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## Incidence, outcomes, and recidivism of elderly patients admitted for isolated hip fracture



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## ABSTRACT

**Introduction:** Isolated hip fracture (IHF) is a common injury in the elderly after a fall. However, there is limited study on elderly IHF patients' subsequent hospitalization for a new injury, that is, trauma-related recidivism.

**Methods:** A retrospective review of the trauma registry at an ACS level I trauma center was performed for all elderly (age  $\geq 65$  y) blunt trauma patients admitted between 2007 and 2017, with a focus on IHF patients. IHF was defined as a fracture of the femoral head, neck, and/or trochanteric region without any other injuries except minor soft tissue trauma after a fall.

**Results:** Of the 4986 elderly blunt trauma admissions, 974 (19.5%) had an IHF. The rate of trauma-related recidivism was 8.9% ( $n = 87$ ) for a second injury requiring hospitalization. The majority of recidivist (74.7%) and nonrecidivist (66.5%) patients were females. Hospital length of stay was similar at index admission (7 d for recidivists versus 8 d for non-recidivists). The median interval between index hospitalization and admission for a second injury was 373 d (IQR 156–1002). The most common mechanism of injury at index admission (95.4%) and at second injury-related hospitalization (95.4%) was a low-level fall. Among recidivist patients at second admission, a second hip fracture was present in 34.5% and intracranial hemorrhage in 17.2%.

**Conclusions:** After initial admission for an IHF, 8.9% of patients were readmitted for a second injury, at a median time of approximately 1 y, overwhelmingly from a low-level fall. Emphasis on fall prevention programs and at index admission is recommended.

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## Introduction

With the aging of the population, hospitals are increasingly evaluating geriatric trauma patients.<sup>1</sup> According to the 2014 National Trauma Data Bank (NTDB) statistics, nearly 28% of admitted trauma patients were aged 65 y or older.<sup>2</sup> Hip fractures have been identified as a leading cause of hospitalization in these elderly patients, with over 330,000 hip fractures occurring in the United States 2006.<sup>3,4</sup> In the United States, the prevalence of hip fractures is projected to increase to 458,000 to over one million cases per year by 2050.<sup>4</sup>

Hospital readmission in isolated hip fracture (IHF) patients has been extensively studied, with reported 1-mo readmission rates of approximately 10%.<sup>5-7</sup> The high readmission rate has been attributed to advancing age, cognitive decline, comorbidities, frailty, and discharge disposition.<sup>5,6</sup> Patients discharged to a skilled nursing facility (SNF) are more likely to require readmission than patients who were discharged to their own residence.<sup>5</sup> The factors likely contribute to the 21-31% 1-y mortality rates after IHF.<sup>7,8</sup>

However, there is little known regarding trauma recidivism, that is, admission, for any new injury following index hospitalization. As there is no universally accepted definition of duration of time between index and subsequent admission with a new injury, the reported recidivism rates in select trauma populations have varied widely based on study duration, types of injuries, geographic locale, patient age, etc.<sup>9-11</sup> With regard to hip fractures, a meta-analysis noted an 8.54% incidence of asynchronous second hip fractures.<sup>12</sup> We evaluated the incidence (19.5% of geriatric blunt trauma admissions) and outcomes of elderly patients admitted with an IHF to our trauma center. We sought to determine the frequency and outcomes of recidivists for any subsequent injury requiring hospitalization and examine risk factors thereof.

## Methods

A retrospective review of the trauma registry (maintained on Trauma One v. 4.1, Lancet Technologies, Boston, MA) was performed at an American College of Surgeons Level 1 verified trauma center that serves a suburban population of approximately 1.49 million people.<sup>13</sup> The registry was queried for all elderly (age  $\geq 65$  y) blunt trauma admissions between January 1, 2007 and April 30, 2017. Specific attention was given to elderly blunt trauma patients who sustained an IHF. It should be noted that there is no consensus definition of IHF in the literature, with only some studies utilizing specific Abbreviated Injury Scale (AIS) or International Classification of Diseases (ICD) codes.<sup>14</sup> For this study, an IHF was defined, in accordance with the current American College of Surgeons Trauma Quality Improvement Program (TQIP) criteria, as: (1) patient is aged  $\geq 65$  y, (2) mechanism of injury is a fall; (3) the fracture involves femoral head, neck, and/or trochanteric region; and (4) no other injuries other than minor external injuries such as lacerations or contusions.<sup>15</sup> Hence, the registry was queried for patients discharged before 2015 with IHF, by ICD9 code 820 (fractures of femoral head, neck, and trochanteric areas) and for discharges in or after 2015, by AIS6 digit

codes for hip fractures without any other trauma except minor external injuries.<sup>16</sup>

With regard to demographics, comorbidities and complications were recorded concurrently by trained nurse registrars in accordance with the annually revised National Trauma Data Standard (NTDS) data dictionary criteria.<sup>17</sup> Of note, functionally dependent health status is defined in the NTDS as those patients who are dependent on equipment, devices, or other people to complete at least some activities of daily living (ADLs). Further, bleeding disorder largely refers to the use of antithrombotic agents other than aspirin in our population. The Injury Severity Score (ISS) was used to assess injury severity. It is calculated by taking the squares of the AIS score in the 3 (of 6) most severely injured body regions. An ISS score above 16 indicates serious injury and correlates with increased hospital length of stay (LOS) and subsequent mortality.<sup>18</sup> We subsequently compared patients who were admitted for a new injury, that is, trauma recidivists, regardless of injury mechanism, with those who were not readmitted for a new injury. Univariate statistical analyses of demographic and outcome variables were performed using chi-squared and median tests, as appropriate, via SPSS v23.0 (IBM, Armonk, NY). Per our Institutional Review Board, this study of aggregate state-mandated trauma registry data was categorized as not requiring Institutional Review Board oversight.

## Results

Between 2007 and 2017, 4986 blunt trauma patients meeting study criteria with age  $\geq 65$  y were admitted to our hospital. Of these, 974 (19.5% of admissions) had an IHF at the index admission. Among these 974 patients with an IHF, there were 87 recidivists (8.9% of IHF patients) who sustained a second injury requiring hospitalization during the study time period; 887 had no recidivism (Table 1). At index admission, the two groups had a similar median age (84 y in recidivists and 83 y in nonrecidivists). Women were disproportionately represented at index and at second admission (74.7% recidivists and 66.5% nonrecidivists).

In evaluating pre-existing conditions, the majority of patients in both groups had at least two comorbidities (71.3% recidivists and 71.0% nonrecidivists). At index admission, recidivist patients (20.7%) were less often functionally dependent on devices or others for ADLs than nonrecidivists (31.9%,  $P = 0.03$ ). There were no significant differences in the frequency of other comorbidities between the two groups at index admission.

The median ISS at index admission in recidivists and nonrecidivists was 9, corresponding to an extremity AIS of 3. The majority of hip fractures occurred at home or other personal residence (82.8% recidivists and 70.8% nonrecidivists). The second most common place of injury was at a residential institution (9.2% recidivists and 14.4% nonrecidivists).

With regard to outcomes at index admission, recidivists had statistically similar hospital length of stay (LOS), frequency of intensive care unit (ICU) admission, ICU LOS, and frequency of mechanical ventilation as compared to nonrecidivists (Table 2). The vast majority of patients in both

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