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Factors associated with hospital admission after an emergency department treat and release visit for older adults with injuries

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Abstract

Introduction—Emergency Department (ED) visits for injury often precede hospital admissions in older adults, but risk factors for these admissions are poorly characterized. We sought to determine the incidence and risk factors for hospitalization shortly following discharge home from an ED visit for traumatic injury in older adults. We hypothesized higher risk for admission in those with increased age, discharged home after falls, with increased comorbidity burden, and who live in poor neighborhoods.

Methods—We identified all community-dwelling patients ≥ 65 years old treated and released for traumatic injury at non-federal EDs in Florida using the 2011 State Inpatient Database and State ED Database of the Agency for Healthcare Research and Quality. Outcome measures were

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Presentations

None to report.

hospitalization within 9 and 30 days of discharge from the ED. Multivariable logistic regression was used to establish independent risk factors for hospital admission.

Results—Of 163,851 index ED injury visits, 6298 (3.8%) resulted in inpatient admissions within 9 days and 12,938 (7.9%) within 30 days. Factors associated with increased odds of admission within 9 days included; each additional comorbidity, moderate injury to abdomen or pelvis/ extremities, and median neighborhood income < \$39,000. Additional factors associated with increased odds of admission within 30 days included: lack of private insurance supplement and median neighborhood income < \$48,000.

Conclusion—Among older adults treated and discharged from the ED for an injury, those who have high comorbidity burdens, have abdominal or orthopedic injuries, and live in poor neighborhoods are at increased risk of hospitalization within 9 or 30 days of ED discharge.

1. Introduction

In 2010, there were over 2.5 million treat and release Emergency Department (ED) visits for traumatic injury in adults 65 years old in the United States costing over 11.5 billion dollars [1]. As the U.S. population continues to age, the number of older adults injured each year will also rise. Healthy People 2020, a division of the U.S. Department of Health and Human Services (HHS), has identified reducing the rate of ED visits from falls in the elderly as a national health priority [2]. Older adults are at high risk for poor outcomes (including death, functional decline, adverse events, increased level of care, inpatient hospitalization) after ED visits as compared to younger adults [3–18]. Approximately 25% of older adults seen and discharged in the ED for any cause are readmitted soon thereafter [19], but the incidence of readmission after injury is not known.

Research on predictors of repeat visits and inpatient admission following ED discharge has been focused primarily on chronic medical conditions [5–23]. Injury research assessing predictors of falls in older adults has identified an elevated Carpenter score and an inability to cut one's toenails as the most powerful predictors [24–27]. While several screening tools have been developed to identify ED patients at risk of poor outcomes, such as the Identification of Seniors at Risk (ISAR) tool and Triage Risk Screening Tool (TRST), those tools have not been shown to be clinically useful [18,27–28]. ED clinicians lack a standardized approach to identify injured older adult patients who are at risk for complications after ED discharge, including the need for an inpatient admission. Given the prevalence and disproportionate resource use for falls and other minor trauma in older adults, identifying risk factors in this vulnerable group could inform focused intervention, reducing the burden to individual patients and the health care system.

The aim of this study was to identify the incidence and clinical and demographic predictors of inpatient hospital admission in adults 65 years old within 9 days and 30 days of discharge from the ED for treatment of a traumatic injury. We hypothesized that patients of increased age, discharged home after falls, with increasing comorbidity burden, and who live in poor neighborhoods would be at higher risk of being admitted shortly following ED discharge for traumatic injury.

2. Methods

This project was deemed exempt by the Institutional Review Board.

2.1. Study design

This retrospective cohort study examined all visits of adults ≥ 65 years old to non-federal emergency departments in the state of Florida (FL) (n = 189) from January 1, 2011 to December 31, 2011. Data were obtained from the State Emergency Department Database (SEDD), which includes all visits to a non-federal ED that do not result in hospital admission, and the State Inpatient Database (SID), which includes all non-federal hospital admissions, regardless of whether or not they originate in the ED. The SEDD and SID databases are subgroups of the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP).

2.2. Setting and population

Patients ≥ 65 years old with an ICD-9 diagnosis code indicating traumatic injury (dxccc 225–244) who were seen at a non-federal ED in Florida in 2011 were eligible for inclusion. Since we were interested in examining index visits for traumatic injury, patients with index ED visits for late effects of a prior injury were excluded. To focus on community-dwelling older adults, we also excluded patients coming from or discharged to a skilled nursing facility (SNF). Patients with multiple ED visits during the same day and those patients who were admitted the same day they were seen in the ED were excluded as well (Fig. 1).

2.3. Study protocol

HCUP provides revisit variables that allowed us to track individual patients over time and between institutions. Using the HCUP revisit variables *visitlink* and *daystoevent*, we identified and tracked all patients ≥ 65 years old seen at and discharged from an ED for traumatic injury in Florida in 2011. Patients with an index injury emergency visit were followed for 9 and 30 days post-emergency department discharge. Nine days was selected based on prior research that has shown this time point to represent the inflection point for acute returns on a time-to-return curve, [29], and 30 days was selected as this is the time period used in Medicare quality metric [30].

2.4. Measurements

The main outcome measurements were inpatient admission within 9 days or 30 days of the index ED visit for traumatic injury as identified using the SID database. Examined predictor variables included: age, sex, race, income, insurance status (Medicare with or without Medicaid or private supplementary insurance), number of chronic comorbidities, number of new acute medical conditions, new injury severity score, body region with moderate injury, mechanism of injury, diagnosis, weekend presentation, urbanicity neighborhood income, and trauma center accreditation of the index ED. For the years of this analysis, the HCUP database recorded “Hispanic” as a race mutually exclusive with black, white, and other racial descriptors, rather than as a separate ethnicity category. Consequently, in this analysis, we also reported “Hispanic” as a race rather than an ethnicity.

2.5. Data analysis

Frequencies and proportions were used to characterize the distributions for categorical variables of interest, presented by admission status. Means and standard deviations were used to describe the distributions for continuous variables by admission status. Comparisons of distributions were accomplished using chi-square statistics for categorical variables and Kruskal-Wallis tests for continuous variables. Unadjusted and adjusted logistic regression models were generated for the two outcome measures (9 and 30 day hospital admission), with adjusted models including all variables listed in Table 1 with $p = 0.01$ in the univariate analysis. Statistical significance was based on 99.9% confidence intervals for the odds ratio estimates to address our large sample size and potential overpowering; significant findings are concluded on the basis of confidence intervals not straddling the null value of 1.0. All analyses were performed using Stata 14.0 statistical software. Median charges of admission were determined using total charges reported in the HCUP database; median costs of admission were determined using the hospital-specific all-payer inpatient cost/charge ratio.

3. Results

Of the 163,851 treat-and-release ED visits for traumatic injury in adults ≥ 18 years old, 6298 (3.8%) and 12,938 (7.9%) of patients had a subsequent inpatient admission within 9 and 30 days, respectively (Table 1). The mean age for patients not admitted within 30 days was 77.1 years-old, while the mean age of those admitted within 9 and 30 days was 79.9 and 79.8, respectively ($p < 0.001$). The majority of patients were female ($>62\%$ all groups) and white ($>82\%$ all groups). The mean number of chronic comorbidities was 1.3 in patients not admitted within 30 days and 1.6 in patients admitted within 9 or 30 days ($p < 0.001$). While 10.1% of non-admitted patients had a private insurance supplement in addition to Medicare, only 5.5% and 5.6% of patients with subsequent admissions in 9 and 30 days had such an insurance supplement ($p < 0.001$). Of non-admitted subjects, 55.9% had an initial ED visit for a fall, but that proportion rose to 71.1% and 69.0% for patients admitted within 9 and 30 days, respectively ($p < 0.001$). Fewer than 12.1% of all subjects lived in a zip code with a median income $\leq \$64,000$.

In multivariable logistic regression, those with multiple comorbidities (OR 1.2, CI 1.1–1.2 per additional comorbidity), moderate injury to abdomen (OR 2.1, CI 1.5–2.9) or to pelvis/extremities (OR 1.3, CI 1.1–1.6), and who lived in poor neighborhoods (OR 1.3, CI 1.1–1.5) were at increased risk of inpatient admission within 9 days. Factors associated with decreased risk of inpatient admission within 9 days included identifying as Hispanic (OR 0.8, CI 0.7–0.9) or having a primary diagnosis of lacerations of the head, neck, and trunk (OR 0.7, CI 0.5–0.9) (Table 2). When looking at admission within 30 days, additional factors associated with increased odds of admission included lack of private insurance supplement OR 1.3, CI 1.1–1.6) and median neighborhood income $\leq \$48,000$ (OR 1.3, CI 1.2–1.4) (Table 3).

The primary injury diagnosis of the index ED visit was also the primary diagnosis of 12.2% of inpatient admissions within 9 days and 8.2% of inpatient admissions within 30 days, respectively (Table 4). Over half of admissions, 57.6% and 59.3%, respectively, were at the same hospital as the initial index ED visit. Furthermore, 46.1% of the inpatient admissions

within 9 days were associated with a new injury, while 35.5% of those within 30 days were associated with a new injury. Of those admissions for a new traumatic injury, the top five admission diagnoses were, other fractures, fracture of the upper limb, fracture of the neck of femur, fracture of the lower limb, and intracranial injury. Of those admissions not associated with a new injury, the top five admission diagnoses were congestive heart failure, urinary tract infection, septicemia, skin and cutaneous infections, and acute renal failure (Table 4). The median charges of admission, for both 9 and 30 days, was \$32,138 (IQR \$19,198–\$54,147) and \$31,548 (IQR \$18,974–\$53,502), respectively. The median cost of admission, for 9 and 30 days, was \$6376 (IQR \$4010–\$10,634) and \$6251 (IQR \$3914–\$10,680), respectively.

4. Discussion

Among injured community-dwelling older adults who have been treated and released from the ED, we identified several factors associated with increased risk of inpatient hospitalization within 9 days: increased number of chronic comorbidities, moderate injury to abdomen, pelvis, or extremities, and low neighborhood median income. When expanding the window to 30 days, lack of private insurance supplement in addition to Medicare was also a significant risk factor for inpatient admission. Hispanic race and major diagnosis category of superficial wounds of the head, neck, and trunk were associated with lower odds of inpatient admission within 9 days, though Hispanic race was not associated with lower odds of inpatient admission within 30 days. Our data showed that 46.1% of admissions at 9 days were for traumatic injury, as were 35.5% at 30 days.

These findings point to opportunities to identify and intervene with high-risk patients at an index visit. As expected, we saw a strong association between increased comorbidity burden and inpatient admission, which may indicate that admissions are related to underlying chronic disease rather than just to a single injury. Though we did not hypothesize that pelvic and extremity injuries would be associated with increased risk of admission, this finding may indicate that these patients have decreased mobility and may be at higher risk of subsequent falls or inability to perform activities of daily living prompting return to the hospital. As such, frailty indices may be particularly useful in identifying these patients in future studies and risk prediction models. Our data confirmed our hypothesis that low neighborhood median income would be associated with increased rates of inpatient admission in this population, consistent with the established role of socioeconomic status and structural factors in health and health outcomes.

Our inpatient admission rate after injury of 3.9% within 9 days and 7.8% within 30 days is similar to the inpatient admission rate within 7 days of 4.6% after all causes ED visits in older adults in California [20]. Unlike Gabayan et al., however, we did not find that older age was a risk factor, perhaps because we adjusted for the number of chronic comorbidities, which is closely associated with increasing age.

We were surprised not to find an association between falls and inpatient admission, since a recent study by Fawcett et al. that demonstrated a 1.21 OR of readmission in older adults after a hospitalization for traumatic injury due to fall [31]. However, we reported results

using a 99.9% CI to counterbalance any potential overpowering by our large sample size. Though not significant at 99.9% CI, falls were a significant risk factor for inpatient admission at 95.0% CI (OR 1.8). Additionally, we adjusted for injury severity and injury diagnosis, which could attenuate the association with mechanism, as each mechanism is associated with certain patterns of injury.

Also unlike Fawcett et al.'s work, we did not find head injury to be a predictor of inpatient admission in our population. Head injuries were relatively rare and mild in our cohort, as we focused only on older adults who were initially sent home after the index ED visit, rather than those who were initially admitted. Moreover, we limited our focus to community-dwelling older adults who returned to the community. Since severe head injuries may be more likely to result in inpatient admission initially or require skilled nursing follow-up, we appropriately screened out patients with severe head injuries.

Regarding demographic and socio-economic findings, our data confirm that older adults living in low income zip codes are more likely to be admitted to a trauma center than those living in medium or high income zip codes [32]. Our findings also replicate previous reports that those who identify as Hispanic have decreased odds of inpatient admission soon after a treat-and-release ED visit [20].

It is unclear why we saw such a strong association between abdominal injuries and inpatient admission. One explanation might be that damage from blunt traumatic injury, such as internal bleeding or organ damage, can take time to manifest. Therefore, it is possible that these patients could have been initially discharged from the ED only to require subsequent inpatient admission after their internal injuries became manifest. Further research could examine rates and results of imaging, such as CT scans, in older adults with trauma to see if they are being appropriately screened for such internal injuries before being discharged.

Our findings may help identify patients at risk of worsening condition and costly hospitalizations soon after an ED encounter. Identifying patients at high risk of inpatient admission could be useful in creating policies for treating these patients while they are in the ED and for targeting prevention efforts for after they are discharged home. Several prevention efforts have been proposed, and those that go beyond a simple referral or that use a clinical prediction tool to identify eligible patients seem to be associated with the best outcomes [17]. About half (46.3%) of the patients who required inpatient admission within 9 days were diagnosed with a new injury at the time of admission. We speculate that this finding signifies that patients are being admitted for repeat injuries, such as repeat falls, rather than for delayed effects of the index injury.

Our study has a number of strengths, including the large sample size in a geographically diverse state with large population of older adults. Furthermore, because we looked at data from all nonfederal hospitals in Florida, our analysis represents all of the geographic, economic, and demographic areas of Florida. Because the linkage feature of the SEDD allowed us to track individual patients over time between different facilities, we did not lose patients who were seen at different facilities and ensured that each patient was only included in our sample once.

4.1. Limitations

This study has several limitations. First, we examined a single state, Florida, which may have limited applicability to other cohorts. We note that this statewide analysis is also a strength however, as we had a large sample size in a geographically diverse state with a large population of older adults. Additionally, because we looked at data from all nonfederal hospitals in Florida, our analysis represents all of the geographic, economic, and demographic areas of Florida. Second, our data were administrative, meaning that the information was collected for the primary purpose of billing rather than for clinical care, and therefore may less accurately represent the patient's clinical condition. Third, because this study was retrospective, it is possible that some comorbidities may not have been completely documented. For example, the median number of comorbidities in our dataset was 1.3, while the true number may actually have been higher. We considered several different measures of comorbidity for this study, including the Charlson Comorbidity Index and the Elixhauser Index. There were no noticeable differences among the different measures, so we decided to use the raw number of chronic comorbidities for ease of understanding. Finally, while we used inpatient admission as our primary outcome measure under the assumption that all admitted patients clinically warranted admission. However, with the data available to us, we could not verify the necessity of each admission.

5. Conclusions

Among older adults treated and discharged from the ED for an injury, 3.8% were admitted to the hospital within 9 days and 7.9% were admitted within 30 days. High chronic comorbidity burdens, abdominal or orthopedic injuries, and living in poor neighborhoods increased risk of hospitalization within 9 days and 30 days of ED discharge, with lack of a private insurance supplement also contributing to increased 30-day risk of hospitalization. These admissions represent a substantial burden to individual patients and to the healthcare system. Further research is needed to explore the causes for these readmissions, identify potentially preventable admissions, and design and test potential interventions to reduce their incidence. Future interventions will likely include both changes to diagnostic approaches as well as enhanced social assistance, and may occur before, during, or after an index ED visit.

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Fig. 1.
Study population and inclusion/exclusion criteria.

Table 1

Patient characteristics.

	Not admitted w/in 30 days (ref. category) n = 150,913 (92.1%)	Admitted w/in 9 days n = 6298 (3.8%)	Admitted w/in 30 days n = 12,938 (7.9%)	p-Value
Personal demographics				
Age (years), mean (SD)	77.1 (8.3)	79.9 (8.4)	79.8 (8.4)	<0.001
Female	95,028 (63.0)	3992 (63.4)	8186 (63.3)	0.5
Race				
White	121,288 (81.1)	5352 (85.0)	10,818 (83.6)	<0.001
Black	10,281 (6.8)	333 (5.3)	750 (5.8)	
Hispanic	15,696 (10.4)	543 (8.6)	1205 (9.3)	
Other	2560 (1.7)	68 (1.1)	156 (1.2)	
Number of chronic conditions, mean (SD)	1.3 (1.4)	1.7 (1.6)	1.7 (1.6)	<0.001
Private insurance supplement	15,047 (10.0)	343 (5.4)	708 (5.6)	<0.001
Injury characteristics				
New injury severity score, mean (SD)	3.1 (7.7)	3.7 (7.3)	3.4 (6.7)	<0.001
Number of new acute medical conditions at index ED visit, mean (SD)	7.2 (1.7)	6.8 (1.8)	6.8 (1.8)	<0.001
Moderate injury to head/neck	18,414 (12.2)	882 (14.0)	1829 (14.2)	<0.001
Moderate injury to chest	3345 (2.2)	240 (3.8)	421 (3.3)	<0.001
Moderate injury to abdomen	1321 (0.9)	167 (2.6)	268 (2.1)	<0.001
Moderate injury to pelvis/extremities	25,987 (17.2)	1551 (24.6)	2789 (21.6)	<0.001
Major mechanism of injury				
Cut, pierce	9557 (6.3)	126 (2.0)	338 (2.6)	<0.001
Fall	83,699 (55.5)	4466 (70.9)	8900 (68.8)	<0.001
Motor vehicle traffic	10,451 (6.9)	218 (3.5)	472 (3.6)	<0.001
Struck by/against	10,931 (7.2)	254 (4.0)	630 (4.9)	<0.001
Firearm	41 (0.0)	1 (0.0)	2 (0.0)	0.4
Other	21,617 (16.3)	815 (12.9)	1718 (13.3)	<0.001
Missing	11,529 (7.6)	416 (6.6)	869 (6.7)	0.003
Major diagnosis category^a				
Upper limb fracture (229)	12,802 (8.5)	793 (12.6)	1415 (10.9)	<0.001

	Not admitted w/in 30 days (ref. category) n = 150,913 (92.1%)	Admitted w/in 9 days n = 6298 (3.8%)	Admitted w/in 30 days n = 12,938 (7.9%)	p-Value	p-Value [*]
Lower limb fracture (230)	5134 (3.4)	310 (4.9)	527 (4.1)		
Other fractures (231)	5894 (3.9)	472 (7.5)	803 (6.2)		
Sprains and strains (232)	26,829 (17.8)	830 (13.2)	1865 (14.4)		
Open wounds of head, neck, & trunk (235)	14,712 (9.8)	503 (8.0)	1097 (8.5)		
Open wounds of extremities (236)	21,766 (14.4)	562 (8.9)	1286 (10.0)		
Superficial injury: contusion (239)	41,728 (27.7)	1761 (28.0)	3783 (29.3)		
Other injuries and conditions due to external causes (244)	13,751 (9.1)	620 (9.8)	1311 (10.1)		
System characteristics					
<i>Median income of zip code</i>				<0.001	<0.001
\$ 1–38,999	43,229 (29.2)	1957 (31.5)	4008 (31.5)		
\$ 39,000–47,999	46,658 (31.5)	2031 (32.7)	4184 (32.8)		
\$ 48,000–63,999	40,394 (27.2)	1577 (25.4)	3294 (25.9)		
\$ 64,000	18,033 (12.2)	647 (10.4)	1252 (9.8)		
<i>Urban location (county-level)</i>				0.9	0.6
Metro 1 mil pop	82,596 (54.8)	3460 (55.0)	7161 (55.4)		
Metro 50,000–999,999 pop	54,706 (36.3)	2259 (35.9)	4618 (35.7)		
Rural	13,136 (8.7)	561 (8.9)	1118 (8.6)		
Weekend admit	45,281 (30.0)	1819 (28.9)	3658 (29.3)	0.08	<0.001
Initial ED visit at a center with trauma accreditation	24,986 (16.7)	1038 (16.6)	2121 (16.5)	0.9	0.6

SD = standard deviation.

^aDiagnoses present in 3% of sample are included in this table.^{*}p-Values based on chi-square statistic for categorical variables and Kruskal-Wallis test for continuous variables.

Table 2

Risk Factors for Admission within 9 days of ED discharge for a traumatic injury (unadjusted and adjusted).

Predictor variable	Unadjusted: admission within 9 days		Adjusted: admission within 9 days	
	OR	99.9% CI	OR	99.9% CI
Personal demographics				
Age	1.0	1.0-1.0	1.0	1.0-1.0
<i>Race (ref = White)</i>				
Black	0.7 *	0.6-0.9	0.8	0.7-1.0
Hispanic	0.8 *	0.7-0.9	0.8 *	0.7-0.9
Other	0.6 *	0.4-0.9	0.7	0.4-1.0
Number of chronic conditions	1.2 *	1.1-1.2	1.2 *	1.1-1.2
<i>Insurance type (ref = private supplement)</i>				
No private supplement	1.9 *	1.6-2.3	1.3	1.0-1.6
Injury characteristics				
New Injury severity score	1.0	1.0-1.0	1.0	1.0-1.0
Number of new acute medical conditions at index ED visit	0.9 *	0.9-0.9	1.0	1.0-1.1
Moderate injury to head/neck	1.2	1.0-1.3	1.0	0.9-1.2
Moderate injury to chest	1.7 *	1.4-2.2	1.2	0.9-1.6
Moderate injury to abdomen	3.0 *	2.3-3.9	2.1 *	1.5-2.9
Moderate injury to pelvis/extremities	1.6 *	1.4-1.7	1.3 *	1.1-1.6
<i>Major mechanism of injury</i>				
Cut, pierce	0.3 *	0.2-0.4	0.5	0.02-14.7
Fall	1.9 *	1.7-2.1	1.4	0.05-39.6
Motor vehicle traffic	0.5 *	0.4-0.6	0.9	0.03-25.6
Struck by/against	0.5 *	0.4-0.7	0.8	0.02-21.6
Other	0.8 *	0.7-0.9	1.0	0.04-28.9
Missing	0.8	0.7-1.0	1.1	0.03-31.1
Diagnosis				
Upper limb fracture	1.5 *	1.4-1.8	1.0	0.8-1.2
Lower limb fracture	1.5 *	1.2-1.8	1.1	0.9-1.5
Other fractures	2.0 *	1.7-2.3	1.1	0.8-1.5
Sprains and strains	0.7 *	0.6-0.8	0.8	0.6-1.0
Open wounds of head, neck, & trunk	0.8 *	0.7-0.9	0.7 *	0.5-0.9
Open wounds of extremities	0.6 *	0.5-0.7	0.8	0.6-1.0
Superficial injury: contusion	1.0	0.9-1.1	0.9	0.7-1.1
Other injuries and conditions due to external causes	1.1	0.9-1.2	0.8	0.6-1.1
System characteristics				
<i>Median income of zip code (ref = \$64000)</i>				

Predictor variable	Unadjusted: admission within 9 days		Adjusted: admission within 9 days	
	OR	99.9% CI	OR	99.9% CI
\$ 1–38,999	1.2 *	1.1–1.4	1.3 *	1.1–1.5
\$ 39,000–47,999	1.2	1.0–1.4	1.2	1.0–1.4
\$ 48,000–63,999	1.1	0.9–1.3	1.1	0.9–1.2

* Signifies a p -value < 0.001 and 99.9% CI that does not cross 1.0.

Table 3

Risk Factors for Admission within 30 days of ED discharge for a traumatic injury (unadjusted and adjusted).

Predictor variable	Unadjusted: admission within 30 days		Adjusted: admission within 30 days	
	OR	99.9% CI	OR	99.9%CI
Personal demographics				
Age	1.0	1.0-1.0	1.0	1.0-1.0
<i>Race (ref = White)</i>				
Black	0.8 *	0.7-0.9	0.9	0.8-1.1
Hispanic	0.9	0.8-1.0	0.9	0.8-1.0
Other	0.7 *	0.5-0.9	0.8	0.6-1.0
Number of chronic conditions	1.2 *	1.1-1.2	1.2 *	1.2-1.3
<i>Insurance type (ref = private supplement)</i>				
No private supplement	1.9 *	1.7-2.2	1.3 *	1.1-1.6
Injury characteristics				
New Injury severity score	1.0	1.0-1.0	1.0	1.0-1.0
Number of new acute medical conditions at index ED visit	0.9 *	0.9-0.9	1.1	1.0-1.1
Moderate injury to head/neck	1.2 *	1.1-1.3	1.1	0.9-1.2
Moderate injury to chest	1.5 *	1.2-1.8	1.2	0.9-1.5
Moderate injury to abdomen	2.4 *	1.9-3.0	1.9 *	1.4-2.4
Moderate injury to pelvis/extremities	1.3 *	1.2-1.4	1.2 *	1.1-1.4
<i>Major mechanism of injury</i>				
Cut, pierce	0.4 *	0.3-0.5	0.7	0.07-7.4
Fall	1.8 *	1.7-1.9	1.5	0.1-16.1
Motor vehicle traffic	0.5 *	0.4-0.6	1.0	0.1-10.6
Struck by/against	0.7 *	0.6-0.8	0.9	0.1-10.3
Other	0.8 *	0.7-0.9	1.1	0.1-12.1
Missing	0.9	0.8-1.0	1.2	0.1-12.8
Diagnosis				
Upper limb fracture	1.3 *	1.2-1.5	1.0	0.8-1.1
Lower limb fracture	1.2	1.0-1.4	1.0	0.8-1.3
Other fractures	1.6 *	1.4-1.8	1.0	0.8-1.3
Sprains and strains	0.8 *	0.7-0.8	0.8	0.7-1.0
Open wounds of head, neck, & trunk	0.9	0.8-1.0	0.7 *	0.6-0.9
Open wounds of extremities	0.6 *	0.6-0.7	0.8	0.7-1.0
Superficial injury: contusion	1.1	1.0-1.2	1.0	0.8-1.1
Other injuries and conditions due to external causes	1.1	1.0-1.2	0.9	0.7-1.0
System characteristics				
<i>Median income of zip code (ref = \$64,000)</i>				

Predictor variable	Unadjusted: admission within 30 days		Adjusted: admission within 30 days	
	OR	99.9% CI	OR	99.9%CI
\$1–38,999	1.3 *	1.2–1.5	1.3 *	1.2–1.5
\$ 39,000–47,999	1.3 *	1.2–1.4	1.3 *	1.2–1.4
\$ 48,000–63,999	1.2	1.0–1.3	1.2	1.0–1.3
Weekend admit	0.9	0.9–1.0	0.9	0.9–1.0

* Signifies a *p*-value < 0.001 and 99.9% CI that does not cross 1.0.

Table 4

Admission details.

	Admitted within 9 days	Admitted within 30 days
Admitted to same hospital as index ED visit	57.6%	59.3%
Admission diagnosis same as index ED visit	12.2%	8.2%
Admission diagnosis trauma	46.1%	35.5%
Admission dx non-trauma	53.9%	64.5%
Top 5 trauma admission dxccs ^a		
Other fractures	6.8%	5.2%
Fracture of upper limb	6.5%	4.9%
Fracture of neck of femur	3.4%	3.2%
Fracture of lower limb	3.4%	2.4%
Intracranial injury	3.3%	2.4%
Top 5 non-trauma admission diagnoses		
Skin and subcutaneous infections	4.5%	4.0%
Congestive heart failure	3.4%	4.0%
Urinary tract infections	3.3%	3.7%
Septicemia	3.0%	3.3%
Acute and unspecified renal failure	3.0%	2.9%
Median length of stay (days)	4	4
Admitted to accredited trauma center	16.5%	16.7%
Median charges	\$32,138	\$31,548
Median cost	\$6376	\$6251

^aDiagnoses based on five most frequent diagnoses within 30 days.