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## Financial impact of minor injury transfers on a level 1 trauma center

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### ABSTRACT

**Background:** Trauma centers frequently accept patients from other institutions who are being sent due to the need for a higher level of care. We hypothesized that patients with minor traumatic injuries who are transferred from outside institutions would impart a negative financial impact on the receiving trauma center.

**Methods:** We performed a retrospective review of all trauma patients admitted to our urban level I trauma center from October 1, 2011, through September 30, 2013. Patients were categorized as minor trauma if they did not require operation within 24 h of arrival, did not require ICU admission, did not die, and had a hospital length of stay <24 h. Transferred patients and nontransfers (those received directly from the field) were compared with respect to injury severity, insurance status, and hospital net margin. Student's t-test and z-test for proportions were performed for data analysis.

**Results:** A total of 6951 trauma patients were identified (transfer  $n = 2228$ , nontransfer  $n = 4724$ ). Minor injury transfers ( $n = 440$ ) were compared to nontransfers ( $n = 689$ ). Hospital net margin of transferred patients and nontransferred patients were \$2227 and \$2569, respectively ( $P = 0.22$ ). Percentages of uninsured/underinsured for transfers and nontransfers were 27.3% and 36.1%, respectively ( $P = 0.002$ ).

**Conclusions:** During our study period, 19.7% of transfers and 14.6% of nontransfers can be categorized as having minor trauma. Minor trauma transfer patients are associated with a positive hospital net margin for the trauma center that is similar to that of the nontransfer group. The data also demonstrate a lower percentage of uninsured/underinsured in the transferred group.

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## Introduction

The purpose of designating trauma centers is to triage more seriously injured patients toward the specialized resources available at these facilities. Patients who sustain minor injuries could, presumably, be cared for at a nontrauma center equipped to handle acute patients. This system is vital for appropriate allocation of resources. As stated in the 2014 Resource for Optimal Care of the Injured Patient published by the American College of Surgeons Committee on Trauma, “overtriage results in overutilization of finite resources (financial and human).”<sup>1</sup> The Emergency Medical Treatment and Active Labor Act requires specialty centers, including trauma centers, to accept all transferred patients for a higher level of care if capacity exists and if appropriate care cannot be provided at the transferring institution.<sup>2</sup> This mandate for acceptance of all transfers opens the door for unnecessary transfers from surrounding facilities to level I trauma centers and other tertiary care centers.

The financial impact of overtriage by Emergency Medical Services (EMS) has been previously studied. Estimated hospital level differences in the adjusted cost of acute care for trauma patients was found to be \$5590 higher per episode in a level 1 trauma center than in a nontrauma center—designated hospital.<sup>3</sup> This study specifically focused on prehospital EMS triage, or “primary” triage of trauma patients. The impact of interfacility transfer, or “secondary” overtriage, has also been analyzed. A 2008 study found that 64% of patients transferred to a level 1 trauma center from another facility were determined to have only minor injuries and 39% transfers were determined to have been overtriaged (defined as injury severity score [ISS] <10, not requiring an operation, and discharged to home within 48 h of admission).<sup>4</sup>

One theorized reason for the unnecessary transfer of minor injuries to level 1 trauma centers is payer status, with concern that uninsured/underinsured patients are being transferred out for financial rather than clinical reasons. When looking at hand injury transfers to level I trauma centers, one study found that the primary motivations of transfers are truly complexity of care and specialist availability.<sup>5</sup> However, in other studies that looked at spine and other orthopedic transfers, it has been shown that uninsured patients had a higher likelihood of being transferred than insured patients.<sup>6–8</sup> These findings suggest that there may be a significant financial burden on the receiving level I center.

We intended to evaluate the financial impact of patients with minor traumatic injuries on our level 1 trauma center. We sought to compare patients who presented directly to our facility with those who were initially evaluated at another facility and then transferred to our trauma center. We hypothesized that patients being transferred to our facility with minor trauma were more likely to be uninsured or underinsured as compared to patients who presented directly to our facility, thereby imparting a negative financial impact on our trauma center.

## Methods

We obtained institutional review board (IRB) approval for a single institution, retrospective cohort study based on data collected via

the trauma registry of an urban level I trauma center, the primary receiving center for trauma patients in southern New Jersey. A waiver of informed consent was granted by the IRB.

Our study population included all patients seen by the trauma service from October 1, 2011 through September 30, 2013, including patients presenting directly from the field to the trauma bay, those seen as consults in our Emergency Department, and patients transferred to our facility from a referring institution. Patients were categorized as minor trauma patients if they did not require operation within 24 h of arrival, did not require ICU admission, did not die, and had a hospital length of stay < 24 h. We then compared minor trauma transfers to minor trauma nontransfers. Patients with incomplete data were excluded.

Demographic and clinical data were collected for each group, including age, gender, mode of transport, presenting ISS, presenting Glasgow Coma Scale (GCS), subspecialty consults obtained, and insurance status. Uninsured/underinsured patients were those found to be self-payers or those receiving charity care. All others were considered to be insured, including those covered by health maintenance organizations (HMOs), Medicare, Medicaid, and commercial insurance. Financial information was obtained from the billing department for each patient, including direct cost and gross revenue. These data were used to determine hospital net margin for each patient analyzed.

Differences in means and percentages were determined to have statistical significance using Student’s *t*-test with a threshold of  $P \leq 0.05$  for significance.

## Results

A total of 6951 were seen by the trauma service between October 1, 2011 and September 30, 2013, of which 2228 were transferred from another facility. Of all patients seen by the trauma service, 1129 (16.2%) were categorized as having minor trauma by our criteria. Of these minor trauma patients, 440 (39.0%) were transferred from another facility (transfers) and 689 (61.0%) presented directly to our trauma center (nontransfers). Transfers were received from 25 different nontrauma center hospitals during the study period and two regional level 2 trauma centers.

Demographic data, mode of transport to our facility, and subspecialty services consulted for subjects in each group are shown in Table. There was no difference in gender distribution between the two groups. Transfer patients tended to be slightly older and have slightly higher presenting ISS and GCS than nontransfer. However, as expected, patients in both groups who fit our criteria for minor injuries had low ISS (transfer = 4.7 versus nontransfer = 3.5) and high presenting GCS (transfer = 14.7 versus nontransfer = 14.2). The mean ISS for transfers excluded as nonminor trauma was 16.

A significantly larger percentage of uninsured/underinsured patients as defined by our criteria (self-pay and charity care recipients) were seen in the nontransfer group when compared to the transfer group. Twenty-seven percent of transfers were deemed uninsured/underinsured compared to 36% of nontransfers ( $P = 0.002$ ) (Fig. 1).

Compared to nontransfer patients, transfer patients arrived via ambulance more often (52.8% versus 88.6%;  $P < 0.001$ ) and

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