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Admission of elderly blunt thoracic trauma patients directly to the intensive care unit improves outcomes



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ABSTRACT

Introduction: Blunt thoracic trauma in the elderly has been associated with adverse outcomes. As an internal quality improvement initiative, direct intensive care unit (ICU) admission of nonmechanically ventilated elderly patients with clinically important thoracic trauma (primarily multiple rib fractures) was recommended.

Methods: A retrospective review of the trauma registry at a level 1 trauma center was performed for patients aged ≥ 65 y with blunt thoracic trauma, admitted between the 2 y before (2010–2012) and after (2013–2015) the recommendation.

Results: There were 258 elderly thoracic trauma admissions post-recommendation (POST) and 131 admissions pre-recommendation (PRE). Their median Injury Severity Score (13 versus 12, $P = \text{ns}$) was similar. The POST group had increased ICU utilization (54.3% versus 25.2%, $P < 0.001$). The POST group had decreased unplanned ICU admissions (8.5% versus 13.0%, $P < 0.001$), complications (14.3% versus 28.2%, $P = 0.001$), and ICU length of stay (4 versus 6 d, $P = 0.05$). More POST group patients were discharged to home (41.1% versus 27.5%, $P = 0.008$). Of these, the 140 POST and 33 PRE patients admitted to the ICU had comparable median Injury Severity Score (14 versus 17, $P = \text{ns}$) and chest Abbreviated Injury Score ≥ 3 (66.4% versus 60.6%, $P = \text{ns}$). The POST-ICU group redemonstrated the above benefits, as well as decreased hospital length of stay (10 versus 14 d, $P = 0.03$) and in-hospital mortality (2.9% versus 15.2%, $P = 0.004$).

Conclusions: Admission of geriatric trauma patients with clinically important blunt thoracic trauma directly to the ICU was associated with improved outcomes.

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Introduction

With the aging population, trauma centers are increasingly treating elderly patients. According to 2014 National Trauma Data Bank statistics, the elderly accounted for 28% of admissions to participating trauma centers.^{1,2} The association between advanced age and adverse outcomes has been well described.³⁻⁵ Indeed, even minor injury (Injury Severity Score [ISS] < 9) has been associated with increased mortality in the elderly.³

Blunt thoracic trauma has been associated with adverse outcomes in the elderly, such as unplanned intensive care unit (UP-ICU) admission.⁶ Further, elderly blunt thoracic trauma patients with rib fractures have about a two-fold higher mortality rate than younger patients with similar injuries.⁷ A near-linear relationship between the number of rib fractures and mortality rate in the elderly has been described, with a 19.4% increase in mortality for each additional rib fracture in one study and substantial incremental increase in another study.^{7,8} Mortality in elderly patients with rib fractures has been reported at 20.1% as compared with 7.6% in elderly patients without rib fractures.⁷

As a quality improvement initiative in fall 2013, a recommendation was made to the trauma faculty at our university hospital to admit elderly, nonmechanically ventilated patients with clinically important blunt thoracic trauma, with or without other injuries, directly to the ICU from the Emergency Department (ED). Clinically important blunt thoracic trauma referred primarily to the presence of multiple (≥ 3) rib fractures. In addition, patients with limited inspiratory capacity on bedside inspiratory spirometry or multiple major comorbidities with lesser degrees of chest injury were to be considered for ICU admission. Before Fall 2013, nonmechanically ventilated elderly blunt thoracic trauma patients with rib fractures were admitted to the ICU based on attending discretion. We sought to determine if direct admission to the ICU, from the ED, of these patients would improve outcomes.

Methods

To evaluate the effects of this recommendation, the trauma registry at a recently verified American College of Surgeons level 1 trauma center, serving a suburban county of approximately 1.49 million people, was reviewed for blunt trauma admissions with the age of ≥ 65 y.⁹ Patients with burns, ED deaths, intubations in the ED or prehospital intubations, direct transfers to the inpatient trauma service, and patients with hospital length of stay (LOS) ≤ 48 hours were excluded. As the counsel was made in early fall 2013, we studied the 2-y period before the recommendation and the 2-y period after the recommendation. The pre-recommendation (PRE) time frame was 10/1/2010-9/30/2012. The post-recommendation (POST) time frame was 10/1/13-9/30/2015. The 2015 end date was chosen because of coding changes associated with implementation of International Classification of Diseases-10-Clinical Modifier (ICD-10-CM).

The trauma registry is maintained on Trauma One v. 4.1 (Lancet Technologies, Boston, MA). Comorbidities and

complications in the registry were coded in accordance with National Trauma Data Standard definitions.¹⁰ However, UP-ICU admission, defined as a patient who was upgraded from regular floor, telemetry or step-down unit or a patient who had an unplanned return to the ICU (i.e., "bounce-back"), was measured separately from other complications. This complication has been tracked at our center since 2000.

Medians with interquartile ranges (IQRs) and percentages were used to describe predictors and outcomes. Univariate comparisons of outcomes and demographics were performed using chi-squared and median tests, as appropriate, using SPSS v23.0 (IBM, Armonk, NY). This study is considered as a quality assurance project by our Institutional Review Board.

Results

There were 1190 elderly blunt trauma admissions in the 2 y after the recommendation and 745 elderly blunt trauma admissions to the hospital in the 2 y before the recommendation. Of these, 258 POST recommendation admissions and 131 PRE recommendation admissions had blunt thoracic injuries (Table 1). Their median age was similar (81 versus 79 y, $P = \text{ns}$). However, more POST group patients had one (94.2% versus 87.0%, $P = 0.01$) and ≥ 2 (72.5% versus 56.5%, $P = 0.002$) comorbidities than the PRE group. The median ISS (12 versus 13, $P = \text{ns}$) and percentage of patients with serious (Abbreviated Injury Score [AIS] ≥ 3) head, chest, and extremity injuries was similar between groups. Specific chest injury characteristics (i.e., median chest AIS, percentage of patients with rib fractures without serious injury in other body regions, pneumothorax/hemothorax/or both, pulmonary contusion, and thoracic spine injury) were also similar between groups. However, the POST group had a lower percentage of patients with serious abdominal injuries (3.1% versus 9.9%, $P = 0.005$) and also a lower percentage of patients who underwent major abdominal surgery (0.4% versus 3.8%, $P = 0.009$) than the PRE group. Of note, the percentage of elderly blunt thoracic trauma patients admitted to a surgical service was higher in the POST period than that in the PRE period (95.0% versus 84.7%, $P = 0.001$).

With regards to outcomes, the POST group had increased ICU utilization (54.3% versus 25.2%, $P < 0.001$). However, the POST group had decreased UP-ICU admission (8.5% versus 13.0%, $P < 0.001$), median ICU LOS (4 versus 6 d, $P = 0.049$), and complications (14.3% versus 28.2%, $P = 0.001$). More POST group patients were discharged to home (41.1% versus 27.5%, $P = 0.008$). The mortality rate was 2.3% for POST group versus 4.6% in the PRE group, $P = \text{ns}$. On re-analysis after excluding the one POST group patient and five PRE group patients undergoing major abdominal surgery, and thereby generating statistically similar serious abdominal injury rates (3.1% versus 7.0%, $P = 0.07$), the above outcomes remained similar and significantly different between the POST and PRE groups: ICU utilization (54.1% versus 23.0%, $P < 0.001$), UP-ICU admission (8.2% versus 11.9%, $P < 0.001$), median ICU LOS (4 versus 6 d, $P = 0.049$), complication (14.0% versus 26.2%, $P = 0.004$), discharged to home (41.2% versus 28.6%, $P = 0.004$), and mortality (2.3% versus 4.8%, $P = 0.20$) rates.

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