Predictors of mortality, hospital utilization, and the role of race in outcomes in head and neck trauma

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Objective. A retrospective cross-sectional analysis was undertaken to determine the impact of race and insurance status on trauma outcomes in patients admitted to a Level I trauma center following head and neck fractures.

Study Design. Putative predictive factors, including injury mechanism, hemorrhagic shock, injury severity score (ISS), race, gender, and insurance status, were used in a multivariate outcome analysis to determine their influence on length of hospital stay, number of procedures performed, discharge status, and mortality; $P < .05$ was significant.

Results. Proportionately more male patients (76.5%) sustained head and neck fractures compared with females (23.5%). Blacks and Hispanics sustained proportionately more gunshot wounds (GSWs) compared with Whites, 16:1 and 7:1, respectively. There were no significant differences in length of hospital stay and mortality based on race or insurance status. Mortality was related to age, GSW as a mechanism of injury, increasing ISS, and shock on admission.

Conclusions. Minority race and insurance status did not correlate with worse outcomes. Treatment biases in the acutely injured patient with head and neck injuries may be less prevalent than thought, if we consider mortality and utilization of care as primary outcome measures. (Oral Surg Oral Med Oral Pathol Oral Radiol 2016;121:12-16)

A variety of factors are thought to play a role in the disparate health care received by minority populations, including, but not limited to, provider and institutional biases, lack of access to care, insurance status, language barriers, and poor health literacy. Studies have shown that racial disparities pervade the spectrum of health care, including access to care, pain control, oncology, cardiology, transplantation, and trauma.[1,2] For example, ethnic and minority patients are less likely to be placed in acute rehabilitation following traumatic brain injury even after taking their insurance status into account.[3] Likewise, a study examining racial disparities in motorcycle trauma demonstrated that Black patients have an increased risk of mortality despite the fact that Black patients are more likely to use a helmet compared with White patients.[4] Last, in a large study of trauma mortality from the National Trauma Data Bank (NTDB), minority race and lack of health insurance were prognostic for worse outcomes after trauma.[5]

According to the Centers for Disease Control and Prevention (CDC), injuries are the leading cause of death in children and adults between the ages of 1 and 44 years.[6] Trauma centers are in the best position to provide optimal care, since they possess additional equipment and optimal resources to treat severely injured patients. It has been reported that patient survival rates are higher at designated trauma centers, especially Level I trauma centers, compared with non-trauma centers.[7,8]

Furthermore, it can be argued that trauma care provides the least biased setting to investigate racial disparities in health care because of the immediate decision making and emergent care required for the treatment of the injuries. In addition, trauma care is known to be often collaborative with many medical and surgical teams participating in patient care, ensuring multiple layers of protection from bias.

Currently, it is unknown whether racial disparities exist in traumatic fractures involving the head and neck region. The purpose of this study is to determine the impact of race and insurance status on trauma outcomes in patients admitted to our Level I Trauma hospital following head and neck fractures.

Statement of Clinical Relevance

This article provides new insight into racial disparities in head and neck fracture trauma research and an opportunity for discussion and further study of trauma outcomes in an effort to reduce racial disparities in medicine.

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Table I. ICD-9 Codes for head and neck fractures that represented inclusion in the study

ICD-9 Code	*Fracture*
800	Fracture of vault of skull
801	Fracture of base of skull
802	Fracture of face bones
803	Other and unqualified skull fractures
804	Multiple fractures involving skull or face with other bones
805	Fracture of vertebral column without mention of spinal cord injury
806	Fracture of vertebral column with spinal cord injury

ICD-9, International Classification of Diseases 9.

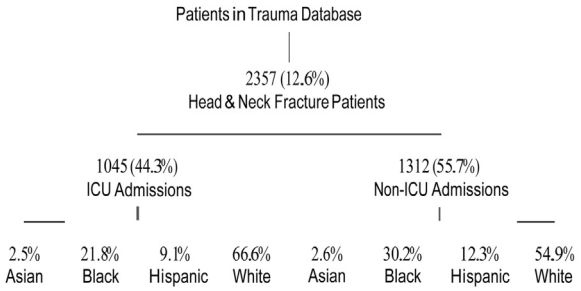

Fig. 1. Racial breakdown of patients meeting inclusion criteria for the study.

MATERIALS AND METHODS

Data source

This study was a retrospective cross-sectional analysis, which received Institutional Review Board approval. The data for the study was obtained from the hospital's Trauma Registry between November 2001 and November 2010. The data were abstracted from the institutional version of the National Trauma Data Bank in compliance with national trauma data standards under the direct supervision of the principal investigator. The inclusion and exclusion criteria were consistently applied, and incomplete records were not included. Any record with even one missing data point of any value of interest was considered incomplete.

Patient population

This study identified records that met the inclusion criteria based on the International Classification of Diseases 9 (ICD-9) codes for head and neck injuries, 800 to 806 (Table I). Patients less than 18 years of age were excluded. Patients were categorized by self-reported race as White, Black, Asian, or Hispanic. Other races were excluded due to small sample sizes. Patients were also classified by insurance status as private (commercial insurance, managed care, worker's compensation, automobile insurance, liability insurance, no-fault), public (Medicare, Medicaid, MassHealth), or uninsured.

Outcome measures and analysis

The records of qualifying patients were studied according to demographic characteristics, including age, gender, race, and insurance status, as well as fracture(s), mechanism of injury, shock on admission (systolic blood pressure [SBP] <90), ISS, Glasgow Coma Scale (GCS), and trauma outcome measures, such as hospital length of stay, number of procedures, discharge status, and mortality. Patient characteristics were analyzed using descriptive statistics. Further analyses were performed with SAS 9.2 (SAS Institute, Cary, NC) and included *t* tests for continuous data and Chi-square analysis for categorical data. Bivariate analysis was utilized to determine the odds ratios (ORs) for various mechanisms of injury by race. Multivariate logistic regression was used to compare the odds of mortality by race, using White males as the reference group; the same analysis was used to determine the odds ratio for increased length of stay.

RESULTS

A total of 2357 patients met the criteria for inclusion in this study. Patients presenting with head and neck fractures accounted for 12.6% of patients in the Trauma Registry Database. Of the patients meeting the inclusion criteria, 1045 (44.3%) patients had sustained injuries that required admission to the intensive care unit (ICU), and 1312 (55.7%) patients were non-ICU admissions (Figure 1). As seen in Table II, Whites comprised the greatest proportion of patients in the study at 60.1%, with the remaining racial breakdown as follows: Blacks 26.5%, Hispanics 10.9%, and Asians 2.5%. The mean age was 40.2 years (ICU: 43.7 years; non-ICU: 37.5 years). Female patients were older than males, with the greatest disparity in age seen between white females and white males (51.3 years versus 41.3 years).

Minority patients were significantly younger: Asians 33.7 years, Hispanics: 32.9 years, and Blacks: 33.1 years, compared with Whites: 44.9 years. More males (76.5%) experienced head and neck fractures compared with females (23.5%), with Blacks and Hispanics peaking at a rate of more than 5:1. More than 90% of Whites and Asians were insured with either public or private insurance. Twice as many Black and Hispanic patients were uninsured compared with White patients.

Blacks and Hispanics experienced more violent trauma (assaults and GSWs) compared with Whites, with a frequency of 2.5 times and 2.2 times more, respectively. In terms of mechanism of injury, Blacks and Hispanics experienced the most GSW injuries, and Asians sustained no GSW injuries (Table III).

Multivariate logistic regression analysis of ICU patients with mortality as an outcome demonstrated that shock on admission (OR: 9.16), increasing age