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Insurance Type is a Determinant of 2-Year Mortality After Non-neurologic Trauma

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Background. **Lack of health insurance (NO-INS) is associated with increased long-term mortality after head and spinal cord injuries (NEURO-TRA). Less is known about the influence of insurance type and long-term mortality following non-NEURO-TRA. We hypothesized that NO-INS would be associated with 2-y mortality after moderate to severe injury.**

Methods. **Adults (≥18) treated at a level-I trauma center following a moderate to severe blunt injury (ISS > 15) and without NEURO-TRA from 2000–2005 and discharged alive were eligible for the study. Two-y mortality was determined utilizing the Social Security Administration Death Master File. Logistic regression analysis was used to determine if type of insurance [NO-INS, Private (PRIV-INS), Medicare/ Medicaid; GOV-INS), or Other (OTH-INS)] was related to 2-y mortality.**

Results. **One thousand nine hundred fifty-eight patients met study inclusion/exclusion criteria. Two-y risk of death was 2.96%. On univariate analysis, admission age, lactate, and insurance type were associated with 2-y mortality ($P < 0.25$). However, race was not. After adjusting for admission age and lactate, compared with PRIV-INS, having either NO-INS or GOV-INS was significantly associated with increased 2-y mortality. The analysis was repeated without patients eligible for Medicare (Age ≥ 65), and GOV-INS was still associated with increased 2-y mortality (OR 4.47 $P < 0.05$).**

Conclusion. **Following moderate to severe blunt, non-NEURO-TRA, having GOVT-INS or NO-INS was associated with increased 2-y mortality. The mechanism by which this association may be explained is unclear. Future research focused on elucidating mechanisms behind poor long-term outcomes should include an examination of socioeconomic status as a potential contributor to reduced long-term mortality after injury.**

Key Words: **long-term mortality; injury trauma; insurance; socioeconomic status.**

INTRODUCTION

Care of injured persons at level I trauma centers is superior in terms of in-hospital survival compared with care received at non-trauma centers [1]. But, lack of health insurance has been associated with worse in-hospital outcomes after injury compared with those with health insurance, even at designated trauma centers [2, 3]. There has been little focus on determinates of long-term mortality except in select patient populations, namely persons with spinal cord injury and traumatic brain injuries.

For persons with neurologic injury, lack of health insurance, race, and socioeconomic status have all been associated with poor outcomes, both in-hospital and after discharge [4–7]. This is not surprising, given that patients with neurologic injury often require intense rehabilitation and chronic care to maintain the highest levels of quality of life. However, little is known about the influence health insurance has on survival after non-neurologic moderate and severe blunt injury. The purpose of this study is to determine the 2-y survival after moderate to severe non-neurologic injury. We hypothesized that lack of health insurance, compared with having health insurance, would be associated with increased 2-y mortality following moderate to severe blunt non-neurologic injury.

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MATERIALS AND METHODS

Study Setting

The Presley Memorial Trauma Center (PMTC) is the single designated adult level I trauma center in Shelby County, Tennessee, and serves an area with a population of approximately 2.5 million people. As a result of this designation, the PMTC receives essentially all significantly injured patients who are residents of Shelby County. Additionally, most other significantly injured persons who require hospitalization are transferred from other hospitals in and around Shelby County to the PMTC for definitive care. Demographic, injury information, patient care information, and insurance status were collected by trained trauma registrars and entered into National Trauma Registry System [(NTRACS) American Cancer Society (ACS), Chicago, IL].

Study Population

After approval from the University of Tennessee Health Science Center Institutional Review Board, the trauma registry at the PMTC was queried for patients admitted from 2000–2005. To be eligible for inclusion in the retrospective cohort, patients had to be greater than or equal to 18 y old, had to have suffered a blunt injury, and had to have an injury severity score (ISS)>15. Patients were excluded who were burned, victims of drowning, bites/stings, overexertion, poisoning, and suffocation. Also, persons who suffered a significant traumatic brain injury as defined by a head and neck abbreviated injury score (AIS)>2 or quadriplegia or paraplegia were excluded. Finally, persons who did not survive to discharge were excluded. The inclusion and exclusion criteria were designed to yield a cohort of moderate to severely injured blunt trauma patients without significant neurologic injury who survived to discharge.

Insurance Status Determination

Insurance status was determined at the time of discharge and recorded in the trauma registry at the PMTC. Persons with health insurance provided by a commercial carrier were considered to have private insurance (PRIV-INS). Persons with Medicaid, Medicare, or TennCare were considered to have government insurance (GOV-INS). TennCare is unique to Tennessee; it is a system of managed care organizations sponsored and supported by the State of Tennessee that was intended to take the place of Medicaid in Tennessee. Persons with workers compensation, automobile insurance, hurricane insurance, and other non-governmental insurance were considered to have other insurance (OTH-INS). Persons who were designated as self-pay were considered to have no insurance (NO-INS).

Outcome Determination

To determine 2-y mortality, we searched the Social Security Administration Death Master File (SSADMF) to determine the date of death of persons who met the criteria for inclusion in the cohort. A person is included in the SSADMF if his or her lump sum benefit was paid as a result of a request from, for example, a family member, an attorney, or a mortuary. To be eligible for such benefits, a person must work for at least 10 y and have paid into the social security system. Additionally, some persons (e.g., federal employees hired before 1984, certain state and local employees, and railroad employees serving for more than 10 y) who contribute voluntarily to social security are also included in the SSADMF. Recent studies indicate that using the widely available SSADMF is equivalent to searching the National Death Index to determine if a person has died [8].

Statistical Analysis

For descriptive analysis, continuous variables are reported as medians with the interquartile range because of non-normal distribution of the variables. Comparisons between groups of continuous variables were carried out using Wilcoxon rank sum test. Categoric variables are reported as a percentage of the group from which they were derived. Using χ^2 test or Fisher's exact test, categoric data were compared.

Univariate followed by multivariate logistic regression was used to determine if insurance status was associated with 2-y mortality. Factors that could potentially influence 2-y mortality were first tested using univariate logistic regression. If a variable had $P<0.25$ on univariate analysis, it was included in the multivariate logistic regression model. Variables included in the analysis were insurance status, age, gender, race, mechanism of injury, injury severity score, AIS for each body region, admission systolic blood pressure (SBP), admission heart rate (HR), and admission lactate level. After the initial analysis including all patients, it was noted that there was a high correlation between age and GOV-INS (likely secondary to Medicare eligibility rules). Because of this, the logistic regression analysis was repeated including persons<65. All analyses were carried out using SAS version 9.2 (Cary, NC).

RESULTS

Characteristics of the Study Population

From January 1, 2000 to December 31, 2005, there were 23,448 injured persons admitted to the PMTC. Of those, 16,945 had an ISS<15. Of the remaining 6503 patients, 2803 patients had no significant neurologic injury. Of those, 2171 suffered a blunt injury and 1958 of those survived to discharge. The characteristics of the overall study population are shown in Table 1. The median age of the study population was 38 (IQR 24), and the majority of the population was white (61.6%) males (65.4%). Motor vehicle crashes (MVC) were the main mechanism of injury (72.5%). Injury severity scores indicate that the population was moderately to severely injured, with a median ISS of 22 (IQR 9). Medians for admission SBP and heart rate were 130 (IQR 34) and 96 (IQR 27), respectively. Median admission lactate was 1.3 (IQR 3).

Demographics and Injury Mechanism and Severity by Insurance Type

When the characteristics of the study cohort were broken down by insurance type, several significant differences were found. Patients with GOV-INS had higher median age compared with the other groups. Also, there were significantly more males in the OTH-INS and NO-INS categories. Racial differences were also found. Over 70% of the patients with PRIV-INS were white, whereas the other groups had significantly less white patients. Mechanism of injury also varied by insurance status. Persons with PRIV-INS and GOV-INS were more likely to have suffered a MVC compared with persons in with OTH-INS or NO-INS. Persons