

Fatal Gunshot Wounds in Young Children

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ABSTRACT

Deaths related to firearms are common within the United States. Although relatively rare compared to other age groups, deaths occurring in young children represent a particularly tragic subcategory of firearms-related fatalities. This manuscript provides details regarding several cases of gunshot wound deaths occurring in young children. Included are a variety of situations and scenarios: the child was an innocent bystander struck by gunfire that was intended for another individual; unsafe firearm handling and manipulation by another individual, resulting in the child being shot; unsafe storage of a loaded firearm with resultant accidental discharge of the weapon; a young child having ready access to a loaded handgun and subsequently shooting him/herself; and the child being considered a potential intended target and being shot by another individual. The details of each case are provided, and discussion will focus on realistic strategies that, if implemented, might prevent such deaths from occurring in the future. *Acad Forensic Pathol.* 2016 6(4): 691-702

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INTRODUCTION

Deaths from firearms-related injuries are relatively common within the United States, with a total of 33 636 firearms-related deaths reported in 2013, the last year for which final statistics were available at the time that this study was initiated (1). Although a vast majority of decedents are teenagers or adults, occasional gunshot wound deaths occur in young children. While it can be argued that all firearms-related deaths are tragic, those involving young children as victims are particularly troubling. This paper reports on a series of young child victims of lethal gunshot injuries, focusing on the circumstances of the shootings and discussion of preventive measures that might have avoided these tragic outcomes.

METHODS

A retrospective review of gunshot-related deaths in young children was undertaken by the author. Cases were selected which involved deaths of children under the age of 12 years, where death was attributed to discharge of a firearm. The series of cases represents a nonrandom sampling of cases about which the author has received investigative information during the last twenty-plus years of forensic pathology practice, arising from medicolegal death jurisdictions within four states (North Carolina, Texas, Indiana, and Michigan). The author performed the autopsies in a majority of the cases presented. Information regarding the cases was obtained from medicolegal death investigation records, police records, court records, and in some cases, media sources.

RESULTS

A total of 13 cases were selected to include in this nonrandom, retrospective review, with the ages of the victims ranging from five months to 11 years. There were four girls and nine boys. None of the cases were suicides; the manner of death was considered accidental or homicidal in each of the cases presented. The cases are grouped into three major categories: 1) child shot self; 2) child shot by another person; and 3) gun discharged without being handled by anyone. A

majority of the cases (nine) involved another person shooting the child, while there were two each of the children shooting themselves and a gun discharging while not being handled by anyone. Various subcategories of cases occur within each of the three main categories. It should be noted that there are no cases in this series related to war, terrorism, or mass-shooting scenarios.

Cases Involving a Child Shooting Self

Cases in which children shot themselves were a minority, occurring in only two of the 13 cases. Neither case was considered suicidal. In each case, the young male child found an unsecured, loaded, semi-automatic handgun with a live round in the chamber.

Case 1

The mother of a 3-year-old boy heard a gunshot, ran upstairs, and found her son lying on a pillow with a gunshot wound of the face. The boy had shot himself with his father's legally owned loaded 9 mm semiautomatic handgun, which he kept in the bedroom. At autopsy, it was determined that the boy died from a close-range perforating gunshot wound of the left eye and head. The manner of death was accident.

Case 2

The mother of a 3-year-old boy heard a gunshot and ran into the computer room, where she found her son lying on the floor, with a gunshot wound of the chest. The father had reportedly heard a noise in the middle of the night, retrieved his legally owned gun, and went to investigate. Finding nothing, he decided to surf the Internet before returning to bed. He placed the loaded semi-automatic, 10 mm handgun on a computer tower and forgot about it. The next day, the child found the weapon and was handling it while it was still atop the computer tower when it discharged. The gun was recovered from behind the tower. Autopsy revealed the cause of death to be an intermediate-range, perforating gunshot wound of the chest. The manner of death was accident.

Cases Involving a Child Being Shot by Another Person

Cases in which the young child was shot by another person were the most common scenario in this series, accounting for nine of the 13 cases. Victims ranged in age from eight months to 11 years. Six of the cases involved male victims. The shooters included five children, all 12 years of age or older, and four adults. In each case, the shooters were reportedly familiar with firearms. Weapons included five handguns (three revolvers and two semi-automatics), two shotguns, and two small caliber (.22) rifles. Various subcategories exist within this group, including filicide cases, hunting/recreational shooting-related cases, innocent-bystander cases, and a miscellaneous category described as “other irresponsible behavior.” The reader should note that another subcategory exists within the category of cases involving a child being shot by another person (cases related to war, terrorism, or mass-shooting incidents); however, this series of cases does not include any examples from this subcategory.

Filicide Cases

Two cases of filicide are included in the series, both involving a parent (the father), who intentionally killed his daughter and then himself, while in the midst of marital difficulties.

Case 3

In the first filicide case, the decomposing bodies of a father and his 6-year-old daughter were found in bed. The father was reportedly terribly upset about an impending divorce. Both sustained gunshot wounds of the head. A legally owned .38 caliber revolver was adjacent to the father’s head. Autopsy of the girl disclosed a close-range, perforating gunshot wound of the head, with the entrance on the central forehead. The manner of death was homicide.

Case 4

The second filicide case was very similar to the first. After obtaining a court order to remove her daughter

from her estranged husband’s home, the mother and others arrived to his home to find both the husband and the 8-year-old girl dead on a couch. The decomposed bodies both had gunshot wounds, and a legally owned .38 caliber revolver was near the bodies. Autopsy revealed a contact-range, perforating gunshot wound of the girl’s head, with the entrance located behind the right ear. The manner of death was homicide.

Hunting/Recreational Shooting Cases

The next subcategory of cases involves situations related to hunting or recreational shooting. There were three cases in this subcategory, including two cases involving shotguns and one involving a .22 caliber rifle. In each case, the firearm involved was legally obtained and purchased, although the young shooters were not necessarily the legal owner of the weapon.

Case 5

The case involved an 11-year-old victim who was shot by a 14-year-old boy, as both were squirrel hunting in the woods. The weapon was a 12 gauge shotgun, containing shells with #4 shot. The shooter, who was reportedly aware of hunting safety rules, claimed that he did not see the victim when he fired his weapon at what he thought was a squirrel. Autopsy revealed that the victim died from a shotgun wound of the head and neck. The case was considered a homicide.

Case 6

Another experienced 14-year-old hunter was retrieving his pump-action 12 gauge shotgun from a storage cabinet at home in preparation for a hunting trip. After removing the gun from the cabinet, the 14-year-old reportedly accidentally pulled the trigger, thinking that the weapon was not loaded. Upon discharge, the bird-shot load struck the shooter’s 2-year-old nephew, who had been standing approximately one meter in front of the weapon. Autopsy revealed the cause of death to be a shotgun wound of the face/head. The manner of death was homicide.

Case 7

A 9-year-old girl was playing in the yard of a family ranch as her 12-year-old brother, who was reportedly familiar with firearms, was unloading his new .22 rifle in a nearby building. The rifle apparently accidentally discharged while he was attempting to unload it. The bullet travelled approximately 17 meters before striking his sister in the chest. Autopsy revealed the cause of death to be a distant-range, penetrating gunshot wound of the chest. The manner in this case was ruled accident.

Innocent Bystander Cases

Innocent bystander cases occur when a person intentionally discharges a firearm, often at another person, and a child is hit inadvertently. Two such cases are included in this series.

Case 8

An 8-month-old infant was in the arms of his mother when the mother's significant other intentionally shot her multiple times with a 9 mm semi-automatic handgun, striking and killing both the mother and the baby. It was unknown whether the firearm was legally owned by the shooter. Autopsy revealed five entrance wounds on the baby's chest, and five exit/partial-exit wound complexes on the baby's back. Although no gunshot residue was present on the chest, rare gunpowder particles were identified on the infant's shirt. The cause of death was multiple gunshot wounds of the chest. The manner of death was homicide.

Case 9

A 2.5-year-old boy was playing in his front yard when he suddenly collapsed. The collapse was witnessed, emergency medical services was called, and a gunshot wound was discovered. The shot was determined to be the result of a gang-related shooting that occurred several blocks away, with the shooter, who was using an illegally-owned .38 caliber revolver, standing approximately 350 meters away from the child at the time of the shooting. At autopsy, the child had a distant-range,

penetrating gunshot wound of the chest. The cause of death was a gunshot wound of the chest. The manner of death was homicide.

Cases Related to Other Irresponsible Behavior

The final subcategory of cases within the "shot by another" category involve a miscellaneous group that can only be described as involving grossly negligent or irresponsible behavior. Two cases are included in this category: one involving a shooter who was a teenager, and another involving an adult shooter.

Case 10

A 13-year-old friend shot and killed a 10-year-old boy after loading a family-owned .22 rifle, putting the safety on, pointing it at the 10-year-old, and pulling the trigger. The shooter was reportedly familiar with guns. At autopsy, there was a distant-range, penetrating gunshot wound of the head with the entrance on the left temple. Gunpowder stipple marks were present on the victim's left forearm. The cause of death was a gunshot wound of the head. The case was ruled a homicide.

Case 11

The adult boyfriend of the 3-year-old victim's mother reportedly routinely played a game with the boy in which the boy would point his finger at the man and say "bang-bang," and the man would point his unloaded legally owned 9 mm, semiautomatic handgun at the boy and pull the trigger. On this occasion, however, when the man pulled the trigger, the handgun discharged, striking the child in the left eye. The man claimed that he did not realize that there was a bullet in the chamber. Autopsy revealed a perforating gunshot wound of the head. The manner of death was homicide.

Cases Involving Discharge of a Firearm Not Being Handled by Anyone

The final case type is the miscellaneous category. There were two cases in this category. In each case, the legally owned gun was not being touched by the victim or another person when it discharged, and in

each case, the discharge involved a loaded, semi-automatic handgun having a round in the chamber.

Case 12

The case involved a young family who was entering their home after playing in the snow. As the father was helping the children remove their winter clothing, a handgun fell from his coat pocket, struck the wooden floor, and discharged, striking his 7-year-old daughter in the head. Scene investigation confirmed the presence of gun strike marks on the wooden floor, as well as a bullet defect within a wall near the ceiling, with a significant upward angulation. The gun, a Chinese-made, Norinco model 54, was examined by a firearms examiner, who determined that the weapon was, in fact, capable of discharging if dropped. Autopsy findings determined the cause of death to be a perforating gunshot wound of the head with an entrance involving the lower occipital scalp, and an exit on the crown. The manner of death was ruled accidental.

Case 13

A grandmother found a loaded semi-automatic handgun and placed it in the broiler drawer, under the oven, to keep it from the children. The next day, she turned the oven on to bake a pizza. As the pizza was baking, the gun discharged, with the bullet travelling through the back of the oven and the kitchen island that contained it. It then travelled across the adjacent room and struck and killed a 5-month-old infant who was lying on a couch. Examination of the .40 caliber Glock semi-automatic handgun revealed that the composite polymer material of the handgun had actually started to melt due to the heat from the oven. At autopsy, there was an entrance wound on the infant's right temple and a subcutaneous bullet within the posterior left scalp. The cause of death was a penetrating gunshot wound of the head. The manner of death was ruled accidental.

DISCUSSION

There is no question that the United States, since its inception, has what might be described as a “gun cul-

ture,” with over 30 000 gun-related fatalities each year during recent years, and more than twice that number of nonfatal injuries occurring annually (1, 2). For perspective, there were a total of 2 596 993 resident deaths registered within the United States in 2013, with 192 945 (7.4%) deaths classified as being injury-related (1). The number one cause of injury-related death in 2013 was “poisoning” (drug-related), accounting for 48 545 (25%) of deaths, followed by “transport” deaths at 37 427 (19%), firearms-related deaths at 33 636 (17.4%), fall-related injury associated deaths at 31 240 (16%) and “asphyxia” deaths at 17 316 (8.9%) (1). Of the 33 636 firearms-related deaths in 2013, a total of 21 175 (63%) were classified as suicides, 11 208 (33.3%) were considered homicides, 505 (1.5%) were unintentional (accidental), 467 (1.4%) were classified as “legal intervention,” and 281 (0.8%) were deemed “undetermined” (1).

Statistics regarding firearms injuries and deaths in young children are not so easily identified and correlated to one another, because numerous studies in the literature include older children and teens. In addition, different studies tend to have differing cut-off ages for inclusion. Numerous studies reporting on firearm-related injuries or deaths in children exist within the literature, with age cut-offs varying from one study to the next, with many including ages of at least the mid-teen years; six recent reviews had upper age cut-offs for inclusion in their studies ranging from 16 to 19 years (3-8). Unless specifically excluded by study criteria, the inclusion of children of the ages 15+ years no doubt includes a percentage of suicidal deaths. Likewise, including these “older-aged children/teens” almost certainly includes gang-related activities involving the victims themselves, unless specifically excluded by study inclusion criteria. The purpose of the current study is to identify firearms-related fatalities in young children, such that certain issues related to older children/teens are not included. Selecting a cut-off age of 15 years (or higher) is too high, as it would include many cases of gunfire-related deaths that are typically associated with these older children/teenagers. At least for the series presented, selecting a cut-off age of under 12 years (all cases had victims under the age of 12 years) allowed for exclu-

sion of suicides as well as victim-involved gang-related activity from the numbers.

While not each of the cases presented would be considered “unintentional” firearms-related fatalities, a reasonably high number of the cases might be classified as such, depending on the criteria used for making such a classification. For perspective, it is interesting to note that, among all “unintentional injury” cases, firearms-related cases are relatively rare. Again, differing age cut-offs may have the unintended effect of skewing the results. A study reports on unintentional injury-related deaths in children (ages 0-19 years) including the years 2000-2005, with the following statistics: ~12 175 per year, rank order of causes: transportation-related (9.8 per 100 000), drowning (1.4/100 000), suffocation (1.2/100 000), poisoning (0.8/100 000), fires/burns (0.7/100 000), and falls (0.2/100 000) (9). Unintentional firearms-related fatalities were grouped together with other unintentional injuries into a group entitled “other injuries,” which had a total rate of 0.9/100 000 (9). It is unclear how the authors determined if a particular injury was unintentional or not. Depending on how one defines “unintentional,” some of the cases reported in the current series and certified as homicide at autopsy might conceivably have been considered unintentional based on certain definitions of the word.

Firearms are considered a normal part of life for a substantial percentage of persons within the United States. This is no doubt a carry-over related to the historical significance of gun ownership and usage during the early settlement of North America, the colonial period, the Revolutionary War years, and the subsequent pioneer/expansion years. This fact is exemplified by the fact that the right of U.S. citizens to keep and bear arms is a constitutionally protected right (10). Current/recent estimates of firearm ownership within the United States suggests that there are around 300 000 000 guns (11-15); however, the exact number of guns is difficult to ascertain. The estimated percentage of U.S. households with at least one firearm is estimated to be around 34% (11) to 45% (15). Notwithstanding the efforts of those who are attempting to make gun ownership illegal for the majority of

citizens within the United States, the fact that there are currently so many legally owned firearms makes the prospects of eliminating firearms-related tragedies highly unlikely, especially considering the fact that there are also numerous illegal firearms, and those numbers would likely increase substantially should gun elimination legislation ever come to pass at a federal level. As such, when attempting to consider strategies for reducing or eliminating firearms-related deaths of young children, one must recognize that firearms elimination legislation represents one possible strategy, notwithstanding legal arguments against such a proposition. Despite this notion, one only needs to observe the gun violence that exists in various “gun-free” zones, including certain entire metropolitan areas, to recognize that existing laws that prevent legal ownership/possession of firearms fail to prevent gun violence (16). Be that as it may, as long as there are guns within our communities, be they legally owned by citizens, illegally in the possession of persons, or owned/possessed by civil servants such as police officers or military personnel, the unfortunate fact will be that there will be injuries and deaths related to firearms, and that some of those deaths will involve young children. The ensuing discussion will focus on strategies that aim to reduce these numbers, given the fact that firearms are currently a ubiquitous feature of our culture.

When attempting to implement strategies to reduce or eliminate childhood firearms-related fatalities, it may be useful to divide cases into the three categories presented within this series: 1) child shoots self; 2) child is shot by another person; and 3) firearm discharges without being handled by anyone. Various subcategories exist within the latter two categories. For cases where a child is shot by another person, the following subcategories may occur: filicide (child intentionally killed by one of the parents); hunting/recreational shooting scenario; “innocent bystander” situation; a miscellaneous subcategory classified as “other irresponsible behavior;” and firearms deaths as a result of war, terrorism, or mass-shooting scenarios. For the final of the major three categories, wherein a firearm discharges without being handled at the time of discharge, a variety of subcategories may occur.

Preventive Strategies

Guns are tools. In order to use a tool effectively, the user must know how to use it properly and safely. To this end, every gun owner must abide by several universal rules related to firearms (17). These include: 1) always keep the gun pointed in a safe direction; 2) always keep your finger off the trigger until ready to shoot; and 3) always keep the gun unloaded until ready to use (17). Additional rules include: 4) know your target and what is beyond; 5) know how to use the gun safely; 6) be sure the gun is safe to operate; 7) use only the correct ammunition for your gun; 8) wear eye and ear protection as appropriate; 9) never use alcohol or over-the-counter, prescription, or other drugs before or while shooting; 10) store guns so they are not accessible to unauthorized persons; 11) be aware that certain types of guns and many shooting activities require additional safety precautions; and 12) regular cleaning of firearms is important in order for guns to operate correctly and safely (17). Several of these rules can be summarized by the statement, “treat all firearms as though they are loaded.”

Whether or not a person or family chooses to own a firearm, it is prudent for all persons to be aware of the basic gun safety rules as detailed above. Especially with regard to children, parents and other responsible persons should teach children, beginning at a young age, about gun safety. One such program, called the “Eddie Eagle Gunsafe Program,” seeks to help parents, law enforcement, community groups and educators to prevent gun accidents by teaching young children what to do if they ever come across a gun: 1) stop; 2) don't touch; 3) run away/leave the area; 4) tell a grown-up (18). By no means is this the only educational program available that is aimed at children, and educational programs are not the only strategies proposed to reduce gun injuries and deaths in children. One review attempts to categorize the various strategies available, with commentary about the efficacy of the various strategies (19). Possible strategies include legislative reform initiatives, product modification, community-based education and media campaigns, parent-education programs, and child-education programs (19). Legislative initiatives have included child access pre-

vention laws, which require parents of children to keep their guns locked or unloaded (19). Some reports suggest that these laws have a beneficial effect at reducing unintentional firearms-related deaths in children (20, 21). Regarding product modification, suggested strategies include the gun-owners' use of trigger locks (on unloaded firearms) and manufacturers' production of “smart guns,” with computer chips designed to recognize only authorized users (19). It should be noted that trigger locks placed on firearms that are loaded will not necessarily prevent accidental or negligent discharge. The remainder of this review will focus on preventive strategies as they apply to the various categories of case types presented. **Table 1** provides a synopsis of the case types and suggested preventive strategies.

Preventing a Child from Shooting Self

Ultimately, the prevention of these deaths depends on preventing firearm access by young children. In addition to potential legislative initiatives and various product modifications, educating gun owners, children, and others of gun safety rules, and always abiding by these rules, should reduce the numbers of these terribly tragic deaths. Some obvious strategies to prevent such tragedies include imploring persons who own firearms to store them so that they are not accessible to children or others. In addition, guns should not be kept loaded until they are ready to be used. As a corollary, keeping the firing chamber of an otherwise loaded semi-automatic firearm empty until ready to shoot could have prevented both of the “self-shootings” presented in this series. It is unlikely that a very young child has the physical dexterity and strength to cycle/load a live round into the chamber with most (but not all) medium-to-large caliber semi-automatic handguns. As a second corollary, once the reason for loading a gun is no longer present, such as a suspicion of an intruder, then the weapon should be immediately unloaded or otherwise properly secured. Finally, all children should be taught to recognize and stay away from firearms.

Preventing a Child from Being Shot by Another

Filicide is the killing of a child by a parent. Filicide cases are not only very disturbing, but probably ex-

tremely difficult to anticipate and prevent. Although there are numerous reasons and motives to explain why filicide occurs, many of them are related to breakdown of familial, relational, or social support systems, or to underlying mental illness on the part of the perpetrator (22). Improved mental health, relational, familial, and social support systems might prevent some of these terribly sad cases.

Preventive strategies as they relate to hunting or recreational shooting scenarios essentially depend on following the basic rules that all persons using firearms should know. Treat all guns as if they are loaded. Always keep the gun pointed in a safe direction.

Keep your finger off the trigger until you are ready to shoot. Know your target and what is behind your target. Keep your weapon unloaded until it's ready to be used, and know how to use the gun safely. By following each of these rules, all of the hunting/recreational shooting deaths presented in this series could have been prevented. The fact that each of the shooters in the three cases in this subcategory were also children suggests that, even if properly-trained in firearm safety, it may be prudent to continually reinforce firearms safety rules with those children who are allowed to handle firearms. It should also be noted that another widely held rule (and in some instances, codified by law) regarding firearm safety is that whenever a minor

Table 1: Categories of Fatal Gunshot Wounds in Young Children

Category - Subcategory	Scenario(s)	Preventive Strategies
Child Shoots Self	Child finds unsecured, loaded weapon and accidentally shoots self	<ul style="list-style-type: none"> - Keep firearms secure - Keep firearms away from children - Keep firearms unloaded until ready to use - Teach children gun safety rules
Child Shot by Another Person	Firearm discharges while in the hands of another person	<ul style="list-style-type: none"> - Keep children away from situations where they may be at risk of gunfire - Teach children to remove themselves from unsafe situations
Filicide	Parent intentionally kills child	<ul style="list-style-type: none"> - Improved relational, familial, social, and mental health support systems
Hunting/Recreational	Mistaken target; not knowing that weapon was loaded; "inadvertent" trigger pull	<ul style="list-style-type: none"> - Follow firearms safety rules - Treat all guns as if they are loaded - Always keep gun pointed in safe direction - Keep finger off trigger until ready to shoot - Know your target and what is behind your target - Keep weapon unloaded until ready for use - Know how to use gun safely
Innocent-Bystander	Child in the path of projectile fired at/toward someone/something else	<ul style="list-style-type: none"> - Follow firearms safety rules - Avoid unsafe situations
Other Irresponsible Behavior	Disregard of firearms safety rules	<ul style="list-style-type: none"> - Follow firearms safety rules - Avoid unsafe situations
War/Terrorism/Mass Shooting Incidents	Specifically targeted versus not	<ul style="list-style-type: none"> - Follow firearms safety rules - Avoid unsafe situations - Prepare in advance for such situations - Escape, hide, defend/fight back
Firearm Discharges Without Being Handled	Firearm discharge occurs while weapon is not being handled	<ul style="list-style-type: none"> - Follow firearm safety rules
Dropped Firearm	Old, cheap, or simple model weapon discharges when dropped	<ul style="list-style-type: none"> - Avoid using unsafe firearms - Properly secure firearms - Keep guns unloaded
Heated Firearm	Firearm with cartridge in chamber discharges upon heating	<ul style="list-style-type: none"> - Never store firearms in areas subject to high temperatures - Keep guns unloaded
Other	"Delayed discharge;" incidents involving strong magnetic fields; frozen weapons upon thawing	<ul style="list-style-type: none"> - Follow firearms safety rules - Avoid unsafe situations - Use care when handling frozen weapons

is handling/using a firearm, he/she should be under the direct supervision of a responsible and knowledgeable adult. A good review and more detailed presentation of hunting-related injuries of all types, as well as safety tips, was published in 2002 by Forks (23).

Innocent bystander cases with young child victims are some of the most challenging to prevent, as they are ultimately the result of the intentional and presumably unsafe behavior of other individuals (i.e., the shooters). From the shooter standpoint, following the gun safety rule related to knowing your target and what is behind (or around) your target, should prevent these deaths. From the standpoint of children (and parents, as well as others), avoiding unsafe situations and constantly being aware of one's surroundings and potential dangers are two useful strategies to prevent these types of cases.

It can be argued that the subcategory of cases described as being related to "other irresponsible behavior" are best prevented by not allowing certain persons to have access to firearms. When a person who is supposedly familiar with and/or knows how to use firearms exhibits the type of irresponsible and unsafe gun handling behavior that occurred in the cases presented, it is inconceivable to believe that these persons actually seriously learned gun safety rules as part of their training in firearms use. Preventive strategies are essentially identical to those previously mentioned, related to firearm safety rules that anyone handling a firearm should follow. The potentially lethal consequences resulting from the disregard of these safety rules cannot be overemphasized when teaching safe firearm handling. Gun safety rules should be taught not only once, but repeatedly, especially to children.

Although the series of cases within this presentation does not include any case related to war, terrorism, or mass-shooting incidents, for completeness, these case types will be briefly addressed as another subcategory of cases where a child is shot by another individual. Such cases are most closely related to the innocent bystander subcategory as described above, although in many shootings related to war, terrorism, and mass-shooting incidents, children may be specifi-

cally targeted rather than being bystanders. Regarding preventive strategies, children (and others) should be taught to remain aware of their surroundings, avoid potentially unsafe areas or situations, prepare in advance with plans and drills dealing specifically with an active shooter situation, and, if faced with an impending shooting scenario, do their best to escape, hide, defend themselves, or fight back, as most appropriate to the situation at hand (24).

Preventing the Discharge of a Firearm While Not Being Handled

Most (but not all) properly functioning, well-made, modern handguns (revolvers and semi-automatics) are made so that they are physically unable to discharge if dropped, at least with forces involved when a firearm is dropped a few feet; with these weapons, only a pull of the trigger results in discharge (25). Unfortunately, poor-quality firearms, certain older weapons, and malfunctioning or damaged guns can discharge when dropped. For example, certain weapons may discharge if the manual safety breaks while a live round is in the chamber (26); if the weapon is dropped and the safety breaks on contact, the firearm may discharge. Avoiding old, cheap, malfunctioning, or damaged weapons can prevent such accidental discharges. Even certain well built, properly functioning firearms may discharge if dropped a substantial distance, such as might occur when a hunting rifle drops from a tree stand (23). There are other examples of well-constructed, high quality weapons discharging when dropped; discharge results from their simple design and small size, such as may occur with derringer handguns (27), or as a result of their unique design characteristics, such as may occur in older style single action revolvers (28). Product design modification may prevent some of these unintentional injuries and deaths. Additionally, persons carrying a gun should ensure that the gun is properly secured in a holster or other storage area, thus reducing the risk of a gun being unintentionally dropped. Regarding the case presented, this unfortunate accident could have been prevented had the father kept the gun in a secure holster/location, or if he had chosen to keep the gun's chamber empty.

It is well known that intact cartridges can explode when the gunpowder reaches a high enough temperature to auto-ignite (29). This temperature varies but is reported to be around 138 to 177°C (280 to 350°F) (29). If the cartridge is not contained within a weapon, there is an explosion, but the projectile itself (or shrapnel) is not typically propelled with sufficient force to cause lethal injuries (29). A report exists that describes a handgun magazine, loaded with live cartridges, which was stored in an oven; upon heating the oven, the live rounds exploded, producing survivable shrapnel injuries to a nearby woman (30). Likewise, if a live round is placed into a fire, the round will explode, but not typically with enough force to produce lethal trauma (29). If, however, the cartridge is contained within the firing chamber of a weapon which is in a fire or within an oven, the bullet can be propelled down the barrel, just as if the trigger had been pulled, such as occurred in the case presented (29). Reasonable preventive strategies include the employment of the basic gun safety rules as previously described, including keeping guns unloaded. In addition, guns should be appropriately stored, and they should be stored in locations where excessive heat will not occur.

There are other potentially lethal firearms-related scenarios involving situations wherein the firearm is not being handled by anyone, and yet, the firearm discharges. Several cases have been reported in which a loaded firearm, in the vicinity of a magnetic resonance imaging unit, can be pulled by the magnet with enough force to cause discharge on impact with the magnet or other structure (31, 32). A delayed discharge may occur when the primer discharges upon trigger pull, but the gunpowder/propellant in the cartridge does not immediately ignite; instead, it burns relatively slowly until enough pressure builds, resulting in delayed projectile discharge, typically after several seconds (33). If the trigger is pulled, and only the primer discharges (no shot is fired), and the shooter immediately puts the weapon down, the firearm could theoretically have a delayed discharge while not being handled at the time of discharge, resulting in injury or death. Another potential scenario that has been brought to the attention of the author involves a frozen weapon, wherein

a trigger pull may not result in immediate discharge of the weapon; instead the trigger-pull essentially is interrupted/suspended by various frozen parts of the trigger/firing mechanism. Upon warming, the thawed mechanical components are able to move sufficiently to allow for continuation/completion of the firing mechanism, resulting in weapon discharge, whether the weapon is in someone's hands or not.

Although it is not the purpose of this review to present an exhaustive discussion regarding the appropriate manner of death rulings in the cases presented, a few comments are in order. The author acknowledges that potential controversy exists regarding the most appropriate manner of death rulings with some of the cases presented. Although guidelines exist within the forensic literature, despite agreement with regard to certain scenarios, universal consensus does not exist. The following is a synopsis of the recommendations presented in the 2002 National Association of Medical Examiners (NAME) "*A Guide for Manner of Death Classification*" prepared by Hanzlick, Hunsaker, and Davis, relating to nonsuicidal firearms-related fatalities (34):

1. When a hunter intentionally fires a weapon and it strikes and kills another person, it is appropriately ruled a "homicide."
2. When a firearms-related death occurs in which a gun is shown to be capable of discharge without pulling the trigger, and, based on investigation, did so, it is appropriate to rule these as "accident."
3. When a victim is struck by a ricocheting bullet fired legally and without disregard for safety or human life, it is appropriate to rule this as an "accident."
4. When a young child shoots another child by pointing a gun and pulling a trigger, the death may be classified as "homicide" or "undetermined." If the weapon is faulty or malfunctioning, "accident" may be used.

Admittedly, these scenarios do not cover all of the possible situations involving firearms, or even all of the cases presented in this review. Amongst those situations described within the NAME recommendations, there may be disagreement between forensic pathologists. For example, consider the following possible scenarios, based on Case 6 in the current series. If the shooter's accidental trigger pull involved him placing his finger on the trigger and pulling it, while the gun was pointed at the victim, while believing that the firearm was not loaded, the case would clearly be the result of a volitional act, violating all sorts of firearms safety rules, resulting in weapon discharge and death, thus representing a homicide. If, on the other hand, the shooter, believing that the weapon was not loaded, was careless in removing it from its storage location, and somehow, during removal, the trigger became snagged on something that caused the weapon to fire, many might consider this an accident. Ultimately, it is beyond the scope of this presentation to discuss the manner of death from each case in detail. Suffice to say that, while widespread agreement exists with regard to certain scenarios, a great deal of controversy exists with various other scenarios. Further presentation and discussion of the rationale for making manner of death determinations in firearms-related deaths, involving victims and shooters of varying age, and in varying situations, is an appropriate and worthy topic for future consideration.

CONCLUSION

By highlighting cases involving firearms-related deaths of young children, the author hopes to heighten awareness of the devastating consequences that can occur when existing gun laws and common sense safety measures are not universally followed/employed by gun users.

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