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Undertriage of older trauma patients: is this a national phenomenon?



Lisa M. Kodadek, MD,^{a,*} Shalini Selvarajah, MD, MPH,^{a,1}
 Catherine G. Velopulos, MD, MHS,^a Elliott R. Haut, MD, PhD, FACS,^b
 and Adil H. Haider, MD, MPH, FACS^{a,2}

^a Center for Surgical Trials and Outcomes Research, Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland

^b Division of Trauma and Acute Care Surgery, Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland

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ABSTRACT

Background: Older age is associated with high rates of morbidity and mortality after injury. Statewide studies suggest significantly injured patients aged ≥ 55 y are commonly undertriaged to lower level trauma centers (TCs) or nontrauma centers (NTCs). This study determines whether undertriage is a national phenomenon.

Materials and methods: Using the 2011 Nationwide Emergency Department Sample, significantly injured patients aged ≥ 55 y were identified by diagnosis and new injury severity score (NISS) ≥ 9 . Undertriage was defined as definitive care anywhere other than level I or II TCs. Weighted descriptive analysis compared characteristics of patients by triage status. Multivariable logistic regression determined predictors of undertriage, controlling for hospital characteristics, injury severity, and comorbidities.

Results: Of 4,152,541 emergency department (ED) visits meeting inclusion criteria, 74.0% were treated at lower level TCs or NTCs. Patients at level I and II TCs more commonly had NISS ≥ 9 (22.2% versus 12.3%, $P < 0.001$), but among all patients with NISS ≥ 9 , 61.3% were undertriaged to a lower level TC or a NTC. On multivariable logistic regression, factors independently associated with higher odds of being undertriaged were increasing age, female gender, and fall-related injuries. A subgroup analysis examined urban and suburban areas only where access to a TC is more likely and found that 55.8% of patients' age were undertriaged.

Conclusions: There is substantial undertriage of patients aged ≥ 55 y nationwide. Over half of significantly injured older patients are not treated at level I or II TCs. The impact of undertriage should be determined to ensure older patients receive trauma care at the optimal site.

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* Corresponding author. Center for Surgical Trials and Outcomes Research, Department of Surgery, Johns Hopkins University School of Medicine, 600 N Wolfe Street, Blalock 611, Baltimore, MD 21287. Tel.: +1 443 287 6567; fax: +1 410 955 8101.

E-mail address: lkodade1@jhmi.edu (L.M. Kodadek).

¹ Permanent address: Hugo W. Moser Research Institute, Kennedy Krieger Institute, 716 N Broadway Street, Suite 403, Baltimore, MD 21205.

² Permanent address: Center for Surgery and Public Health, Department of Surgery, Brigham and Women's Hospital, One Brigham Circle, 1620 Tremont Street, 4-020, Boston, MA 02120.

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1. Introduction

Over 30 million people are treated for traumatic injury in United States emergency departments (EDs) each year [1]. Older trauma patients tend to experience a higher rate of morbidity and mortality after injury when compared with younger patients, which has prompted significant interest in optimizing care for older trauma patients [2–4]. Furthermore, as the fastest-growing segment of the US population, elderly individuals are expected to suffer a disproportionate increase in traumatic injuries in coming years [5]. Older patients today often live independently and enjoy active lifestyles, which may further predispose to the burden of injury [6].

Older trauma patients present unique management challenges, and care may differ significantly from younger patients due to physiologic changes [7], higher rates of preexisting disease [8,9], and polypharmacy [10,11]. Studies have repeatedly shown that older patients, even with lower injury severity, have worse outcomes after trauma than younger patients [12–14]. For this reason, increasing attention has been focused on the triage of older trauma patients to higher level trauma centers (TCs). Because studies have shown that regionalization of trauma care saves lives [15] and improves outcomes and mortality [16], there is evidence to suggest that older patients may benefit from care at higher level TCs.

Research regarding the relationship between age and outcome after injury demonstrates that older patients have worse outcomes after trauma [3,17]. Current national guidelines published by both Centers for Disease Control and Prevention and the American College of Surgeons Committee on Trauma recommend that patients aged ≥55 y be considered for triage to TCs even in the absence of apparent anatomic injury, physiologic instability, or significant mechanism that would otherwise meet criteria for triage to a TC [2,18].

Despite these recommendations, numerous statewide and regional studies suggest that significantly injured patients aged ≥55 y are actually more likely to be undertriaged to lower level TCs or nontrauma centers (NTCs) [19–22]. A study by Smith et al. demonstrated that only 38% of injured patients aged ≥56 y in areas of Pennsylvania and Maryland were treated at TCs. In contrast, 70% of younger patients ages 13–55 y with similar injuries were treated at TCs [19]. Another study examined triage after injury in Maryland and found that older adults ≥50 y were more likely than their younger counterparts to be transported to lower level TCs or NTCs

despite meeting appropriate physiology or mechanism criteria for transport to a TC [21]. A 2013 study showed similar findings in areas of California and Utah, where nearly 33% of injured patients aged ≥55 y with injury severity score (ISS) >15 were undertriaged to lower level TCs or NTCs [22].

Although previous studies have examined undertriage at the regional level, our objective was to determine if older adult undertriage is a national phenomenon. We sought to describe the extent of trauma undertriage for patients aged ≥55 y using a nationwide sample and to identify sociodemographic and injury characteristics associated with undertriage in older trauma patients.

2. Materials and methods

2.1. Study design and setting

Data from the 2011 Nationwide Emergency Department Sample (NEDS) were used to perform a national analysis. NEDS is part of the Healthcare Cost and Utilization Project (HCUP), developed and maintained by the Agency for Healthcare Research and Quality. It is the largest all-payer ED database in the United States, containing approximately 30 million discharge records each year from over 950 hospitals in 30 different states, thus representing a 20% stratified sample of all visits to hospital-based EDs throughout the United States. Survey weights that are calculated and provided by HCUP can be applied to the data during analysis to enable nationwide estimates to be calculated.

Furthermore, NEDS identifies EDs by TC status as verified by the Trauma Information Exchange Program database, which includes both state- or region-verified TCs and those verified by the American College of Surgeons Committee on Trauma. The 2011 NEDS was specifically selected for analysis because this was the first year in which NEDS provides a collapsed category for higher level TCs (level I or level II) and a category for lower level TCs and NTCs, consistent with the premise of our study analysis.

Additional details describing NEDS are published elsewhere [23]. The Institutional Review Board of Johns Hopkins Hospital approved this study.

2.2. Study population

The study population comprised all adult patients aged ≥55 y presenting to the ED with an injury diagnosis identified using

Table 1 – Distribution of injury severity among trauma patients aged ≥55 y in the NEDS 2011.

TC status	Total, n (%) [*]	NISS categories, n (%) [*]			
		<9	9–15	16–24	≥25
All (row %)	4,152,541 (100.0)	3,534,276 (85.1)	445,057 (10.7)	101,109 (2.4)	72,099 (1.7)
Level I or II TC	1,080,589 (26.0)	841,183 (23.8)	150,547 (33.8)	55,794 (55.2)	33,065 (45.9)
Lower level TC or NTC	3,071,952 (74.0)	2,693,093 (76.2)	294,510 (66.2)	45,315 (44.8)	39,034 (54.1)

^{*} Column proportion unless otherwise indicated.

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