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Firearm injuries due to legal intervention in children and adolescents: a national analysis

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ABSTRACT

Background: Firearm injuries related to legal intervention have come under scrutiny because of recent events.

Methods: The Kids' Inpatient Database (1997-2012) was searched for firearm injuries due to legal interventions (*International Classification of Diseases, ninth revision, Clinical Modification E970*) requiring inpatient admission in children aged <20 y. Cases were weighted to provide national estimates. The Brady Campaign criteria were used to identify lenient versus strict gun law states.

Results: Overall, 275 cases were identified, with a 7.5% mortality rate. Incidence peaked at 1.0 per 100,000 admissions in 2006, significantly increased from a low 0.2 per 100,000 admissions in 1997, $P < 0.001$. Patients were predominantly male (97%). African Americans (44%) represented the largest racial group, followed by Hispanics (30%) and Caucasians (20%). Mean age was 17.5 ± 2.08 y. Patients were insured by Medicaid (33%) or a private payer (24%); the remainder (43%) was uninsured. Admissions most frequently occurred at urban teaching hospitals (81%). Cases occurred most frequently in the Southern United States (44%), followed by the Western United States (35%). Most patients presented to non-children's hospitals (97%). Mean hospital admission cost was $27,507 \pm 40,197$ USD, whereas mean charges amounted to $75,905 \pm 116,622$ USD. Cases mostly occurred in lenient (56%) gun law states, whereas the remainder occurred in strict (41%) and neutral (3%) states. When analyzed by race, Caucasians (16%) had a significantly higher mortality rate when compared with African Americans (5%), $P = 0.03$.

Conclusions: An analysis of this very specific injury mechanism demonstrates important findings, which are difficult to collect from conventional data sources. Future research will contribute to the objective analysis of this politically charged subject.

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Introduction

Firearm injuries within the pediatric population remain a public health concern, and in 2014, they were the second leading cause of mortality among children aged 1-19 y.^{1,2} Over the last 15 y, there have been more than 35,000 pediatric (aged 0-19 y) firearm-related mortalities and an admission rate of almost 10,000 per year.¹ In 2010, there were 2966 pediatric deaths in the United States secondary to firearm injuries in children and adolescents aged up to 19 y.³ Although these numbers have decreased over the last few decades, with 5344 recorded pediatric (aged 0-19 y) firearm-related deaths in 1991,⁴ the epidemic continues and health care professionals, law authorities, and parents must still be aware of the implications of pediatric violence exposure in the United States.

Penetrating injury patterns among pediatric patients, similar to adults, have been associated with lower socioeconomic classes.^{5,6} In addition to the immediate patient burden, pediatric firearm injuries pose a significant socioeconomic impact on caregivers and health care costs as well.⁷ Hospital admissions because of these injuries have recently increased and associated health care costs have been quoted to be \$371 million dollars in 2008.⁷⁻⁹ Nonetheless, state and federal authorities have made little progress in raising awareness and passing legislature to help prevent such injuries. Importantly, legal intervention-related firearm trauma has been reported as an injury mechanism of pediatric death in various studies.^{7,10} Although legal interventions comprise a minor fraction of pediatric firearm injury causes, they more commonly affect adolescents compared with infants and young children.¹¹

Because of recent local and national events, firearm injuries secondary to legal intervention have come under closer scrutiny by both the public and law officials alike. Currently, there is a paucity of studies that examine legal interventions in relation to pediatric firearm injuries. The purpose of this study was to examine trends and provide estimates of legal intervention-related pediatric firearm injuries using a large, population-based database.

Materials and methods

To construct our study dataset, we used the Kids' Inpatient Database (KID), which is a sample of pediatric admissions maintained by the Agency for Healthcare Research and Quality.¹² Datasets are releases triennially, with data on up to 7.5 million weighted cases. All diagnoses and procedures are coded using the *International Classification of Diseases, ninth revision, Clinical Modification (ICD-9-CM)*. The data are standardized and cleaned before each release, and quality is ensured following the guidelines set by the Healthcare Cost and Utilization Project.¹³

We identified cases of firearm injuries due to legal interventions (ICD-9-CM code E970), requiring inpatient admission in children aged <20 y from the 1997, 2000, 2003, 2006, 2009, 2012 releases of the KID. These datasets represent all the data available from the KID. Patients with dispositions coded as "transfer to short-term hospital" and "other transfers,

including skilled nursing facility, intermediate care, and other type of facility" were excluded to avoid duplicate reporting.

States were classified as strict or lenient with regard to firearms regulation, based on the Brady Campaign to Prevent Gun Violence grading method, released as the 2013 State Scorecard.¹⁴ The Brady Campaign criteria rank state gun control laws on categories of (1) background checks and access to firearms, (2) other regulation of sales and transfers, (3) gun owner accountability, (4) firearms in public places, (5) classes of weapons and ammunition/magazines, (6) consumer and child safety, (7) investigating gun crimes, (8) local authority to regulate, and (9) other regulations. For the purposes of this study, states with grades "A" to "C+" were considered strict gun control law states, those with "C" were considered to be neutral, and those with "C-" to "F" were considered lenient gun control law states. These grades are based on a summation of points evaluating the aforementioned categories; for example, under the first category, states are given 11 points for background checks, 2 points for mental health reporting, 1 point for prohibiting sales to individuals on the terror watch list.¹⁴ As the "State" variable is not available for the 1997 and 2012 releases, state comparisons use data derived from the 2000, 2003, 2006, and 2009 releases when applicable.

All statistical analyses were performed using SPSS Statistics, version 21.0 (IBM; Armonk, NY, 2012). This study was deemed to be exempt from full review by the Institutional Review Board at the University of Miami Miller School of Medicine (Miami, FL).

Results

Overall, a total of 275 cases were identified during the study period, with a 7.5% mortality rate. Case incidence reached a peak at 1.0 per 100,000 admissions in 2006, significantly increased from a low 0.2 per 100,000 admissions in 1997, $P < 0.001$. For a graphical representation, see [Figure](#).

Patients were predominantly male (97%). African Americans (44%) represented the largest racial group, followed by Hispanics (30%) and Caucasians (20%). Mean age was 17.5 ± 2.08 y. Patients were most frequently insured by

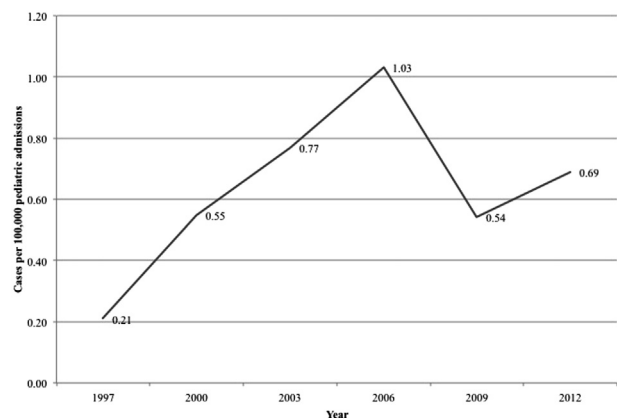


Figure — ■■■■.

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