Chapter 4
Unintentional Firearm Injuries in Children

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Introduction

Unintentional firearm injuries and death in children are sad American realities. According to the Brady project, 86 children are killed unintentionally by gunfire each year, and 2893 are shot unintentionally [1]. With gun-related injuries as the second leading cause of traumatic injury in American children, and approximately 5–10% of American children living in homes with a loaded and unlocked firearm, this is a very significant public health problem [2].

In this chapter we will explore the epidemiology of unintentional firearm injury and death in children. We will explore the cost to children and society. And, we will explore ways to address this public health crisis, through changes in policy, gun manufacture, personal gun use and storage, and avenues for healthcare provider–based intervention.

Epidemiology

Unfortunately, large gaps exist in the literature surrounding gun injuries and death in children. What is known is that between 1991 and 2010, firearms were responsible for 12.6% of all deaths in children in the United States [3]. This prevalence represents 19 children or adolescents injured or killed by firearms every day. The incidence of nonfatal gunshot wounds has been estimated to be between 15 and 20 per 100,000 per year, with death rates at 3–3.44 per 100,000 per year [4]. The American rate of

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unintentional firearm deaths is much higher than in all other high-income countries. In review of 23 high-income countries, it was found that close to 90% of all children aged 0–14 unintentionally killed by firearms resided in the United States [5].

A large proportion of the gun injuries and death in children have been found to be unintentional in nature. Population-based estimates suggest that between one- and two-thirds of all gunshot wounds were unintentional in children [4, 6]. Unintentional gunshot injuries and deaths can be grouped into two categories; those where the gunshot injury was self-inflicted, but unintentional, and those where the gunshot injury was inflicted by another, but unintentional. A recent exploration of this other versus self-inflicted unintentional injury categorization by Hemenway et al. revealed that two-thirds of unintentional injuries in children were other inflicted, with one-third self-inflicted injuries [7]. This is in line with previous work showing that in more than 50% of unintentional fatalities somebody besides the victim fired the shot [8].

Deep explorations in this field have revealed that most unintentional firearm deaths and injuries happen in the context of playing with the gun, hunting, cleaning, or loading the gun [8]. Often these injuries occur when children are playing together, and one thinks that the gun is a toy. These injuries and deaths occur most often in the home [9]. It has been found that a high percentage of the shooters in unintentional injury and death in children are male, a family member, or a friend or acquaintance. Most often the guns used in unintentional shootings were owned by family members (68%) [10].

Unintentional firearm injuries and death span both urban and rural communities, and are not specifically concentrated in any racial or socioeconomic demographic [3]. When considering all age unintentional firearm injury deaths, those in more rural counties more likely to die from unintentional firearm deaths than urban counties [11].

The injuries caused by unintentional gunshots are more likely to lead to death in the youngest children, with case fatality rates higher in younger patients [3]. Case fatality rates from gunshot wounds are almost five times higher in younger versus older children [4]. It is known that children under the age of 10 rarely commit suicide, but unintentional firearm deaths are within the top 10 causes of injury deaths in this population [12]. Lack of danger awareness, inability to understand cause-and-effect consequence, failures of supervision, and popular media showing frequent use of guns all make young children at the highest risk for unintentional firearm injury and death [13].

Cost estimates of firearm-related unintentional injury and death in children are difficult, but one paper from 2002 by Cook and Ludwig estimated that the cost of gun suicides and accidents (unintentional injury and death) range between $10 and $20 billion per year [14].

Gun Laws

In 2019 the American Pediatric Surgical Association issued a position statement on firearm injuries in children. This consensus statement detailed multiple policy recommendations, and echoed similar recommendations from a consensus statement

of eight health professional organizations and the American Bar Association [15]. One major focus of the policy recommendations was on the creation of strong childhood access prevention laws (CAPs) [16]. CAPs are state-imposed regulations that place liability on those who improperly store firearms. There is significant variability in the strength of individual state CAP laws. Some states have elected for strong CAP laws that impose felony charges on those whose guns are used by children in injuries or deaths.

Efficacy of CAP laws has been questioned, but their intent in reducing unintentional injury and death from in-home gun use by children is clear. CAP laws have been shown to be associated with lower rates of unintentional firearm fatalities in adults, and states with felony CAP laws had lower unintentional firearm death rates than those with misdemeanor CAP laws [12, 17, 18]. Although the data is of variable quality regarding the efficacy of CAP laws, there appears to be a trend toward their effectiveness.

Other gun laws are less specific to the prevention of child unintentional injury. Those related to minimum age for purchase, permit to purchase, background checks, assault weapons bans, and junk gun bands to limit the sale of inexpensive poor-quality firearms have been proposed as generalized preventative strategies for all ages and for unintentional and interpersonal violence-related injury and death.

Gun Manufacture and Storage

The most frequently reported guns found in homes with children are shotguns, rifles, and handguns. Several gun manufacturers build and market hunting rifles in child-friendly colors [19]. Historical data suggests that handguns were responsible for the majority of unintentional injuries and deaths [20]. Unfortunately, the Consumer Product Safety Commission (CPSC) is not allowed to regulate firearms or ammunition [21].

All manufactured safety devices on firearms are electively placed there by the manufacturer, and are not required by law. Several of these manufactured mechanical safety devices have been available since the nineteenth century [21]. Mechanical loaded chamber indicators show when a handgun with a clip has a bullet in the chamber. Magazine safeties operate in a similar fashion to prevent the discharge of bullets not recognized to be present within the gun after the magazine has been removed. Further mechanical innovations such as fingerprint detection, heavier trigger pulls to prevent child, combination squeeze and trigger mechanisms use (a technology available since the 1880s), and integrated locking mechanisms are all available and may prevent child use and inadvertent discharge of weapons in homes [22]. Decreasing the lethality of the weapon is also a potential avenue for safety.

The least safe manner for gun storage is loaded and unlocked. The safest manner for gun storage is unloaded and locked. Multiple methods are available for locking guns, from trigger and barrel locks to safes. Unfortunately, surveys have shown that

a high percentage of gun owners store at least one of their firearms in the least safe manner. There is a high prevalence of poor storage, with the literature finding close to 50% of respondents to in some surveys reporting an unlocked firearm [23].

Other Interventions

Multiple avenues are potentially available to impact the primary prevention of unintentional gun injury and death in children. From community-based interventions for safe firearm storage, to school-based interventions that include behavioral skills, to clinician-driven informational interviewing in the pediatrician's office, to legislative efforts such as buyback programs. Unfortunately, current research is not sufficient to evaluate the strengths or weaknesses of any one specific interventional strategy on unintentional firearm injury and mortality in children [24]. Some research has shown that community-based firearm safety counseling and unlocked distribution have changed the way parents have stored and kept guns in the home, although the quality of such work is inconsistent [25].

The American Pediatric Surgical Association advocates for clinicians to discuss firearm safety with patients and their family members, free of legislative restriction [16]. Unfortunately, it has been shown that screening rate for firearm safety by clinicians is low. It is unclear whether or not this screening practice actually impacts high risk population injury and mortality [26]. There appears to be a lack of knowledge and practice on the part of individual clinicians with respect to obtaining and applying screening and counseling for firearm risk.

Conclusion

The United States unfortunately has the world's highest rate of unintentional firearm injury and death in children. Changing this state of affairs will require a combination of approaches to address the inherent lack of safety of how many guns are stored in the United States, their accessibility to children in homes across the nation, and the overall prevalence of firearms in our society. The youngest children are most vulnerable to death from gunshot injury, and have the least inherent fear of the weapon. From legislative strategies to enforce the safe-keeping and storage of firearms away from children, to the reduction in overall volume of guns in homes through by back programs to the improved engineering for safety of firearms, and through the advocacy, screening, and clinical intervention of pediatricians and other healthcare providers, there may be a way to decrease the frequency of these tragedies.

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