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Socioeconomic disparities in the thoracic trauma population

Krista L. Haines, DO,[a] *Tiffany Zens, MD,*[a] *Megan Beems, MD,*[a] *Ryan Rauh, BS,*[a] *Hee Soo Jung, MD,*[a] *and Suresh Agarwal, MD*[b,*]

[a] *Division of Trauma and Critical Care, Department of Surgery, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin*

[b] *Division of Trauma and Critical Care Surgery, Department of Surgery, Duke University School of Medicine, Durham, North Carolina*

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ABSTRACT

Background: Health-care disparities based on socioeconomic status have been well documented in the trauma literature; however, there is a paucity of data on how these factors affect outcomes in patients experiencing severe thoracic trauma. This study aims to identify the effect of insurance status and race on patient mortality and disposition after thoracic trauma.

Methods: The National Trauma Data Bank was queried from 2007 to 2012 for patients with sternal fractures, rib fractures, and flailed chest. Demographics data were examined for the cohort based on insurance status. Univariate and multivariate logistic regression models were used, controlling for patient comorbidities, age, injury severity score, and associated injuries, to determine the impact of race and insurance status on length of stay, mortality, and discharge disposition.

Results: A total of 152,655 thoracic traumas were included in our analysis. As compared to privately insured patients, uninsured patients with thoracic trauma were 1.9 times more likely to die (odds ratio [OR]: 1.91, confidence interval [CI]: 1.76-2.09) and 4.6 times more likely to leave against medical advice (OR: 4.61, CI: 3.14-6.79). When compared to Caucasians, Hispanics had slightly higher in-hospital mortality (OR: 1.14, CI: 1.02-1.27), but there was no survival difference seen in black patients (OR: 0.95, CI: 0.86-1.05).

Conclusions: Insurance status appears to have a more significant effect on thoracic trauma patient outcomes than race, but substantial socioeconomic disparities were seen in this patient population. Further studies are needed to show reproducibility of our findings and to investigate the impact of universal health care and expansion of insurance availability on thoracic trauma outcomes.

Level of evidence: Level 3, economic/decision.

This research was presented as a podium presentation at the 2017 Academic Surgical Congress in Las Vegas, Nevada.

* *Corresponding author.* Division of Trauma and Critical Care Surgery, Department of Surgery, Duke University School of Medicine, Durham, NC. Tel.: +1 608 265 9574; fax: +1 608 252 0936.

E-mail address: agarwal@surgery.wisc.edu (S. Agarwal).

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Background

Despite implementation of the Affordable Care Act, the United States Department of Health and Human Services estimates that in 2016, 28.2 million patients (8.2%) were still uninsured, down from 48.6 million in 2010.[1] Socioeconomic disparities in the trauma population have been well documented in the literature, and trauma patients without insurance have been shown repeatedly to have inferior outcomes and higher mortality.[2-6] Unfortunately, there has been a paucity of data in the literature regarding the impact of race and insurance status on trauma patients with severe thoracic trauma.

Thoracic trauma accounts for 10%-15% of all trauma admissions and 25% of traumatic deaths.[7] A significant number of thoracic trauma patients will develop pulmonary complications or require an extended-care facility.[7] In addition, thoracic injuries are often associated with concomitant cardiac, pulmonary, abdominal, and intracranial injuries, making this a vulnerable population.[8] As a result, poor-quality trauma care or premature hospital discharge may have a significant effect on patient outcomes in this population. The primary aim of our study is to identify the effect of insurance status and race on patient mortality and disposition after thoracic trauma.

Methods

Data collection and subjects

Patient data for this retrospective cohort study were obtained from the National Trauma Data Bank (NTDB). The NTDB is the largest national database for trauma data and is sponsored, maintained, and copyrighted by the American College of Surgeons Committee on Trauma. The patient information in this database is de-identified, and all analyses for this study were in compliance with the Data Use Agreement and our institutional review board.

The NTDB was queried from 2007 to 2012 for all patients older than 15 y who suffered thoracic trauma. Thoracic trauma was defined using International Classification of Diseases, Ninth Revision, codes for rib fractures (807.00-807.19), sternal fracture (807.2-807.3), and flail chest (807.4). Open and closed fractures were combined in this analysis. Patients were excluded if they had a head injury with an Abbreviated Injury Scale score of three or more because their outcomes would be significantly affected by the presence of a severe head injury. In addition, patients with Emergency Department hospital death were excluded since their race, insurance status, and ethnicity were unlikely to affect their overall inpatient hospital course. The trauma patients within our dataset were next subdivided into groups based on race and insurance status. Data on demographics, concomitant traumatic injuries, and medical comorbidities were collected to better describe each subgroup.

Primary and secondary outcomes

The primary outcome for this analysis was the effect of race and insurance status on in-hospital mortality of thoracic trauma patients. Secondary outcomes included evaluation of factors influencing total hospital length of stay (LOS) and patients leaving against medical advice (AMA).

A Pearson chi-squared univariate analysis was performed to determine factors impacting our primary and secondary outcomes. We evaluated the impact of the following factors: (1) patient injury severity score (ISS); (2) patient age; (3) presence of sternal fracture, flail chest, or severe abdominal injury; and (4) medical comorbidities including history of bleeding disorder, hypertension, chronic obstructive pulmonary disease, steroid use, cirrhosis, congestive heart failure, chronic renal failure, diabetes, peripheral vascular disease, myocardial infarction, angina within 30 d, and presence of disseminated cancer; (5) social factors including smoking and alcohol use. Patient factors found to significantly impact our primary and secondary outcomes with a $P > 0.05$ were integrated into our multivariate logistic regression models. The multivariate logistic regression model was then created using Caucasian patients with private insurance as a reference to all other races and insurance statuses.

A negative binomial regression model with margins commands was used to determine the impact of race and insurance status on patient LOS (given the variance [160.9 d^2] is equal to the mean [10.3 d] assumption was not satisfied). Patients with less than 1-d LOS and those who were recorded as leaving AMA were removed from the LOS analysis. The purpose of this model was to determine the average LOS for those patients not leaving AMA based on race, ethnicity, and insurance to better understand the extent of medical services those patients voluntarily leaving AMA were not receiving.

Statistical analysis

Data analysis was done using StataCorp. 2015. Stata Statistical Software: Release 14 (StataCorp LP, College Station, TX). Demographics data and initial outcomes analysis were performed using independent t tests and chi-squared tests. A multivariate logistic regression model was designed to control for factors found significant in our univariate models to determine the impact of race and insurance status on our primary and secondary outcomes.

Results

Demographics and injury data

A total of 152,655 thoracic trauma patients met inclusion criteria for our analysis. This patient population consisted of 87.1% Caucasian patients, 10.2% black patients, 7.6% Hispanic patients, and 1.98% Asian patients. After dividing the cohort into groups based on insurance status, we noted that 22% of patients were privately insured, 12% were uninsured, 12% had Medicare, 7% had Medicaid, and 15% had an "other" form of insurance.

Table 1 depicts the demographics data of our patients after they were stratified based on insurance status. There was a male predominance across all the groups, with the uninsured patients group having the highest proportion of males (77.8%)