 6% of patients were intoxicated at the time of their fall and this was more common among the GLF than non-GLF, although this finding was not statistically significant (Table 1).

Skull fractures occurred in 10 patients (2.5%) and 90 (22.5%) patients were found to have a traumatic brain injury (TBI). Following TBI, the second most common injury documented was lower extremity fracture (21.5%). Even though there was no significant difference in the incidence of TBI between GLF and non-GLF patients, non-GLF patients were associated with a higher burden of injury than GLF. Patients who sustained non-GLF had a higher incidence of skull fractures (5.4% vs 2.0%), subarachnoid hemorrhage (17.9% vs 12.5%), and epidural hematomas (1.8% vs .6%). Non-GLF were associated with a significantly increased rate of facial fractures (14.3% vs 4.9%, $P = .014$), rib/scapular fractures (21.4% vs 1.2%, $P < .001$), humeral fractures (10.7% vs 3.8%, $P = .036$), and pulmonary contusions (7.1% vs .3%, $P < .002$). There were no significant differences between the groups with respect to forearm/wrist, pelvic, lower extremity fractures or intra-abdominal injuries (Table 2).

A closer look at the location of the non-GLF injuries showed that the majority of falls occurred from stairs (50%) followed by ladders and rooftops (37.5%). When we looked at the important outcomes, there was no significant difference between the 2 groups with respect to the need for operative intervention, mortality, duration of mechanical ventilation, or length of hospital stay. However, duration of intensive care stay and overall hospital costs were significantly higher in patients who suffered non-GLF injuries (Table 3).

Comments

Falls are the leading cause of nonfatal injury in the elderly population.[12,13] Prior research has found that the majority of falls occur in individuals over 65 years of age and up to 80% of falls occur in and around the home.[9] In 2005, Roudsari et al[4] reported that slipping, tripping, or