

Original Contributions

KNIFE-RELATED INJURIES TREATED IN UNITED STATES EMERGENCY DEPARTMENTS, 1990–2008

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Abstract—Background: Knives cause more disabling injuries than any other type of hand tool. **Study Objectives:** This study investigates knife-related injuries requiring Emergency Department (ED) treatment among children and adults in the United States (US) from 1990 through 2008. **Methods:** A retrospective analysis of data from the National Electronic Injury Surveillance System of the Consumer Product Safety Commission was conducted. **Results:** An estimated 8,250,914 (95% confidence interval [CI] 7,149,074–9,352,755) knife-related injuries were treated in US EDs from 1990 to 2008, averaging 434,259 (95% CI 427,198–441,322) injuries annually, or 1190 per day. The injury rate was 1.56 injuries per 1000 US resident population per year. Fingers/thumbs (66%; 5,447,467 of 8,249,410) were injured most often, and lacerations (94%; 7,793,487 of 8,249,553) were the most common type of injury. Pocket/utility knives were associated with injury most often (47%; 1,169,960 of 2,481,994), followed by cooking/kitchen knives (36%; 900,812 of 2,481,994). Children were more likely than adults to be injured while playing with a knife or during horseplay ($p < 0.01$; odds ratio 9.57; 95% CI 8.10–11.30). One percent of patients were admitted to the hospital, and altercation-related stabbings to the trunk accounted for 52% of these admissions. **Conclusions:** Knives represent an important source of morbidity and mortality to people of all ages. Manufacturers should develop safer knife designs that incorporate features, such as improved opening and closing mechanisms on pocket knives, to prevent these injuries. Other potential safety efforts include targeted educational interventions and

changes in voluntary product safety standards and public policy. © 2013 Elsevier Inc.

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INTRODUCTION

A knife is defined as an instrument with a blade with a sharp edge used for cutting, usually attached to a handle (1). It can have either a fixed blade or a blade that folds into a handle. Knives may be used as tools (e.g., pocket knife, utility knife, machete, scalpel), utensils (e.g., bread knife, table knife, butcher knife, electric knife), and weapons (e.g., bayonet, throwing knife, combat knife).

Knives cause more disabling injuries than any other type of hand tool (2). There are no epidemiological studies of knife-related injuries in the literature that use a nationally representative sample. Most knife-related injuries are described in studies of firearm- and knife-related penetrating trauma, hunting-related injuries, and studies or case reports involving knife-related injuries to a particular body region (3–12). This report investigates knife-related injuries requiring Emergency Department (ED) treatment among children (<18 years) and adults (≥ 18 years) in the United States (US) from 1990 through 2008 using nationally representative data from the National Electronic Injury Surveillance System

(NEISS) of the US Consumer Product Safety Commission (CPSC).

MATERIALS AND METHODS

Data Source

The CPSC monitors injuries treated in US hospital EDs through the NEISS. The NEISS was established in 1972 and has had revisions made in its sampling frame in 1978, 1990, and 1997. The NEISS obtains data from a probability sample of 98 hospitals, which were selected from the population of all hospitals with EDs with at least six beds in the US and its territories (13). Estimates of injuries occurring nationally are made from this probability sample. Data regarding injuries associated with consumer products and recreational activities are collected on a daily basis by professional NEISS coders at each participating hospital and are uploaded electronically to the CPSC.

Data were obtained from the CPSC regarding knife-related injuries (product codes: 0218 [knives, electric or battery-powered]; 0836 [knives with replaceable blades]; and 0464 [knives, not elsewhere classified]) reported through the NEISS during the 19-year period, 1990 through 2008.

Data Analysis

The narrative for each case is free text and was reviewed manually, and cases that were erroneously coded as knives were excluded from this study. Data were divided into two main age groups for analyses: children (<18 years) and adults (≥ 18 years). Trends by age group were identified using graphs based on age in single years. The original NEISS variables for body region injured, diagnosis, locale, and disposition from the ED were regrouped for analyses as follows. Categories for body region injured consisted of: head/face/neck; trunk (NEISS categories: shoulder, upper trunk, lower trunk, and pubic region); finger; hand; other upper extremity (upper arm, elbow, lower arm, and wrist); lower extremity (upper leg, knee, lower leg, ankle, foot, and toe); and other (internal and >25% of body). Diagnosis was categorized as: amputation/avulsion, laceration, puncture, and other (NEISS categories: burn, contusion/abrasion, hematoma, ingested foreign object, foreign body, fracture, dislocation, concussion, crushing, dental injury, nerve damage, strain/sprain, hemorrhage, electric shock, "other," and internal organ injury). Locale (location where the injury event occurred) was categorized as: home, school, other public property, and other (NEISS categories: street/highway, industrial, and place of recreation/sports). The final disposition of patients from the ED was categorized as: treated and released (NEISS categories: "treated and released" and

"against medical advice"), admitted ("treated and transferred for hospitalization," "treated and admitted for hospitalization," and "held for observation for <24 hours"), and fatality.

The narrative for each case was used to identify cases involving frozen food, a stabbing during an altercation, the type of food being cut or separated at the time of injury (butter, vegetable, meat, seafood, beverage [frozen], fruit, dessert, breads, and other), and the type of knife involved in the injury event (cooking/kitchen, craft/hobby, toy/plastic, sports, weapon [sword, saber, army/military, switch blade, dagger, ninja, and bayonet], brush cutting/gardening/harvesting [machete, corn, scythe, cane, pruning, sickle, bush, and bolo], utility/pocket, electric, construction/home remodeling [carpenter's, carpet, linoleum, hook, roofing, flooring, draw, tile, wall board, and insulation], dull-edged [putty, scraper, and taping], and other [serrated, locking blade, scalpel, double-edge, cigar cutter, "pipe cleaning," "horse hair," "rock," "sheering," retractable, and triple-edge]). Mechanism of injury was also coded from the narrative. The 11 categories for mechanism of injury included: cutting food item; cutting non-food item; opening item; washing/drying dishes or putting knife in/taking knife out of dishwasher; knife was dropped or fell onto patient; playing with knife/horseplay; using knife as a tool (e.g., screwdriver, pry bar); cleaning fish/field dressing game; sharpening knife/pencil/crayon; carving/whittling wood/pumpkin; and other (categories comprising <2% of the total number of cases).

Data were analyzed using SPSS software (version 17.0; SPSS, Chicago, IL). Sample weights provided by the CPSC were used in all analyses to adjust for the inverse probability of selection and make national estimates regarding knife-related injuries. Unweighted numbers <20 were not used for data analyses because they would provide unstable estimates. This procedure for dealing with small numbers is similar to that used by the National Hospital Ambulatory Medical Care Survey (14). Statistical analyses included linear regression, chi-squared analysis with Yates' correction, and computation of odds ratios (ORs) with 95% confidence intervals (CIs). All 95% CIs were calculated using SAS (version 9.1; SAS Institute, Cary, NC) and SAS-callable SUDAAN (version 10; Research Triangle Institute, Research Triangle Park, NC) software. The level of significance for all statistical tests was $\alpha = 0.05$. All data reported are national estimates unless identified as unweighted sample data.

Injury rates were calculated using US resident population data from the US Census Bureau as the denominator (15). Census data used for injury rate calculations were matched to the age range of patients included in this study (0–101 years) and were for July 1 during intercensal

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