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Original Contribution

Inpatient admissions from the ED for adults with injuries: the role of clinical and nonclinical factors

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ABSTRACT

Introduction: Inpatient hospital costs represent nearly a third of health care spending. The proportion of inpatient visits that originate in the emergency department (ED) has been growing, approaching half of all inpatient admissions. Injury is the most common reason for adult ED visits, representing nearly one-quarter of all ED visits. **Objective:** The objective was to explore the association of clinical and nonclinical factors with the decision to admit ED patients with injury.

Research design and participants: This is a retrospective cohort study of injury-related ED encounters by adults in select states in 2009. We limited the study to ED visits of persons with moderately severe injuries. We used logistic regression to calculate the marginal effects, estimating 4 equations to account for different risk patterns for older and younger adults, and types of injuries. Regression models controlled for comorbidities, injury characteristics, demographic characteristics, and state fixed effects.

Results: Injury location, type, and mechanism and comorbidities had large effects on hospitalization rates as expected. We found higher inpatient admission rates by level of trauma center designation and hospital size, but findings differed by age and type of injury. For younger adults, patients with private insurance and patients who traveled more than 30 miles were more likely to be admitted.

Conclusions: There is great variation in inpatient admission decisions for moderately injured patients in the ED. Decisions appear to be dominated by clinical factors such as injury characteristics and comorbidities; however, nonclinical factors, such as type of insurance, hospital size, and trauma center designation, also play an important role.

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1. Introduction

Inpatient hospital costs represent nearly a third of health care spending [1]. The proportion of inpatient visits that originate in the emergency department (ED) has been growing, approaching half of all inpatient admissions [2,3]. In 2010, mean inpatient payments per stay were \$13243 compared to \$1020 for ED payments [4]. The proportion of patients admitted to the ED who are subsequently admitted to inpatient care is highly variable for broad samples of patients [2,5]. In addition, studies have demonstrated considerable physician-level variation within hospitals, especially for conditions such as pneumonia, chest pain, and acute cardiac ischemia [5–7].

No study to our knowledge has focused on the variation in admission rates for injuries. Injury is an important component of ED care and the most common reason for adult ED visits, representing nearly one-quarter of all ED visits [8]. In addition, the vast majority of injury-related inpatient admissions originate in the ED—80% for adults younger than 65 years and 84% for those 65 years and older [9,10]. Although visits for injury are common in the ED, they are less likely to result in an inpatient admission than other types of ED visits [11].

Emergency department visits for minor injuries such as abrasions, contusions, and lacerations rarely result in an inpatient admission, unless there is a complicating medical reason. Emergency department admissions for severe injuries, such as multiple fractures or multiple organ injuries, almost always result in an inpatient admission due to clinical considerations such as the delivery of critical care, surgery, or other treatments, and the need to provide close observation for potential clinical deterioration. Emergency department visits for many moderately severe injuries, however, can sometimes be cared for safely in either outpatient or inpatient settings. These decisions are guided by

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both clinical considerations, such as severity of illness and inpatient resource needs, but also nonclinical considerations such as patient and provider preferences and characteristics, and availability of services outside the hospital to ensure close follow-up.

In this article, we assess the contribution of clinical and nonclinical factors to hospital admission decisions for adult ED patients with moderately severe injuries. We specifically explore how injury patterns differ among young and older adults and how this influences the impact of nonclinical factors on hospital admission decisions. We focus on the role of hospital trauma center designation and patient insurance status, and explore differences by age and type of injury.

2. Methods

2.1. Data and design

This is a retrospective cohort study of injury-related ED encounters for adults in select states in 2009. Patient encounter data were from 2731 hospitals in 29 states that provided a State Emergency Department Database (SEDD) [12] and a State Inpatient Database (SID) [13] to the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project (HCUP) in 2009. The SEDD captures discharge information on all treat-and-release ED encounters (ie, visits that do not result in subsequent admission to the same hospital). The SID contains the universe of the inpatient discharge abstracts, including information on inpatient stays that began in the ED. The SID and SEDD data are derived from hospital discharge abstracts often originally collected for billing purposes and, when combined, contain information on the universe of ED visits [14]. Patient encounter data came from the following states: Arizona, California, Connecticut, Florida, Georgia, Hawaii, Indiana, Illinois, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Missouri, North Carolina, Nebraska, New Hampshire, New Jersey, New York, Ohio, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, and Wisconsin.

Data on hospital trauma level came from the Trauma Information Exchange Program (TIEP). The TIEP identifies all US hospitals that are designated as trauma centers by a state or regional authority or verified by the American College of Surgeons' Committee on Trauma. Data on all other hospital-level characteristics came from the American Hospital Association Annual Survey of Hospitals.

2.2. Sample

We identified admissions in the SID that began in the ED using the HCUP variable HCUP_ED, which indicates records that have evidence of ED services in that hospital. To construct a sample of ED encounters, we combined 2009 SEDD (all treat-and-release ED encounters) and the subset of 2009 SID encounters with an indication that care began in the ED. Consequently, we captured all ED encounters, the first group who entered the ED and was not hospitalized, and the second group that was hospitalized. We restricted the sample to ED encounters for individuals 18 years and older with a first-listed injury-related diagnosis. Injury was defined using the *International Classification of Diseases, Ninth Revision*, codes of 800.0 to 909.2, 909.4, 909.9, 910 to 994.9, and 995.8 to 995.85. This definition is consistent with the State and Territorial Injury Prevention Directors Association's Consensus Recommendations for Using Hospital Discharge Data for Injury Surveillance [15]. Transfers from the ED and those who died in the ED were excluded (1.7%). Emergency departments in which 95% of injury patients were younger than 18 years were excluded because they were likely to be part of children's hospitals ($n = 28$).

We identified more than 12.2 million injury encounters from the combined HCUP data sets. We used the New Injury Severity Scale (NISS) to classify injury severity [16]. We used ICDPIC, a publicly available Stata program, to calculate the NISS. The NISS is computed as the sum of squares of the 3 most severe injuries [17]. We excluded persons

with injuries not included in the NISS severity calculation ($n = 822,574$): late effects of injuries (diagnoses 905–909); effects of foreign body (930–939); burns (940–949); certain early complications of trauma (958); and poisoning by drugs, toxic, and other effects (960–995). We included persons with moderately severe injuries based on NISS scores ranging from 9 to 15 ($n = 406,933$). We then excluded cases with missing variables, resulting in an analytical sample of 402,801 encounters.

2.3. Analytical approach

We used logistic regression to calculate the marginal effects of both clinical and nonclinical factors on the decision to admit moderately injured patients after adjusting for state fixed effects. Clinical factors included age, injury characteristics, and comorbidities. Nonclinical factors included both patient and facility characteristics. Data availability limited our choice of nonclinical patient factors that may impact the decision to admit. Patient characteristics included sex, primary expected payer, median household income, and distance to the hospital. Hospital and ED characteristics were included to capture differences in resource availability (eg, hospital bed size, trauma center designation) and differences in management mission (eg, hospital ownership). We estimated 4 equations to account for different risk patterns for older and younger adults, and differences by type of injury. We separated fractures of the lower extremities from other injuries because of their high prevalence and because the admission decision for these cases may be more dominated by clinical (eg, requirement for emergent surgery) rather than other factors, even though these injuries had been classified as moderately severe by the NISS. In addition to using the NISS to identify moderately severe injuries, we controlled for severity in the regressions using the actual NISS score. Robust standard errors account for clustering of patients in the ED; 95% confidence bands are calculated using the delta method. We calculate marginal effects and predicted probabilities based on the model results. All analyses were conducted using the logit command in Stata version 12.0 MP (Stata Corp, College Station, TX).

2.4. Dependent variable

In the regression analysis, the dependent variable is a 0/1 binary variable that identifies whether the ED visit resulted in a hospitalization.

2.5. Independent variables

2.5.1. Patient clinical characteristics

Clinical characteristics included age, comorbidities, and injury characteristics. Patient comorbidities were defined based on the Agency for Healthcare Research and Quality comorbidity software, which identifies coexisting medical conditions present on ED or hospital admission that are secondary to the main reason for the ED visit or hospitalization and have been shown to increase the intensity of resources required to treat the patient [18]. Injury was characterized based on the severity, location, type, and mechanism of the injury. Injury mechanism was obtained from E-codes. Location and type were characterized using the Barrel matrix [19]. Severity was calculated using the NISS as discussed above.

2.5.2. Patient nonclinical characteristics

Nonclinical factors included variables such as sex, median household income of patients' ZIP code, payer, and distance traveled to the ED. Payer was based on primary expected payer as indicated in the discharge record. We calculated the distance traveled to the ED using the patient's and hospital's ZIP code based on the haversine formula, that is, the great-circle distances between 2 points on a sphere from their longitudes and latitudes [20]. We hypothesized that availability of social supports would increase the likelihood of outpatient care. We hypothesized that patients living further from the hospital were more likely to be admitted to the hospital than those who lived closer. For these

patients, it may be more difficult to garner the family support needed for outpatient care options to be feasible [4,21].

2.5.3. ED characteristics

To estimate the potential influence of the size of the ED relative to the number of inpatient beds, we calculated the ratio of all ED visits to inpatient beds, hypothesizing that a higher ratio may lower the risk of being admitted. We also created a local practice pattern variable that measures the average rate of hospitalizations for moderate and severe injury patients within the county to account for local standards of care that may have an impact on admission rates [2]. We also characterized the ED visit by the month of the visit to control for seasonality and assessed whether the visit was on the weekend (when staffing is generally lower) [22].

2.5.4. Hospital characteristics

Hospital characteristics included hospital-bed size (using the HCUP definition, which places hospitals into small, medium, or large categories that are defined by the hospital's census region, urban/rural location, and teaching status) [23], ownership (nonprofit, for profit, and public), and whether the hospital was located in an urban area. We identified whether a hospital was a Level 1, 2, or 3 trauma center or a nontrauma center based on TIEP data [24].

3. Results

Three out of 4 ED visits for moderately injured adults resulted in an admission (76%). Visits for women, older patients, persons injured by a fall, and persons injured from a firearm were more likely to result in an admission. A number of comorbidities—such as renal disease, congestive heart failure, diabetes, chronic pulmonary disease, fluid and electrolyte imbalance, and hypertension—also increased the likelihood of an admission. Visits for persons who were uninsured had below-average admission rates, and elderly visits for patients with Medicare as the expected payer had above-average rates. Emergency department visits associated with Level 1 or Level 2 trauma hospitals had higher admission rates. Furthermore, living between 30 and 90 miles from the hospital increased the likelihood of an admission (Table 1).

High proportions of ED visits for elderly patients (65 years and older) involved an injury from a fall or a fracture of the lower extremities (Table 2). Younger patients were more likely to have a variety of injury mechanisms including falls, motor vehicle accidents, and injuries caused by an assault. They were more likely to have fractures that were not of the lower extremities and other types including internal organ injuries. In addition, on average, older adults had more comorbidities (2.0 vs 0.8).

For ED visits resulting in an admission, older adults were more likely to have surgery; and the vast majority of surgeries involved the lower extremities (Table 3). For younger adults, the location of the surgery was more diverse. Emergency department visits for younger adults were much more likely to result in an admission for medical treatments for trauma and stupor/coma (26.1 % vs 9.4%).

Location of the injury, injury type, injury mechanism, and comorbidities had large effects on hospitalization rates as expected. For example, the hospital rate for ED visits for patients with lower extremity fractures was 91% compared with 58% for patients with other injuries. The impact of comorbidities and injury mechanism varied by patient subgroup, but large differences in the rate of hospitalization can be seen in the younger than 65 years/other subgroup regression results. For example, for ED visits of younger adults with injuries other than lower extremity fractures, injuries from firearms increased the likelihood of an admission by 23 percentage points; and motor vehicle accidents increased admission rates by more than 10 percentage points. Comorbidities such as pulmonary/circulatory conditions, weight loss, electrolyte imbalance, anemia, and obesity each raised the likelihood between 20 and 35

Table 1

Selected patient and hospital characteristics of moderately injured ED patients (N = 402801)

	Column %	Inpatient admission	Treat and release
		Row %	Row %
All	100	76.4	23.6
Age, y			
18–34	16.2	57.4	42.6
35–49	12.3	59.4	40.6
50–64	14.9	70.7	29.3
65–74	11.5	80.9	19.1
75–84	21.4	87.3	12.7
85 plus	23.7	89.7	10.3
Female	53.1	81.4	18.6
Mechanisms			
Fall	61.3	84.3	15.7
Motor vehicle accidents	12.7	74.5	25.5
Assault	7.1	58.0	42.0
Struck by; against	5.7	40.8	59.2
Firearm	1.8	88.0	12.0
Comorbidities			
Hypertension	44.8	90.3	9.7
Fluid & electrolyte imbalance	17.4	97.5	2.5
Deficiency anemia	15.2	97.8	2.2
Diabetes	12.9	87.9	12.1
Diabetes with complications	2.0	96.8	3.2
Chronic pulmonary disease	13.7	92.2	7.8
Congestive heart failure	8.6	95.6	4.4
Renal failure	7.3	96.4	3.6
Primary expected payer			
Private	23.2	67.4	32.6
Medicare age 65 plus	50.3	87.9	12.1
Medicare age 64 below	3.6	72.1	27.9
Medicaid	6.4	68.4	31.6
Self-pay (uninsured)	10.4	54.1	45.9
Other	5.8	65.0	35.0
Missing	0.3	57.4	42.6
Hospital trauma designation			
Nontrauma center	52.8	71.8	28.2
Level 3	6.4	74.3	25.7
Level 2	18.4	82.4	17.6
Level 1	22.4	82.9	17.1
Driving distance to hospital, mile			
≤30	88.0	76.1	23.9
>30≤60	5.8	81.3	18.7
>60≤90	1.9	80.4	19.6
>90	4.4	73.3	26.7

percentage points (full regression results are in Table S1 in the supplementary appendix).

After accounting for injury type and location, age had a moderate impact; ED visits for the older group had 10 percentage points higher admission rates (for lower extremity fractures, 93% of older adult visits

Table 2

Clinical characteristics by age

	Age 18–64 y	Age ≥65 y
	Column%	Column%
Mechanism		
Fall	30.3	85.0
Motor vehicle accidents	25.1	3.2
Assault	16.1	2.5
Struck by; against	12.0	0.9
Firearm	4.2	0.1
Type and location*		
Fracture	58.8	88.7
Lower extremity	25.4	77.0
Other fracture	33.4	11.7
Other	41.2	11.3
Internal organ injury	23.8	8.1
Non-internal organ injury	17.4	3.2
Mean comorbidity count	0.8	2.0
Total n (%)	174969 (100)	227832 (100)

* Based on Barrel Matrix using first listed diagnosis.

Table 3

Reasons for inpatient admission (n = 307 691)

	Age 18–64 y	Age ≥ 65 y
	%	%
Surgical	50.4	77.6
Lower extremities	29.7	74.3
Other	20.7	3.3
Medical	39.8	18.6
Stupor & coma	13.4	5.6
Trauma	12.7	3.8
Fracture	3.7	6.9
Other	10.0	2.3
Ungroupable or invalid	9.9	3.8
Total n (%)	109 393 (100)	198 293 (100)

Based on Diagnosis-Related Groups.

had an inpatient admission compared with 83% of younger adult visits; for other injuries, 65% of visits of older adults and 55% of visits of younger adults resulted in admissions) (Table 4).

3.1. Effect of nonclinical risk factors on the probability of inpatient admission

Table 4 provides the adjusted probabilities for the 4 condition/age subgroups for the nonclinical factors that affected admission probabilities (by at least 4 percentage points) based on the regression analyses—trauma center designation, expected payer, hospital size, and distance to the hospital.

Emergency department visits of younger adults with a moderately severe injury who entered the ED with a fracture of the lower extremities had higher inpatient admission rates in trauma centers, and the rate was greater the higher the designation level (ie, the lower the number) (79% in a nondesignated ED, 84% in Level 3, 87% in Level 2, and 89% in Level 1). In contrast, admission rates from the ED were high for elderly patients with a fracture of the lower extremities; but the rate was unaffected by trauma center designation (ranging from 93% to 95%).

For ED visits of moderately injured adults with other injuries, trauma center designation increased the admission rate of both younger and

elderly patients. The effects associated with higher trauma levels were large and were more pronounced for younger adults. For younger patients, the increase was from 40% in a nondesignated ED to 69% in a Level 1 trauma center. For elderly patients, the increase was from 59% in a nondesignated ED to 78% in a Level 1 trauma center.

For ED visits of younger adults in both injury groups, being uninsured or having Medicare as the primary expected payer was associated with about a 7–percentage point reduction in the admission rate compared with visits for persons with private insurance. For younger adults with fractures of the lower extremities, Medicaid coverage was also associated with a similar admission rate reduction. For ED visits of the elderly, the primary insurance payer was not associated with the admission rate except for the very small group of uninsured (<1% of elderly patients) who had lower admission rates.

Two important additional risk factors were found. For all age groups, ED visits affiliated with a moderate- or large-sized hospital were associated with higher admission rates, generally adding 3 to 6 percentage points compared with a small hospital. For elderly patients with a lower extremity fracture, this was the only identified nonclinical risk factor. For the other 3 groups, admission rates were higher for ED visits for persons traveling 30 to 90 miles to the ED compared with those traveling less than 30 miles, increasing the admission rate by 5 to 9 percentage points. For those traveling 90 miles or more, the increase was smaller, ranging from 1 to 6 percentage points (Table 4).

4. Discussion

The decision to admit a patient from the ED, rather than discharge and treat as an outpatient, is important for the health care system because of the large cost and possible quality implications. For many patients, this is a straightforward decision, dominated by clinical considerations. In this study, we also showed that clinical considerations remain the predominant factor impacting admission decisions in moderately injured patients. Admission decisions depend heavily on the nature and severity of the injury, the location and type of injury, the mechanism of the injury, and associated comorbid conditions.

Yet, we also found that a variety of nonclinical factors also contribute to admission decisions. We explicitly studied how the effects of these

Table 4

Selected predicted probability of hospital admission by age group and injury type for moderately injured adults in the ED

	Injury type or location			
	Fracture, lower extremity: predicted probability (95% CI)		All other injuries: predicted probability (95% CI)	
	Age 18–64 y	Age ≥ 65 y	Age 18–64 y	Age ≥ 65 y
n	44 374	175 514	130 594	52 318
Inpatient admission (%)	83.4	93.5	55.4	65.4
Hospital trauma designation				
Nontrauma center	0.79 (0.78–0.80)	0.93 (0.93–0.94)	0.40 (0.39–0.41)	0.59 (0.58–0.60)
Level 3	0.84 (0.82–0.86)	0.95 (0.94–0.97)	0.49 (0.47–0.52)	0.62 (0.59–0.65)
Level 2	0.87 (0.85–0.88)	0.94 (0.93–0.95)	0.64 (0.62–0.65)	0.72 (0.70–0.73)
Level 1	0.89 (0.88–0.90)	0.93 (0.91–0.94)	0.69 (0.67–0.71)	0.78 (0.77–0.80)
Hospital bed size				
Small	0.79 (0.77–0.80)	0.90 (0.87–0.91)	0.50 (0.48–0.53)	0.62 (0.61–0.64)
Medium	0.84 (0.83–0.85)	0.94 (0.93–0.94)	0.55 (0.53–0.56)	0.65 (0.63–0.66)
Large	0.84 (0.83–0.85)	0.94 (0.94–0.95)	0.56 (0.56–0.57)	0.66 (0.66–0.67)
Primary expected payer				
Private	0.86 (0.85–0.87)	0.93 (0.92–0.93)	0.58 (0.57–0.59)	0.64 (0.62–0.65)
Medicare (65+)		0.94 (0.93–0.94)		0.66 (0.65–0.67)
Medicare (<65)	0.79 (0.78–0.80)		0.50 (0.48–0.51)	
Medicaid	0.80 (0.79–0.81)	0.93 (0.92–0.94)	0.56 (0.55–0.57)	0.67 (0.63–0.71)
Self-pay (uninsured)	0.80 (0.79–0.81)	0.87 (0.94–0.89)	0.51 (0.50–0.52)	0.53 (0.49–0.57)
Other	0.87 (0.86–0.88)	0.92 (0.92–0.94)	0.59 (0.57–0.60)	0.64 (0.62–0.66)
Missing	0.78 (0.73–0.83)	0.92 (0.89–0.95)	0.50 (0.41–0.59)	0.61 (0.53–0.68)
Driving distance to hospital, miles				
≤30	0.83 (0.82–0.83)	0.93 (0.93–0.94)	0.54 (0.53–0.55)	0.65 (0.64–0.66)
>30≤60	0.89 (0.88–0.90)	0.95 (0.94–0.95)	0.63 (0.61–0.64)	0.72 (0.70–0.74)
>60≤90	0.88 (0.86–0.90)	0.94 (0.93–0.95)	0.63 (0.61–0.65)	0.73 (0.70–0.76)
>90	0.85 (0.84–0.86)	0.94 (0.93–0.95)	0.60 (0.57–0.61)	0.67 (0.65–0.68)

Probabilities based on stratified logistic regression models by age and injury type controlling for injury characteristics, comorbidities, demographics, and state fixed effects.

nonclinical factors varied in older and younger adults because injury patterns tend to differ—older adults are more prone to certain types of injuries, such as hip fractures, which almost always require inpatient operative repair. In addition, older adults are more likely to have concurrent medical conditions and comorbidities that can complicate outpatient management even when injuries are not severe.

After accounting for clinical factors, 4 nonclinical factors were associated with inpatient admission decisions: trauma center designation, the size of the hospital, expected primary payer, and whether the distance traveled to the ED was greater than 30 miles. As we expected, older adults were much more likely to have lower extremity fractures, which are almost always treated in the hospital. In older adults, trauma designation did not impact admission decisions. For younger adults without lower extremity fractures, trauma center designation was an important factor. This may reflect differences in clinical decision making in trauma centers or, potentially, that more severely ill patients tend to be transported and/or referred to trauma centers and that this severity was inadequately accounted for with our risk adjustment strategy.

We also found that, for younger adults, expected insurance payer had a significant effect, indicating that access to inpatient care may be lower for uninsured persons and those with Medicaid or Medicare, pointing out the importance of insurance for access to inpatient care. As additional younger adults gain insurance from private coverage or through the Medicaid program with the implementation of the Affordable Care Act, the access to inpatient care may improve. A recent study also found that hospitals are more likely to transfer ED patients with serious illnesses to other hospitals when they had Medicaid or were uninsured [25]. There was also an important hospital size effect, where patients in medium and larger hospitals were more likely to be admitted, which may reflect that available inpatient resources may be an important factor, as larger hospitals tend to have greater service offerings. Finally, the small percentage of persons who traveled more than 30 miles to the hospital was more likely to be hospitalized. This may reflect the difficulty of managing injuries only with outpatient services for persons who live far from the hospital. Alternatively, some may have traveled long distances or have been referred to centers that can provide more specialized care.

There are several important limitations to this study. This article was based on administrative encounter data. We captured inpatient hospitalizations that began in the ED from the SID by using a variable that identifies the provision of emergency services from the same hospital. We may have underestimated the number of visits resulting in a hospitalization for persons that were transferred directly from the ED from another hospital. Also, we were not able to identify transfers from lower-level trauma centers to higher-level trauma centers. Consequently, we may have missed some Level 1 inpatient visits; and therefore, we are likely to be underestimating the impact of trauma center designation on the decision to hospitalize, resulting in a conservative estimate.

We attempted to partially assess the magnitude of bias caused by this limitation. We identified visits that lasted 2 or fewer days and only involved medical treatment and resulted in a discharged to another hospital, to approximate visits that were used to stabilize patients before transfer to another hospital. As expected, these visits were mainly in nondesignated trauma hospitals or Level 3 trauma hospitals. Although we do not know what percentage went to higher-level hospitals, we assumed that they were all transferred to Level 1 trauma hospitals, the most extreme case. We redid the regression analyses classifying these cases to Level 1 trauma hospitals. The impact was negligible because of the small number of cases that this group represented ($n = 2022$). We find that we are at most underestimating the trauma center effect by about 1 percentage point.

Another limitation is that states vary in the number of comorbidities they allow on the discharge abstract. Consequently, we may have missed some comorbidities. In addition, the data are from 29 states. Trauma systems vary by state; and the relationship between emergency medical services and trauma centers also may vary, affecting

triaging, transfer behavior, and potentially the decision to hospitalize. Therefore, generalizing these findings to other states should be done cautiously.

We were also limited by the severity measure, the NISS, which measures severity of each injury and accounts for multiple injuries that occur. For this analysis, it became clear that the hospitalization decision was more related to the specific clinical consideration of each case and that, with this measure, fractures of the lower extremities were often classified as moderately severe injuries, yet almost always hospitalized. We therefore decided to do separate analyses for this group, so we would be able to identify nonclinical factors for other moderately severe injuries when the hospitalization decision was possibly affected by nonclinical factors.

In conclusion, we find that the decision to hospitalize adult patients in the ED, who are moderately severely injured, is dominated by clinical factors but that nonclinical factors have some influence on the decision. Nonclinical effects were strongest for patients without fractures of the lower extremities and for younger adults in general. These nonclinical factors included patients who were younger than 65 years without insurance coverage or disabled with Medicare coverage, who were less likely to be admitted, and those treated by a hospital with a higher trauma center designation, treated in a moderate or large hospital, or lived more than 30 miles from the hospital, who were more likely to be admitted. As policymakers attempt to reduce reliance on cost-based reimbursement and improve pay-for-performance methods and prospective payment systems to encourage efficiency and improve value [26], more questions will be raised about nonclinical factors that affect the cost of care. Further research is needed to better understand how nonclinical factors affect inpatient decisions and affect the quality of care for adults who are evaluated in the ED for an injury.

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