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Self-inflicted gunshot wounds: readmission patterns



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ABSTRACT

Background: Self-inflicted gunshot wounds (SI-GSWs) are often fatal, but roughly 20% of individuals survive. What happens to survivors after the initial hospitalization is unknown. We hypothesized that the SI-GSW survivors are frequently readmitted and that the pattern of readmission is different from that of the survivors of non-GSW self-harm (SH).

Methods: We conducted a retrospective cohort analysis using the 2013 and 2014 Nationwide Readmission Database. Patients with any diagnosis indicating deliberate SH in the first 6 months of the year were included. This group was divided into those who had SI-GSW as their mechanism and those who did not. Weighted numbers are reported.

Results: A total of 1987 patients were admitted for SI-GSW in the study period. Many ($n = 506$, 26%) experienced at least one readmission in 6 months. When compared with non-GSW SH patients, readmission rates were not statistically different (26% versus 26%, $P = 0.60$). However, readmissions for repeat SH were lower for the SI-GSW cohort (3% versus 7%, $P = 0.004$). Readmission for the SI-GSW cohort less frequently had a primary diagnosis of psychiatric illness (28% versus 57%, $P < 0.001$). In multivariate analysis, there was no difference in odds ratios (OR) of all-cause readmission between the two groups. SI-GSW was associated with a lower OR of repeat SH readmission compared with non-GSW SH (OR 0.65, $P = 0.039$).

Conclusions: Readmissions after an SI-GSW are frequent, highlighting the burden of this injury beyond the index hospitalization. There are differences in readmission patterns for SI-GSW patients versus non-GSW SH patients, and this suggests that prevention and follow-up strategies may differ between the two groups.

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Introduction

Self-inflicted gunshot wounds (SI-GSWs) are the leading cause of gun-related deaths in the United States. While SI-GSWs are an exceedingly lethal form of self-harm (SH), nearly one-fifth of the individuals with SI-GSWs survive.¹

What happens to those who survive after their initial hospitalization is not well characterized. Given the severity of the injuries, it might be expected that SI-GSW survivors have high rates of healthcare utilization, both initially and after their injury. Furthermore, it might be expected that this population both shares and has differences when compared with the

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individuals admitted with other forms of deliberate SH. Prior studies have often been limited to single-center retrospective chart reviews with fairly small sample sizes.² These studies have described the profiles of patients who are admitted to the hospital but rarely look beyond the index hospitalization. The few studies that do look at long-term outcomes have a narrow focus³⁻⁵; one study, for example, looked specifically at ocular injuries after an SI-GSW in 18 patients and assessed the functional outcomes after surgical repair.³ A more comprehensive picture of life after an SI-GSW is lacking.

Having a clearer understanding of the trajectory of healthcare utilization for SI-GSW patients and the differences between SI-GSW and non-GSW SH patients would allow providers to anticipate patient needs.

To define the rates and describe the patterns of hospital readmission in the SI-GSW population, we used a national longitudinal database of hospital discharges in the years 2013 and 2014. We hypothesized that patients who survive an SI-GSW are frequently readmitted and that readmission rates would be higher than patients admitted for other mechanisms of non-GSW SH.

Methods

Data source

We performed a retrospective cohort study of patients hospitalized after a deliberate SH attempt using the Nationwide Readmission Database (NRD) from the Healthcare Cost and Utilization Project and the Agency for Healthcare Research and Quality, 2013 and 2014. The NRD is a nationally representative sample of inpatient hospitalizations in the United States with an identifier that allows for linkage across hospitalizations. There are approximately 14 million discharges recorded in the NRD each year. The NRD database includes data on patient demographics, insurance status, hospital characteristics, diagnoses, and procedures. The 2013 and 2014 data sets are the most recent data available at the time of publication.

Study population and variable definition

To have 6-month follow-up data for every patient, we included only patients discharged in the first half of the calendar year because the NRD does not allow year to year tracking. Patients were identified if they had any diagnosis indicating deliberate SH as coded by the International Statistical Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis codes. Only hospitalizations that fell within a 6-month time frame from the index hospitalization were included. The group was divided into those who had an SI-GSW as their mechanism for SH (E955.0-E955.4 and E955.9) and those who did not. Patients who died at their index admission were excluded from the analysis.

Injury Severity Scores (ISSs) were calculated using the International Classification of Diseases Program for Injury Categorization, a publicly available statistical program in STATA, which generates ISSs from ICD-9-CM codes.

Primary psychiatric diagnoses were categorized into categorical groups using ICD-9-CM codes, as defined by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (ICD-9-CM 290-319.99).

Outcomes

The primary outcome was readmission within 6 months of discharge. The secondary outcomes included costs associated with readmission.

Statistical methods

Statistical analysis was performed using STATA, version 14.2 (StataCorp, College Station, TX). Population estimates were produced using survey weights provided by the Healthcare Cost and Utilization Project. Weighted numbers are reported. The Wald t-test was used to compare continuous variables, and Pearson's chi-squared test was used to compare categorical variables. All testing was two-sided and performed at the 0.05 level of statistical significance.

Unadjusted and adjusted analyses were performed with all-cause readmissions as the dependent variable. Adjusted analysis included all variables hypothesized to be associated with readmissions including demographic factors, injury severity, and disposition. The most parsimonious model was used. Pairwise interaction terms, such as between disposition and substance abuse, were tested to identify possible effect modification.

The study was waived by the Stanford University Institutional Review Board as not requiring full review, as all data were de-identified.

Results

Patient, injury, and hospital characteristics

A total of 1987 patients were admitted for SI-GSW and discharged alive between January and June 2013 and January and June 2014. A total of 192,013 patients were admitted for non-GSW SH during the same time period. The patient, injury, and hospital stay characteristics of the index admissions are described in [Table 1](#).

The two groups differed significantly in many demographic characteristics. Notably, the SI-GSW population was more frequently male (SI-GSW versus non-GSW SH, 76.0% versus 40.0%, $P < 0.001$) and more likely to reside in a ZIP code where the median income falls into the lowest quartile (35.5% versus 29.8%, $P < 0.001$).

Injury characteristics were also different between the two groups. The body region that was most often injured in the SI-GSW population was the head or the neck ($n = 530$, 26.7%) followed by the thorax ($n = 300$, 15.1%). In the non-GSW SH group, the majority of injuries were systemic injuries due to poisoning ($n = 148,211$, 77.2%). In the SI-GSW group, most of the patients' ISSs fell in the 0-9 range ($n = 1090$, 54.8%), and only 5.7% ($n = 112$) had scores above 26.

The prevalence of psychiatric diagnoses differed between the two groups ([Table 2](#)). Overall, patients admitted for non-

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