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# Injuries associated with bunk beds that occur in jail☆

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ABSTRACT

*Background:* There are many studies of bunk bed injuries, but none specifically addressing those occurring in jails. It was the purpose of this study to investigate the magnitude and patterns of bunk bed injuries occurring in correctional institutions.

*Methods:* The National Electronic Injury Surveillance System (NEISS) data for the 10 year period 2006 through 2015 due to bunk beds was accessed. Injuries involving bunk beds were identified and the mechanism of injury determined. Statistical analyses were performed with SUDAAN 10™ software. A $p < 0.05$ was considered statistically significant.

*Results:* There were an estimated 639,505 ED visits for bunk bed associated injuries; 51,204 occurred in jail. All jail cases occurred in the age groups ≥10 years (177,165); 29% of these 177,165 sustained the injury in jail. Those who sustained a bunk bed injury in jail compared to those who did not were older, more commonly male, seen in smaller hospitals, more likely admitted, and more frequently associated with a seizure. For those injuries occurring in jail, the most common injury in the trunk and lower extremity was a strain/sprain; the upper extremity a contusion/abrasion; and the head/neck a laceration or traumatic brain injury. A fall off the bunk bed accounted for 71.8% of the injuries, had the highest hospital admission rate (7.4%), accounted for all of the spine injuries, 96% of the head injuries, and had the highest proportion of fractures (14.4%). Inmates having a seizure before the injury sustained fewer fractures, more lacerations, and more head/neck injuries.

*Conclusions:* Injuries in jail account for 29% of all bunk bed injuries resulting in an ED visit in the USA in those age groups ≥10 years. A fall from the bed occurred in 72% and a seizure disorder was 4.5 times more common in jail inmates compared to non inmates. Possible prevention strategies include railings/ladders to reduce the incidence of falls, changes in flooring surfaces, and seizure education and placing inmates with seizure and/or alcohol related disorders on the bottom bunk. This will require a multidisciplinary approach involving the disciplines of medicine, material engineering, and criminal justice.

## 1. Background and rationale for the study

Physicians are often called upon to care for patients, especially children, who have sustained injuries falling from a bunk bed. Of the bunk bed injury studies,[1–7] none specifically investigate those occurring in different housing locations. In an ongoing study of injuries associated with bunk beds, it was anecdotally noted that a bunk bed injury while the patient was in jail was common. To our knowledge there is no study specifically addressing bunk bed injuries which occur in correctional institutions. We thus wished to investigate the magnitude and patterns of bunk bed injuries occurring in correctional institutions. As this was an exploratory study, there were no null hypotheses, but rather a descriptive study that might guide further investigation and injury prevention avenues.

## 2. Materials and methods

### 2.1. Data source

The data in this study comes from the National Electronic Injury Surveillance System (NEISS). The NEISS is a dataset maintained by the US Consumer Product Safety Commission, which collects injury data from ~100 hospitals in the United States and its territories. Patient information is collected from each NEISS hospital for every emergency department (ED) visit involving an injury associated with consumer products. This data base is in the public domain and can be found at

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www.cpsc.gov/library/neiss.html. Details regarding the acquisition of the NEISS data and guidelines for its use can be accessed from the above web site. This study was classified as exempt by our local Institutional Review Board.

The NEISS data base includes stratified hospital size, date of ED visit, product involved in the injury, gender/race/age of the injured patient, diagnosis, disposition from the ED, geographic location of the injury, and body part injured. At the end of every case are narrative comments giving further details. The hospital strata are comprised of 4 hospitals based on size (the total number of ED visits reported by the hospital which are small [0–16,830], medium [16,831–21,850], large [28,151–41,130], and very large [ > 41,130]) and 1 stratum consisting of children's hospitals of all sizes. From this stratified and weighted sample, an estimated total number of product related injuries treated in hospital EDs is calculated.

### 2.2. Collected data

The data for the 10 year period 2006 through 2015 due to bunk beds (NEISS product code 0661) was downloaded from the NEISS website into a Microsoft Excel™ file (Microsoft® Office 2003, Microsoft Corporation 1985–2003). Race was classified according to Eveleth and Tanner[8] as White, Black, Amerindian (Hispanic and Native American), Indo-Malay (Asian origins), Indo-Mediterranean (Middle Eastern and Indian subcontinent), and Polynesian. Due to the small numbers of Indo-Malays, Indo-Mediterranean, and Polynesian peoples in the data set, race/ethnicity is only reported for the White, Black, and Amerindian groups.

Injuries occurring in jails were identified by searching the narrative comments for each case using the FIND command in Excel™. This search was performed solely by one author to ensure consistency in identification. The terms used in the search were jail, prison, incarcerate(d), detention, correctional institution, prisoner, inmate, custody, police, law enforcement, justice, center. Only when the narrative comments were appropriately detailed to ensure that the patient was truly in a jail was the case marked as such. Throughout the remainder of this manuscript, the term jail will be used for all correctional institutions.

The mechanism of injury was obtained from the individual narrative comments. Five major mechanisms were identified: 1) falling out of the bunk bed, 2) jumping in some manner on the bunk bed, 3) striking/hitting the bunking bed, 4) getting onto the bunk bed, or 5) getting off the bunk bed. The injured anatomic areas are reported three ways. The first is a detailed breakdown, which was then condensed into two different classifications. The first classification collapsed the upper extremity injuries into one group and the lower extremity injuries into another group. The second classification placed neck injuries into the axial group, and collapsed upper and lower extremity injuries into an appendicular group. While reviewing the narrative comments it was often noted that the patient had a seizure and then sustained an injury. Thus the FIND command was used to search for the terms seizure, seizing, seized, and epilepsy to identify those who had a seizure before the incident.

Subcategories were created for further analyses and were: age groups, those with/without a fracture, a head injury, and an internal organ injury. A fracture was defined as an osseous fracture, excluding teeth and other organs. Narrative comments were reviewed to find fractures which were not coded as the primary diagnosis when a more severe injury was actually the primary diagnosis. In a few cases, an injury coded as a fracture was a “fracture” of an organ such as the spleen or eye, and were deleted as a fracture. A head injury was defined as a concussion, skull fracture, or any bleed within the calvarium. A traumatic brain injury (TBI) in this study excluded a skull fracture, while the head injury category included a skull fracture. Internal organ injuries were defined as any injury involving the lung, heart, mediastinum, trachea/larynx, abdominal organs [liver, spleen, kidney, pancreas, intestines, genitourinary organs {bladder, testicle, scrotum, vagina, uterus}], and head injury excluding skull fracture. Due to this refinement of data using the narrative comments, the estimated numbers given in the tables are not totally identical when comparing the head injury and traumatic brain injury groups, and the fracture yes/no groups with a fracture as the diagnosis in the major diagnosis categories.

### 2.3. Statistical analysis

Statistical analyses were performed with SUDAAN 10™ software (RTI International, Research Triangle Park, North Carolina, 2008) due to the stratified and weighted nature of the NEISS data to account for the weighted and stratified nature of the data. Such analysis calculates an estimated value across an entire population encompassed by the data set along with ± 95% confidence intervals [CI]. For the purposes of reporting our results, we include the raw number of patients (n), the estimated number (est), and 95% CI [lower, upper]. Analyses between groups of continuous data were performed with the Student's t-test (2 groups) or ANOVA (3 or more groups). Differences between groups of discrete data were analyzed by the $\chi^2$ test. A $p < 0.05$ was considered statistically significant.

## 3. Results

There were 20,742 ED actual visits for bunk bed associated injuries resulting in an estimated 639,670 [542,965, 736,045] visits. All of those occurring in jail were in the 10–14 year age group or beyond. We therefore excluded those in the 0 to 4 and 5–9 year age groups, and are reporting only on the subset of patients over 10 years of age (n = 4976, est = 177,165 [144,213, 210,117]). Of these 177,165 cases, 51,204 [35,082, 55,860] (n = 1381) occurred in jail (28.9%) (Fig. 1). We analyzed the data set to ensure that we identified all injuries which occurred in jail. All the 1381 injuries that we identified as occurring in jail, using the FIND command, had the NEISS location code of 5, which is other public property. We thus feel confident that the data is accurate. In the following sections we report results with notable differences. All results (notable or not) for all variables, with their n, est, 95% CIs, and p values, are given in the supplemental tables.

### 3.1. Comparison between those in or out of jail

Analyses between those occurring in or out of a jail demonstrated no differences by year, month, or weekday of injury, and so no further temporal analyses are reported. Those who sustained a bunk bed injury in jail compared to those who did not (Supplemental Table 1) were older (33.5 [32.2, 34.8] vs 24.2 [23.2, 25.2] years ($p < 0.001$), more commonly male (81.2% vs 53.8%, $p < 0.0001$), seen in smaller hospitals (50.2% vs 27.8%, $p < 0.001$), more likely admitted (6.4% vs 3.2%, $p = 0.0051$), more frequently associated with a seizure (3.6% vs 0.8%), and less frequently associated with alcohol use (0.2% vs 1.7%,

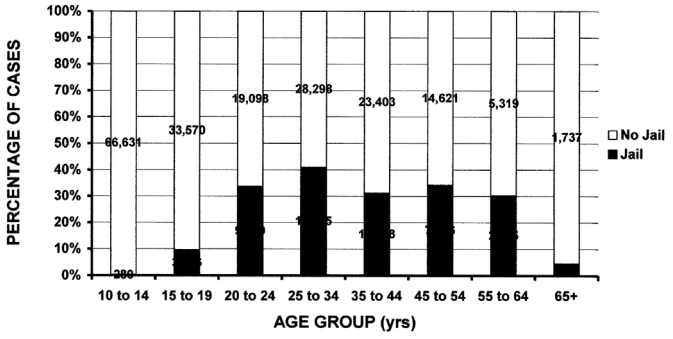


**Fig. 1.** Age histogram of bunk bed injuries comparing those occurring in or outside of jail.