An Overview of Firearm Safety and Injury Prevention

Firearm injuries are a significant public health problem in the United States (U.S.), contributing substantially to premature death and disability. Suicide by firearm alone is the fourth leading cause of injury deaths in the U.S. for persons of all ages. Understanding the nature and impact of the problem is a first step toward preventing firearm injuries. From 2012 to 2016, there have been over 175,000 firearm deaths in the U.S. Firearm injuries are preventable and using a science-driven approach to understand the risks and protective factors can help to identify effective solutions to achieving measurable reductions in firearm violence. The purposes of this topic brief are to educate emergency nurses on the prevalence of firearm injuries in the U.S., discuss populations at risk, review safe storage practices, and provide suggestions for patient education.

Overview: Firearm Injuries in the United States

A firearm-related injury is defined as a wound or penetrating injury resulting from a weapon that uses a powder charge to fire a projectile. Some examples of firearms include rifles, handguns, revolvers, and shotguns. Air or gas-powered ball projectiles or “BB” pellet guns are not classified as firearms. Injuries resulting from non-penetrating mechanisms such as being struck or “pistol whipped” are also excluded.

The characteristics and frequency of firearm injuries in conjunction with the considerable impact on health and safety, make firearm-related injuries and death an important public health problem. Many Americans are non-fatally injured or die in acts involving a firearm each year. Firearm-related injuries that present to an emergency care setting can include acts of interpersonal violence, self-directed violence such as suicide, and intentional and unintentional injuries such as homicide or accidental firing.

While firearm injuries are a global issue, the U.S. held the 31st highest rate in the world, totaling 3.85 deaths per 100,000 people due to firearm violence in 2016. Table 1 and Table 2 (located at the end of the document) provide an overview of firearm-related mortality and the incidence of firearm injuries from 2016. Each of the ten countries depicted in the tables show variation in injuries and death that emergency nurses can consider when targeting an approach for prevention. Perhaps lessons can be learned from other
countries with lower rates of mortality. Although limited research is currently available, having a better understanding of the incidence and risk factors for firearm-related injuries can help emergency nurses to develop strategies to decrease injury and death.

**Firearm-Related Injuries and Deaths**

The demographics of firearm-related injuries and deaths reveal that males account for 90% of all firearm injuries treated in EDs in the U.S. and have a disproportionately high rate of firearm mortality, succumbing to death by firearms six and a half times more often than their female counterparts. In 2015, firearm-related deaths in the U.S. nearly equaled the number of motor vehicle-related fatalities. Additionally, males represent 85% of the firearm-related fatalities; suicide related to firearm injuries is the most frequent cause of mortality (62%), followed by homicides (35%) and unintentional deaths (2%).

**Geography**

Patterns of firearm deaths vary by state. It may be beneficial for the emergency nurse to be aware of the firearm death rate in their state to have a better understanding of the likelihood of injury or death. Having awareness of the geographic location can also help the emergency nurse anticipate potential situations that they may encounter.

Overall, according to the CDC’s most recent data for 2016, Alaska had the most firearm deaths followed by Alabama. Between 2008–2014, Montana and Wyoming had two of the highest rates of suicide by firearm in the continental U.S.; however, states as far east and south as West Virginia and Alabama also report numbers higher than the national average.

The highest rates of firearm homicide among children were largely concentrated across seven Southern states (AL, FL, GA, LA, MS, SC, and TN), four Midwestern states (IL, MO, MI, and OH), two Western states (CA and NV), and three Northeastern states (CT, MD, and PA). Firearm suicides among children were more dispersed across the United States.

**Pediatric Population**

From 2002 to 2014, 5,790 children received medical treatment in an ED each year for a firearm-related assault, an act of self-harm, or from an unintentional firearm injury. During this same period almost 1300 children died each year in the United States from a firearm-related injury. Of these, 53% percent were homicides, 38% were suicides, and 6% were unintentional firearm deaths, while the remaining 3% were due to legal intervention or deaths of undetermined intent.

“When children are fatally injured by guns, the location is most often a home, the shooter is family, the gun owner is a relative, and the gun most often originates from the home, where it was left unlocked.”

**Intimate Partner Violence**

According to data obtained from the National Vital Statistics System and from the National Electronic Injury Surveillance System, trends from 2002 to 2014, intimate partner violence–related firearm homicides were more likely to be associated with younger children (as bystanders) while older children were associated with a precipitating crime.

While firearm prohibitions for those under domestic violence restraining orders (DVRO) have been shown to significantly reduce rates of intimate partner homicide, firearm access is associated with increased severity of intimate partner homicide. In the ED, victims of DV may or may not chose to disclose abuse to law enforcement for varied reasons. State laws regarding mandatory reporting should be followed, and it is crucial that ED nurses advocate for these patients by providing resources and assisting with detailed and practical safety planning upon discharge.
Suicide by Firearm

The American Foundation for Suicide Prevention reports that in 2016 suicide was the 10th leading cause of death in the U.S., and of those, over half were the result of a firearm.\(^2\) Although mass shootings and other firearm homicides garner much more attention, twice as many firearm deaths in the U.S. are actually suicide.\(^1\) Rates of suicide by firearm tend to increase with age; those aged 65 and older have the highest rate.\(^3\) Understanding the association between late-life suicide and physical illness is critical because chronic illness or poor health may function as a significant stressor contributing to the mounting risk for a vulnerable person.\(^4\) Other specific factors that may contribute to suicide in the elderly include psychiatric illness; social connectedness of the older person with his or her family, friends, and community; physical illness; and functional capacity.\(^5\) Acknowledging the complexity and multi-determined nature of suicidal behavior in older adults can help emergency nurses when screening for and identifying suicidogenic aging adversities including widowhood, social isolation, loss of financial security, poor health, and access to firearms.

Despite lower rates of suicide by firearm in younger groups, it remains a significant and preventable problem. According to data obtained from the National Vital Statistics System and the National Electronic Injury Surveillance System, trends from 2002 to 2014 show that firearm suicides among children were frequently precipitated by situational issues such as a crisis in the past or upcoming two weeks or being witness to relationship troubles with a parent and intimate partner, friend, or family member.\(^6\) Behavioral health factors have also shown to be evident in 34% of younger populations who commit suicide by firearm.\(^6\) Some indicated being in a depressed mood at the time of their death or had a medical diagnosis of a mental health problem, yet only 18% were receiving treatment at the time of death.\(^6\)

Acknowledging the complexity and multi-determined nature of suicidal behavior in older adults can help emergency nurses be cognizant in screening for and identifying suicidogenic aging adversities including widowhood, social isolation, loss of financial security, poor health, and access to firearms. As an emergency nurse, it is important to be observant of family structures, interactions, and dynamics of behavior. Understanding that possible triggers to commit suicide by firearm for children or younger populations include situational crisis or having reported being depressed can help healthcare providers screen potentially vulnerable persons and provide appropriate resources and education necessary to prevent injury or death. These precipitating factors may be indications for healthcare providers to further investigate and assess for firearm access and intent to harm self or others. As a part of discharge planning, it is important the ED nurse discuss ways of removing or locking up firearms during crisis periods. Restricting access is crucial in this period of crisis as many suicides are carried out with little preplanning.\(^16\) Validated screening tools such as the Ask Suicide-Screening Questions (ASQ), Manchester Self-Harm Rule (MSHR), Risk of Suicide Questionnaire (RSQ), the Columbia Suicide Severity Rating Scale (C-SSRS), and Geriatric Depression Scale, when used consistently, can aid the ED nurse in identifying and providing resources to patients at-risk for suicide.\(^17\)

Unintentional Firearm Injuries and Deaths

In 2016, there were a reported 161,374 deaths related to unintentional injuries and of that, 495 were firearm-related deaths, mostly consisting of the pediatric population.\(^7\) Unintentional firearm injuries and deaths are those in which an incident involving a firearm occurs without the intent to harm. For instance, a person who owns a firearm may be cleaning their firearm and it accidentally discharges causing harm or death. Injuries or deaths may occur if the individual, for one reason or other, believed that the firearm was not loaded. Another example of an unintentional injury is when a child finds a firearm and believes it to be a toy or playing with it out of curiosity and the firearm accidentally discharges. Unintentional firearm-related deaths account for a small portion of deaths but remain a significant and preventable issue.
Firearm-related deaths are the third leading cause of death among U.S. children and adolescents aged 1 to 17.\(^6\) Each day, it is estimated that 19 U.S. children are killed by or receive emergency treatment for firearm wounds.\(^8\) Boys, older children, and minorities are disproportionately affected.\(^7\) The difference becomes more pronounced by age, with the rate for 13- to 17-year-old boys being six times higher than the rate for same-aged girls.\(^8\)

The most common circumstance surrounding unintentional firearm deaths of both younger and older children was playing with a gun.\(^8\) Older children, comparative to younger children, more often died in occurrences involving showing a gun to others and/or mistakenly thinking the gun was unloaded or the safety was engaged.\(^5\) In fewer cases, a gun was mistaken for a toy, or a child was injured while hunting or target shooting.\(^8\) While occurrence of unintentional firearm injury and deaths remains low, unintentional firearm injury may be decreased with age appropriate firearm education, safe storage practices, and gun locks.

### Strategies for Reducing Firearm-Related Injuries and Death

According to the Centers for Disease Control and Prevention (CDC), strategies to reduce death and injury related to firearms need to focus on the underlying reasons.\(^18\) For example, if the underlying cause of death from a firearm was suicide, intervention strategies might include suicide prevention and interventions such as removing access to firearms and increasing coping mechanisms through lethal means counseling.\(^18\) On the other hand, if firearm-related death is a result of homicide, prevention may include mental health services and interventions through law enforcement. The American Academy of Pediatrics (AAP) argues that firearm-related injuries and deaths are preventable through programs that help children manage their emotions and develop coping and problem-solving skills through community outreach, school-based programs, and therapeutic approaches.\(^19,20\) In addition, the safe storage of firearms can help prevent access by a child who is playing or one considering suicide at the time of crisis.\(^20\) In addition, talking to children and adolescents about life stressors and educating parents on signs of depression or anxiety, as well as signs of violence in the home, are additional interventions.\(^20\)

### Safe Storage of Firearms

Safe firearm storage refers to practices that limit and control accessibility or convenience to firearms by unauthorized users.\(^21\) Storing firearms unloaded and in a locked area, in addition to storing ammunition in a separate locked area, has been shown to significantly reduce both accidental injuries and self-inflicted injuries and deaths among children and adolescents.\(^22\) In homes that contain firearms, there is a greater risk of violent death if the firearm is not stored safely and left unlocked, loaded, or both.\(^22\)

In addition to posing a risk for injuries amongst children and adolescents, suicide is five times more likely in homes containing firearms.\(^23\) One study found that families with young children were more likely to store guns securely, shortly after highly-publicized, nearby active shooter incidents.\(^24\) Suicide rates in homes with firearms stored unsafely are even higher.\(^23\) Safe storage of locked and unloaded firearms appears to be related to lower morbidity and mortality rates.\(^25\)

There are five main types of firearm storage: lock boxes, firearm vault or safe, cable locks, trigger locks, and personalized locks.\(^26\) Lock boxes are small and designed to store a firearm. The firearm is placed inside the box and typically has a push button, combination, digital keypad or a key to specifically open the lock.\(^26\) Some models have features that include lighting for access in the dark, and most have padded interiors. The advantages of a lock box include quick access and keeping firearms out of sight. It is important to convey to patients that when using this type of option to safely store firearms, combinations, codes, and keys are kept private and secure to ensure others do not have access.
Firearm vaults or safes come in a variety of sizes and most are designed to store long firearms but can safely store handguns, and other valuables.26 Most vaults or safes come with a push button, combination, or digital key pad that opens the lock. This type of option can be expensive, depending on the size and additional features. The advantages of using this type of firearm storage are that it allows a firearm collector to store many long firearms and handguns, the vaults are difficult to steal because of their size and weight, they are typically fire resistant, and keep valuables out of plain view.26 Some disadvantages are that these vaults are heavy to move and can be costly. Like lock boxes, it is important to convey to patients that when using this type of option to safely store firearms, combinations and codes are kept private and secure to ensure others do not have access.

Cable locks are devices that block the chamber of a firearm to prevent a cartridge from being fired.26 Chamber locks are inserted in or through the magazine well or chamber or are inserted through the firearm barrel and chamber to block a cartridge from moving into position.26 A combination lock or key opens the lock.26 The advantages of these types of locks are that they are inexpensive, and the long cables can be threaded through multiple firearms. A disadvantage is that these cables can be cut.

Trigger locks are often a two-piece lock that fits snuggly over the trigger guard of a firearm so that the trigger cannot be pulled.26 A push button keypad, combination, or key, opens the lock. Some trigger locks are battery operated; some have lighted keypads and anti-tamper alarms.26 The advantages of these types of locks are that they are relatively inexpensive and widely available. However, the disadvantages are that some models may not prevent older children or teens from accessing, the trigger lock may not prevent theft as the lock can be removed later, and sometimes trigger locks can easily break.26

Personalized locks are less common but are safety devices that are permanently installed on a firearm by the firearm owner or manufacturer.26 Personalized locks vary and have some sort of built-in key or combination lock that are specially designed with a magnetic or electronic lock that only allows the owner of the firearm access. The firearm owners have a special ring or bracelet, and in some cases, fingerprint recognition technology that allows the firearm to unlock.26 The advantage of having a personalized lock is that it is more difficult for anyone other than the firearm owner to access.

Having a better understanding of the available types of firearm safety storage options can help emergency nurses be more prepared when providing resources and patient education. Patients, or their families, may ask what is required by the law regarding firearm storage. Each state may have different laws concerning firearm locking devices, and it is important for the emergency nurse to become familiar with their state’s requirements in order to be able to provide the most accurate information.

Patient Education

Patient education conducted via a multi-disciplinary approach, with the coordination of healthcare providers, local law enforcement, communities, and legislators, can be effective. This approach requires an initial screening for the risk of firearm injury and provides counseling on firearm storage. Screening can be as simple as asking whether the patient has firearms in the home, whether they have access to firearms, and whether they are secured properly.27 Some emergency nurses may feel uneasy asking initial questions regarding firearms in the home, but it is important that healthcare providers become comfortable asking firearm screening questions to promote safety and help prevent injuries.

Access to firearms is a major factor for suicide and firearm-related injuries. Unfortunately, there is often no difference in firearm storage practices and accessibility in households with children who have mental health issues.28 In these cases, safe
removal of firearms for at risk populations is one option, but it may require legislators to adopt laws that make it easier to temporarily transfer ownership of firearms from owners who are at risk to a responsible adult who can properly store the firearm.\textsuperscript{29,30}

Some studies have shown that states with stricter child access prevention (CAP) laws have demonstrated a reduction in pediatric firearm injuries. This may be a result of firearm owners in those states being more aware of the laws and current legislation concerning firearm ownership and proper storage.\textsuperscript{31} Methods to prevent firearm-related injuries are often controversial, as they promote restrictive licensing laws or other restricted access to firearms.\textsuperscript{32} CAP laws regarding firearm safety and children garner more public support than do firearm safety laws. However, these laws alone may not completely address firearm safety in homes with children.\textsuperscript{33} Of note is that since there is no Federal law or standard on firearm storage/safety, and numerous laws have been enacted in the past 26 years, these CAP laws are not consistent across states.\textsuperscript{34}

Other studies have shown that children model observed behaviors, such as parental behavior and behavior in video games, television, and motion pictures.\textsuperscript{35} Although the entertainment industry has ratings on programs, games, and movies, its depiction of gun violence is on the rise, especially in programs geared toward younger viewers. It is important that the emergency nurse consider discussing age-appropriate entertainment choices with parents when providing patient education. However, it is ultimately the parent or guardian who should consider what influences entertainment has on children and model safe firearms-related behavior.\textsuperscript{35}

As previously discussed, safe storage can also be used, as firearms that are stored locked, unloaded, and separate from ammunition decrease firearm-related suicide or homicide.\textsuperscript{22} Currently there are no data available that indicate that firearm safety courses or buy-back programs are effective at reducing firearm-related injuries, more research is needed.\textsuperscript{36} Emergency nurses have multiple opportunities to discuss various firearm safety storage practices and can help prevent injuries through patient education.

There are promising strategies for addressing firearm-related violence through early prevention programs such as community youth programs.\textsuperscript{37} Emergency nurses who provide care for gang-affiliated youth in hospitals may have the opportunity to refer their patients to community programs, if available, upon discharge.\textsuperscript{38} It is important for emergency nurses to reach out to community programs and advocacy groups to learn more about resources available for at-risk youth so that better discharge resources can be provided. More importantly, it is essential that emergency nurses identify gang-affiliated youth who present to the emergency department.\textsuperscript{39} Working with local law enforcement may be required to identify potential gang members.

In devising screening tools to assess and educate patients, it is important that the emergency nurse become comfortable in addressing firearm safety. As part of routine screening the emergency nurse can ask whether firearms are in the home and counsel parents on proper storage. The nurse can also advise parents to remove firearms from homes of children or teenagers who suffer from depression or other mental health disorders. In addition, the emergency nurse should encourage parents to ask whether there is a firearm in the home of their child’s friends in which they play and by promoting age-appropriate entertainment and media choices.\textsuperscript{40}
Conclusion

Firearm-related injuries and deaths are preventable. They are a major public health problem, particularly in the U.S.\textsuperscript{41} International studies reveal that 91% of firearm deaths of children aged 0 to 14 years occur in the U.S. when compared to other high-income countries globally.\textsuperscript{42} This makes firearm injuries a serious pediatric and public health problem in the U.S.\textsuperscript{42} The first step in preventing firearm injuries is understanding the nature and extent of the problem. Subsequently, recognizing the populations most affected, understanding the locations where most injuries and deaths occur, and identifying any patterns or changes in patterns could help healthcare professionals develop a deeper understanding of the problem and possibly aid in further prevention. While more research is greatly needed, emergency nurses can play a pivotal role in answering and analyzing these questions to help reduce firearm-related injuries and deaths through advocacy, patient and family education, and community injury prevention programs. It is critical that emergency nurses become comfortable asking routine screening questions during patient visits and help raise awareness of firearm safety, safe storage, and access to firearms. Many of the strategies mentioned may help contribute to the reduction of firearm-related injuries and deaths.

Resources

- Asking Saves Kids Campaign
- LOK-IT-UP: Promoting the Safe Storage of Firearms in King County and Washington State
- National Crime Prevention Council
- National Suicide Prevention Lifeline: 1800-273-8255
- Project Child Safe
- SafeFirearmsStorage.org
- Sandy Hook Promise
- Columbia-Suicide Severity Rating Scale
- Geriatric Depression Scale: Short Form
- ENA Clinical Practice Guideline: Suicide Risk Assessment
Definitions of Terms

**Ammunition:** Cartridge cases, primers, bullets, or propellant powder designed for use in any firearm.³

**Cartridge:** A preassembled firearm ammunition packaging that holds bullets or propellant substances that has an ignition device within a case that is made to fit within the barrel chamber of a firearm.

**Chamber:** The part of the barrel or firing cylinder where the cartridge is inserted before the firearm is fired. Some firearms have single chambers in their barrels while others have multiple chambers such as a revolver.

**Child Access Protection (CAP) Laws:** A wide range of individual, state laws designed to prevent children from accessing firearms. These laws range from prohibiting persons from directly providing a firearm to a minor to imposing criminal liability when a minor gains access to a negligently stored firearm.

**Domestic Violence Restraining Order (DVRO):** A civil court order that is signed by a judge and tells the abuser to stop the abuse or face serious legal consequences. It offers civil legal protection from domestic violence to both female and male victims (womenslaw.org).

**Firearm:** Any weapon that is designed to or can readily be converted to expel a projectile by an explosive or other propellant and has a barrel.⁴

**Firearm lock:** Also known as “the safety”; An internal mechanism of the firearm that prevents ignition of the propellant.

**Gun lock:** A mechanism externally attached to a firearm to prevent firing. Can be in the form of a trigger lock.
### Table 1: Firearm-related mortality categorized by gender and age. Mortality is displayed as an average rate combining self-harm, violence, and unintentional deaths (2016).

<table>
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<tr>
<th></th>
<th>USA</th>
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<th>France</th>
<th>South Africa</th>
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<td>0.69</td>
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<td>70+</td>
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<td>0.82</td>
<td>0.39</td>
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Rate per 100,000. This estimate shows, for a single-country year, and by age, and sex, the number of deaths due to cause X divided by the population. Information obtained from the Global Burden of Disease (GBD) and the GBD Results Tool.
Table 2: Firearm-related incidence categorized by gender and age. Incidence is displayed as average rate combining self-harm, violence, and unintentional deaths (2016).

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<td>17.54</td>
<td>21.51</td>
<td>20.11</td>
<td>16.58</td>
<td>16.49</td>
<td>39.51</td>
</tr>
</tbody>
</table>

Incidence is the number of new cases of a given disease during a given period in a specified population. Incidence is also used for the rate at which new events occur in a defined population. Incidence is differentiated from prevalence, which refers to all cases, new or old in the population at a given time. Information obtained for this chart came from the Global Burden of Disease (GBD) and the GBD Results Tool.
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References


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