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Injuries from firearms in hunting activities☆

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ABSTRACT

Background: Recreational hunting is a very popular sport, and frequently involves firearms. Few studies address the pattern of firearm injuries occurring with hunting and how they differ from firearm injuries not associated with hunting.
Purpose: A nation wide database will provide an overall perspective of the scope of the problem and types of injuries.
Methods: Our data were obtained from the Inter-University Consortium for Political and Social Research Firearm Injury Surveillance Study 1993–2008 (ICPSR 30543). It was statistically analyzed for demographic and injury patterns using SUDAAN 10^{TM} software. A $p < 0.05$ was considered to be statistically significant.
Results: There were 1,841,269 ED visits for firearm related injuries 1993–2008; 35,970 were involved in hunting (1.95%). Hunters were older than non-hunters (34.5 vs. 26.7 years, $p < 0.0001$). Handguns were involved in 48% of the non-hunters and 5.3% of the hunters ($p < 0.0001$). The injury was unintentional in 99.4% of hunters; for non-hunters 32.1% were unintentional and 60.7% assaults. The majority of the hunting injuries presented to small hospitals (65.9%) while the majority of non-hunting injuries presented to the large (27.0%) and very large (35.0%) hospitals. Hunters were nearly all Caucasian (92%). In hunters, 57% were shot compared to 77% in non-hunters. The most common diagnosis in hunters was a laceration (42%) compared to a puncture in non-hunters (41%). The head and neck accounted for nearly one-half of the injuries in hunters (47%); for non-hunters it was the head and neck (29%) and the leg/foot (24%). Mortality was 0.6% for hunters and 5.3% for non-hunters. The use of alcohol and being involved in antisocial behaviours was much higher in the non-hunters. The estimated incidence of a firearm injury associated with hunting activities was 9 per 1 million hunting days.
Conclusion: Hunters injured by firearms were nearly all Caucasian, older than non-hunters, did not involve handguns, presented to small hospitals, often sustained unintentional injuries and were not shot; most commonly injured in the head and neck, and had an overall mortality of 0.6%. These data can be a reference for future studies regarding hunting injuries associated with firearms.

Recreational hunting is a popular sport in the United States and frequently involves firearms. The US Fish and Wildlife Service estimated that ~13 million people were annually involved in hunting activities 1991 through 2011 [1–5]. This exposes millions to potential injury from firearms, estimated to be 6.3% of the entire US population [1–5]. No study has investigated the pattern of firearm injuries from hunting activities and how they differ from firearm injuries not associated with hunting. None have used a national database to include all patients, both those admitted and discharged from the hospital. It was the purpose of this study to address this question. This will provide a global perspective of this issue and the types of injuries.

Materials and methods

The data for this study was obtained from the Inter-University Consortium for Political and Social Research Firearm Injury Surveillance Study 1993–2008 (ICPSR 30543) [6] collected by the National Electronic Injury Surveillance System (NEISS) [7]. This study was determined to be exempt by the local Institutional Review Board. The NEISS, a branch of the US Consumer Product Safety Commission, collects data from a probability sample of hospitals in the United States and its territories that have at least

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six beds and an emergency department (ED). (Unfortunately it does not include those who only get care at acute care facilities not associated with a hospital or care in their own physician's offices.) The sample contains five strata, four based on size (the total number of emergency room visits reported by the hospital and are small, medium, large, and very large) and one stratum consisting of children's hospitals. Currently there are 100 hospitals in the NEISS. Patient information is collected daily from each NEISS hospital for every patient treated in the ED due to an injury associated with consumer products. For this particular study, the ICPSR data set consists of any patient seeking care in and ED for any firearm related injury, regardless of activity involved during the injury (e.g. hunting, drill practice, committing a crime, suicide, assault), and whether or not the patient had been shot by the firearm or injured in some other way (e.g. laceration while cleaning a firearm, head trauma from being pistol whipped, a clavicle fracture from a rifle recoil, etc.).

The hospitals selected to be in the NEISS reflect the current distribution of all hospitals in the USA and its territories. Each hospital has an associated weight based on its ED size and geographic location. The hospital weight used by NEISS is equal to the inverse of the probability of selection for the hospitals in each stratum. The inverse of the probability of selection is simply the total number of hospitals on the sampling frame divided by the total number of hospitals in the sample calculated at the stratum level. Adjustments to these basic weights are made for non-response and hospital mergers. Annual estimates of injuries are derived by summing the monthly estimates for all months of the year. In order to produce national estimates of injuries, the statistical weights must be used rather than raw case counts. Because the statistical design provides different statistical weights for hospitals by its strata, weighted data (rather than raw counts) must also be used when analyzing for proportions or ages. Estimates across the entire data set (in this instance the USA and its territories) are thus calculated using appropriate statistical software which accounts for the stratified, weighted data. Further details regarding the acquisition of the ICPSR/NEISS data and guidelines for use of such data can be accessed from their respective web sites (ICPSR – www.icpsr.umich.edu, NEISS – www.cpsc.gov/library/neiss.html).

The detailed data for emergency department (ED) visits for the period 1993 through 2008 due to firearms were downloaded from the ICPSR website. It was analyzed for age, diagnosis, gender, race, marital status, type of firearm, perpetrator of injury (stranger, self, friend/acquaintance, spouse/ex, other relative, not seen/other), intent of injury (unintentional, assault, suicide, law enforcement), anatomic location of the injury, the geographic location of where the injury occurred, method of transportation to the ED, disposition from the ED, was the patient shot, and behavioural circumstances involved (drugs/crime/fight/argument/alcohol). Regarding the diagnosis, the one recorded in the data set is the final diagnosis given by the ED attending physician. If there is more than one diagnosis, the most severe diagnosis is recorded [8]. For example, a bullet injury could be coded as either a laceration or a puncture. However, unless it was simply a superficial grazing laceration, a puncture diagnosis would be recorded, as that is more severe. Regarding the perpetrator of the injury, a self inflicted occurs only when the patient injures himself; any one else is described by on of the other groups (stranger, friend/acquaintance, spouse/ex, other relative, not seen/other). With firearm injuries the common thinking is that the patient was shot; however that is not necessarily true, as the injury could have occurred by a different mechanism (e.g. a clavicle fracture during recoil from a rifle, beaten with a hand gun, etc.). Race was classified as White, Black, Amerindian (Hispanic and Native American) and Indo-Malay (Asian origins) [9]. Anatomic location of the injury was grouped into head/neck, upper and lower trunk, arm/hand, and leg/foot.

The individual comments for each case were analyzed to determine if either hunting or alcohol was involved by searching the ICPSR data set using the FIND command in Microsoft Excel™ (Microsoft® Office 2003, Microsoft Corporation 1985–2003). The keywords used to search for any injury involving hunting were: hunt(ing), deer, elk, moose, bear, antelope, coyote, lion, wolf, boar, hog, groundhog, prairie dog, squirrel, rabbit, coon, beaver, waterfowl, goose/geese, turkey, duck, quail, coon, pheasant, bird, sparrow. The keywords used to search for alcohol were: alcohol, EtOH, intoxicated, drinking, drank, drunk, club, ethanol, saloon, tavern, liquor, booze, beer, whiskey, brandy, rum, vodka, scotch, tequila, wine, sake, champagne, and cognac.

Statistical analyses

Due to the stratified and weighted nature of the ICPSR data, statistical analyses were performed with SUDAAN 10™ software (RTI International, Research Triangle Park, North Carolina, 2008). This software accounts for the weighted and stratified nature of the data, and calculates an estimated value across the population encompassed by the data set (the entire United States of America in this case) and 95% confidence intervals (given in brackets as [lower 95%, upper 95% intervals]). Continuous data are reported as the mean and discrete data as frequencies. 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 χ^2 test. These tests for significance in SUDAAN are stratum adjusted for the weighted nature of the data and are analogous to their counterparts with non-survey, weighted data.

Results

There were a total of 1,841,269 [1,818,437, 1,864,101] ED visits for firearm related injuries 1993–2008; 35,970 were involved in

Table 1
Age and age groups.[a]

	Total	%	Hunting	%	Not hunting	%	*p* value
All	1,841,269 [1,818,437, 1,864,101]		3597 [26,330, 49,162]		1,805,299 [1,792, 107, 1,814,939]		–
Age (years)	26.9 [26.4, 27.4]		34.5 [32.5, 36.4]		26.7 [26.2, 27.3]		<0.0001
Age group (years)							
0–14	243,467 [197,758, 297,735]	13.5	4277	11.9	239,190	13.3	<0.0001
15–24	748,773 [711,745, 786,270]	41.5	8101	22.6	740,672	41.3	
25–34	406,901 [385,444, 429,207]	22.5	6759	18.8	400,142	22.3	
35–44	231,299 [221,013, 242,070]	12.8	6875	19.1	224,424	12.5	
45–54	110,784 [103,640, 118,288]	6.1	4870	13.6	105,914	5.9	
55–64	50,101 [44,312, 56,581]	2.8	2854	7.9	47,247	2.6	
65+	38,765 [33,875, 46,693]	2.1	2166	6.0	36,599	2.0	

[a] 95% CI in brackets.