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## Emergency Department recidivism in adults 65 years treated for fractures

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### Abstract

**Objectives**—Fractures in older adults are a commonly diagnosed injury in the Emergency Department (ED). We performed a retrospective chart review to determine the rate of return to the same ED within 72 hours (returns) and the risk factors associated with returning.

**Methods**—Retrospective chart review study of patients 65 years old discharged from a large, academic ED with a new diagnosis of upper extremity, lower extremity, or rib fractures. Risk factors analyzed included demographic data, type of fracture, analgesic prescriptions, assistive devices provided, other concurrent injuries, and comorbidities (Charlson Comorbidity index). Our primary outcome was return to the ED within 72 hours.

**Results**—Three hundred fifteen patients qualified. The majority of fractures were in the upper extremity (64% [95% CI 58-69%]). Twenty patients (6.3% [95% CI 3.9-9.6%]) returned within 72 hours. The majority of returns (15/20, 75%) were for reasons associated with the fracture itself, such as cast problems and inadequate pain control. Only three patients returned for cardiac etiologies (<1% of all patients). Patients with distal forearm fractures had higher return rates (10.7% vs 4.5%, *p* 0.03) and most commonly returned for cast or splint problems. Age, gender, other injuries, assistive devices, and Charlson Comorbidity Index score (median 1, [IQR 1-2] for both groups) did not predict 72-hour returns.

**Conclusion**—Older adults with distal forearm fractures may have more unscheduled healthcare usage in the first three days after fracture diagnosis than older adults with other fracture types. Overall, revisits for cardiac reasons or repeat falls were rare (<1%).

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## Keywords

fractures; older adults; elderly; 72 hour returns

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## Introduction

Older adults with fractures present significant challenges to the Emergency Department (ED) and the US health system as a whole. The number of older adults, 65 years old or older, treated for a fracture in the ED has increased 24% from 2001 to 2008 and continues to rise with the aging population.<sup>1</sup> In contrast to patients with hip fractures who are treated almost exclusively as inpatients, the majority (50-70%) of older adults with other fractures are treated as outpatients.<sup>1,2</sup> These patients have increased needs for home health care, subacute rehabilitation, and physical and occupational therapy.<sup>3</sup> A prospective study of 230 older adults with blunt trauma injuries such as fractures, contusions, and sprains found that 40% had functional decline within the first week of discharge from the ED, and 49% required new social services. Patients with extremity fractures had the highest likelihood of requiring new services.<sup>4</sup> A better understanding of the risk factors behind the increased healthcare needs in this population could help us direct therapy, interventions, and disposition planning.

Both the Society for Academic Emergency Medicine and the American Geriatrics Society recognize a need for identifying risk factors for poor outcomes in older adults and injured older adults in particular.<sup>5,6</sup> Identifying patients at high risk for poor outcomes after ED discharge could lead to early interventions to improve patient care. One criterion for poor outcomes in the short-term setting is ED recidivism, or return to the ED within 72 hours. While this is not a perfect indicator of patient safety, it does identify a subset of patients who require further care.<sup>7,8</sup> Older adults are at increased risk for ED recidivism, with an average 72-hour rate of return of 3.2% for all ED patients over 65 years old compared to 0.47% rate for all adults.<sup>9</sup> We hypothesized that the addition of a non-hip fracture would result in increased ED recidivism. Our objectives for this study were to determine the rate of 72-hour returns and any factors associated with an increased likelihood of return for older adults with non-hip fractures.

## Methods

### Study Design

This study approved by the institutional review board was a retrospective chart review designed to identify factors associated with 72-hour return to the ED among older adult patients with fractures.

### Study Setting and Population

Adults 65 years old diagnosed with a non-hip extremity or rib fracture and discharged from the ED were included. The study setting was a large, academic hospital with an annual ED census of 120,000 patients. Exclusion criteria included hospital admission, initial treatment

at an outside facility, or incomplete ED chart (defined as greater than 2 major data points missing, i.e. physical exam, physician chart note, diagnosis).

### Study Protocol

The hospital's electronic medical record system (EPIC<sup>R</sup>, Epic Systems Corporation, Verona, Wisconsin), a direct computer data entry system, was queried for ICD-9 codes 807, 810-818, 820-826, and discharged status for a 12-month period (August 2010 to July 2011) in ED patients  $\geq 65$  years of age. Patient demographics, fracture type, treatment, prescriptions, and comorbidities were examined. Comorbidities not charted were presumed to be absent. Patients in private residence were defined as those not in a skilled nursing or assisted living facility (as there is no formal definition of assisted living, we used this term if it was so documented). The charts were reviewed by trained, non-blinded study physicians (LS, RS) and documented on a standardized abstraction form.

### Measurements

The ICD-9 fracture diagnoses were confirmed by radiographic interpretation of an attending radiologist. The Ageless Charlson Comorbidity Index, a weighted numerical tally of comorbidities validated in ED patients, was calculated.<sup>10,11</sup> The primary outcome was 72-hour return to the ED.

### Data Analysis

Data was analyzed using Stata v.12 (StataCorp, College Station, TX). Descriptive statistics included means with standard deviation, median with interquartile range, and proportions with 95% confidence intervals (CI) as appropriate. Comparisons were made using the Student T-test with a sensitivity of  $p < 0.05$  considered significant. Ten percent of charts were abstracted twice and inter-rater reliability on the primary endpoints of fracture type (kappa 0.80) and 72-hour returns (kappa 0.80) were good, however agreement on individual comorbidities was lower (kappa 0.4).

### Results

Over 12 months, 533 older-adult patients were diagnosed with a rib or a non-hip extremity fracture in the ED of whom 39.8% (n=208) were admitted and 60.2% (n=325) were discharged. Ten charts (3%) were missing physician notes or were treated first at an outside institution leaving 315 patients eligible for the study (Table 1). The median age was 77 years [IQR 69-83], and 77% of patients were women. Most were community-dwelling older adults (95%) with only 4% returning to skilled nursing facilities and 1% to assisted living. The Ageless Charlson Comorbidity Index was low (median 1, [IQR 1-2], range 0-7). Formal cognitive assessment was not done, however the diagnosis of dementia as a documented comorbidity was noted in 11% of patients.

Among the 315 study patients, the majority of fractures (64% [95% CI, 58-69%]) were located in the upper extremity, most commonly distal forearm fractures (n=93). Patients with rib fractures made up 12% [95% CI 8.6-16%] of the patients discharged, and the remaining 24% [95% CI, 19-29%] of patients had lower extremity fractures (Table 1).

The overall rate of return within 72 hours was 6.3% (95% CI, 3.9-9.6%) (n=20). No patients returned more than once to the ED within that frame. Reasons for return included cast or splint problems (n=11, 55%), pain control (n=4, 20%), cardiac complaints (n=3, 15%), fall with another fracture (n=1, 5%), and need for higher level of care (n=1, 5%). The highest rate of returns was seen in patients with distal forearm (11%, n= 10/93), ankle (12%, n=4/39), and hand fractures (13%, n= 3/24), however the proportions of patients with ankle and hand fractures were much lower, and therefore the 95% CI are broad. Patients with rib and upper arm fractures had lower return rates. The admission rate among those returning was 35% (n= 7/20), with three admissions for cardiac issues (atrial fibrillation with rapid ventricular rate in two patients and chest pain in a third patient). Other admissions were for uncontrolled pain, inability to care for self, fall with new fracture, and possible compartment syndrome.

Risk factor analysis did not demonstrate any significance to age, gender, comorbidity index overall or dementia in particular, assistive devices, or concurrent injuries (Table 2). Charlson Comorbidity Index was low and not associated with returns (means 1.45 +/- 0.02 for returning patients; 1.47 +/- 0.01 for non returning patients). Most patients (78% [95% CI, 73-82%]) were given either a prescription or a recommendation for pain control at home, with the majority receiving an opioid analgesic (n=192, 60% [95% CI, 56-67%]). Lack of analgesia did not appear to be a factor in predicting 72-hour return rate, as the patients returning had a higher rate of opioid analgesic prescription than those who did not return (17/20 returns, 85%, vs 175/295 non returns, 59%, p = 0.02). However, those that received a prescription for opioid analgesics were not more likely to return than those prescribed acetaminophen or a NSAID (p=0.20). While several patients returned for inadequate pain control, there were no returns from complications of analgesics such as respiratory depression, overdose, or constipation.

Almost half of patients (47.3% [95% CI, 42-53%]) received assistive devices upon discharge. Slings were the most common device (29% of patients), and 20% received devices to aid mobility (wheelchairs, walkers, and crutches). Assisted devices were not protective from or associated with 72-hour returns (Table 2). Eighty-five patients (27% [95% CI, 22-32%]) had other injuries diagnosed; hematomas (35% of injuries) and abrasions (27% of injuries) were the most common. Additional injuries were not associated with returning (Table 2). Head trauma was noted in only 7.3% (n=23) of patients, and therefore the study was underpowered to make an association between head trauma and 72-hour return rates.

## Discussion

Adults 65 years old and older with fractures deemed safe for discharge from the ED had a 6.3% rate of 72-hour return to the ED and returned mainly for reasons related to the fracture (pain control, cast or splint problems). While this study was a smaller study focused on patients at a single institution, it is still the largest fracture-specific cohort to our knowledge. While data from a single institution may limit our reproducibility, it does provide more specific information than national studies that combine all fractures treated as outpatients together or combine all injuries. Prior studies have found an average rate of 72-hour return

for older-adult patients is 3.2%, and in this selection of patients with extremity fractures the rate was almost double at 6.3%.<sup>9</sup> We found a low rate of cardiac complications or further falls (1% of patients). These data support the hypothesis that in the short-term setting, outpatient care is likely appropriate for the majority of older adults with non-hip fractures. The patients in this study tended to be community-dwelling with low CCI scores, suggesting that those considered safe for discharge had relatively few or less severe chronic comorbidities and were high functioning at baseline. Our rate of documented dementia was slightly lower than the national prevalence, 11% vs 13.9%,<sup>12</sup> which suggests that this patient population was healthier than average for age. This is consistent with prior research suggesting that older adults who fall and sustain a fracture have better baseline health and function than those who fall without fractures.<sup>13</sup>

The 72-hour return admission rate was 2.2%; other studies have found a return admission rate of 1.4% for adult patients older than 18 with any sprains or fractures.<sup>14</sup> Although our number of revisits is relatively small, our admission rate at return presentation was also higher than the national average (35% compared to 13% nationally).<sup>7</sup> This suggests that older adults with fractures may require more inpatient care than older adults with other diagnoses.

Certain fractures in older adults may require more prompt outpatient follow up, as over 10% of patients with distal forearm, ankle, and hand fractures required a subsequent ED visit. A cast or splint check within 48 hours would have prevented many patients from returning to the ED. Other subgroups such as patients with rib fractures, foot fractures, or proximal humerus fractures had lower return rates and may be more appropriate for the current standard of care of later follow up. This study is underpowered to find the reason behind the increased rate in hand and ankle fractures, as we had less than 40 patients in each of these groups. However, over 90 patients had distal forearm fractures, and the reason behind the increase in unscheduled health care use for these patients is not definitively clear. Assistive devices, other injuries, and comorbidity score did not correlate with return visits. The patients who returned did have a trend toward receiving opioid analgesic prescriptions, however in a chart review study we cannot know if they were filled or taken. The overall analgesic prescription rate was 78%, with 61% of patients receiving opioids. In comparison, nationally in adults over 70 years with fracture, only 58% received analgesia including only 41% received opioids.<sup>15</sup> While that is still likely undertreatment, the relatively low rate of return for analgesia only (4/315 patients or 1%) suggests that in this study patients' pain was reasonably addressed.

This study is limited by its dependence on accurate charting and the imprecision of our primary endpoint of 72-hour ED recidivism as a proxy for poor recovery at home. Additionally, the retrospective review does not allow for full cognitive or gait assessment, which could be significant risk factors. The final analysis is also limited by the low number of return patients, and does not identify patients who sought follow up in another ED or orthopedic office within 72 hours. Further prospective multicenter studies are needed to identify the risk factors for increased acute and subacute healthcare needs in older adults with fractures.

In conclusion, older adults with fractures who are discharged are a higher-risk population for short-term return to the ED. The overall rate of return to the same ED of 6.3% suggests that the majority of these patients are recovering well in the short term, but certain fracture types such as distal forearm fractures may be associated with increased healthcare needs. Further prospective research is needed into risk factors for poor outcomes and interventions to assist this high-risk population and to improve the long-term outcomes of older-adult patients with fractures.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Table 1**

Discharge rates and 72-hour return rates stratified by fracture type in older adults discharged from the Emergency Department.

<b>Anatomical Group:</b>	<b>Total number (discharged and admitted)</b>	<b>Patients Discharged (% of fracture type discharged):</b>	<b>72-hour returns (percentage of those discharged returning):</b>
Upper Arm	128	85 (66%)	2 (2.4%) [95% CI 0.01-8.2%]
Distal Forearm	105	93 (87%)	10 (11%) [95% CI 5.3-19%]
Hand	26	24 (92%)	3 (13%) [95% CI 2.6-34%]
Ribs	95	38 (40%)	0 (0%) [95% CI 0-9.2%]
Upper Leg	54	9 (17%)	1 (11%) [95% CI 0.3-48%]
Ankle	70	39 (56%)	4 (10%) [95% CI 2.9-24%]
Foot	31	27 (87%)	0 (0%) [95% CI 0-13%]
<b>Total</b>	<b>523</b>	<b>315 (60%)</b>	<b>20 (6.3%) [95% CI 3.9-9.6%]</b>

CI=confidence interval



**Table 2**

Demographics and comorbidities do not predict 72-hour return to the ED in patients with non-hip extremity or rib fractures.

	Non returning patients (n=295)	Returning patients (n=20)	p value
Age	77.1	77.3	0.93
Gender (female)	228 (77.3%)	17 (85%)	0.74
Ageless Charlson Comorbidity Index	1.5 (median 1)	1.5 (median 1)	0.60
Dementia	31 (11%)	3 (15%)	0.56
Cardiac disease (MI or CHF)	69 (23%)	3 (15%)	0.36
Analgesics (any)	246 (83%)	19 (95%)	0.07
Opioid prescribed	175 (59%)	17 (85%)	0.02
Assistive devices	140 (47%)	8 (40%)	0.52
Concurrent injuries (any)	83 (28%)	2 (10%)	0.05
Head trauma	25 (8%)	1 (5%)	0.62