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Firearm Violence: A Global Priority for Nursing Science

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Abstract

Purpose: This purpose of this paper is to frame firearm violence as a health and public health problem, to illustrate the magnitude of the problem, to examine factors that increase the risk to be injured by a firearm, or conversely, that confer protection, and to identify relevant priority areas for nursing science.

Organizing Construct: Firearm violence results in physical and psychological injuries and is a global health priority. Firearm violence is categorized as intentional (interpersonal and self-inflicted) and unintentional (interpersonal and self-inflicted) and accounts for an estimated 196,000–220,000 non-conflict deaths annually.

Methods: We reviewed the theoretical and scientific literature to analyze the magnitude and geographic distribution of firearm violence, the factors associated with firearm injury, the consequences of firearm violence, and areas where nursing science can make an impact on prevention, outcomes, and recovery.

Findings: Firearm violence is a significant public health problem that affects the health of individuals, families, and communities. The burdens and contributors to firearm violence vary worldwide, making it important to understand the local context of this global phenomenon. Relevant areas of inquiry span primary prevention focusing on individual and environmental risk factors, focus on managing the physical and psychological consequences post-injury, and mitigating long-term consequences of firearm violence.

Conclusions: Reducing the global burden of firearm violence and improving the health and safety of individuals, families, and communities provide compelling reasons to integrate this area into nursing science.

Clinical Relevance: The goal of nursing is to keep people healthy and safe and to help return those injured to their optimal levels of health and well-being. Understanding the factors that come together to injure people with a firearm in various physical, social, economic, and cultural

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environments, positions nurses to both extend the dialogue beyond pro-gun vs. anti-gun and to design and to carry out rigorous studies to reduce firearm violence.

Keywords

Traumatic Injury; firearms; policy; research; homicide; suicide

Introduction

The World Health Organization declared violence to be a growing worldwide public health problem over two decades ago, a problem which effects every level of society (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002). The use of firearms in non-conflict situations is responsible for a staggering proportion of that violence, accounting for an estimated 196,000–220,000 deaths annually (Richmond, Cheney, & Schwab, 2005). The magnitude of firearm violence is particularly significant in the United States (U.S.), where firearms are used to kill almost 100 people daily. The U.S. experienced an average of 32,983 deaths from firearms every year from 1981–2015 (Centers for Disease Control and Prevention [CDC], 2015). Firearms are used to commit 73% of all homicides and 50% of all suicides in the U.S. (CDC, 2015).

The ready availability of firearms is one factor that contributes to such high levels of firearm violence. Firearm is an inclusive term that encompasses all gun types such as handguns (revolvers, pistols) and long guns (rifles, shotguns). The U.S. ranks first among 178 countries in the number of privately owned firearms; civilians are in possession of an estimated 270–310 million firearms (Karp, 2007; Krouse, 2012). In 2015, more than 9 million firearms were manufactured in the U.S., with fewer than 350,000 exported to other countries, and in 2016, over 5 million firearms were imported into the U.S. (Bureau of Alcohol, Tobacco, Firearms and Explosives, 2017). Globally, the availability of unregulated small arms left behind from conflict situations is a significant problem. In 2015, Ban Ki-Moon (then Secretary General of the United Nations) said “the widespread availability of small arms and light weapons was a factor in the over 250 conflicts of the past decade, leading to more than 50,000 deaths each year...civilians, including children, suffered the most” (UN Security Council, 2015). Consequently, the 2030 Agenda for Sustainable Development Goals set a target to significantly reduce the flow of illicit arms globally (Goal 16) (UN Office for Disarmament Affairs, 2017).

Despite the staggering impact of firearm violence, there is limited nursing science directed at preventing or addressing its impact on individuals, families, and communities. Yet the end product of firearm violence – death, acute injury, co-morbidities, psychological distress, and the community effects, provides a compelling reason for nursing to incorporate firearm violence into its scholarly portfolio. This purpose of this paper is to frame firearm violence as a health and public health problem, to illustrate the magnitude of the problem, to examine factors that increase the risk to be injured by a firearm, or conversely, that confer protection, and to identify relevant priority areas for nursing science.

Foundational Concepts

Intent of injury is a foundational concept relevant to firearm violence. Intent is categorized as either interpersonal, legal intervention, intentionally self-inflicted, or unintentional. An intentional interpersonal firearm event involves an instigator (shooter), a firearm, and a victim. Legal intervention is a separately designated type of interpersonal event where an on-duty law enforcement officer shoots a civilian. In the case of an intentionally self-inflicted injury (i.e., a suicide attempt), the shooter and the victim are one in the same. Unintentional firearm injury may involve a separate shooter and victim (e.g., a hunting accident where a person shoots a friend) or may be self-inflicted (e.g., a child picks up a gun and unintentionally shoots himself). These categories can intersect, such as with a murder-suicide and mass shootings, two unique subsets of interpersonal firearm violence.

Firearm violence can be considered from two commonly used theoretical perspectives. The Haddon Matrix is a broadly used classic theoretical approach in injury science. The Haddon Matrix recognizes the temporal aspect of injury which spans pre-event, event, and post-event phases. Further it incorporates the host (e.g., shooter and/or victim), the agent (e.g., firearm), the physical environment, and the social environment. Application of the Haddon Matrix to interpersonal firearm violence can be seen in Table 1. The strength of the Haddon Matrix is its ability to identify etiological factors leading to injury and to inform the development and testing of preventive strategies (Runyan, 2003).

The Haddon Matrix, however, does not fully encompass the range of effects of firearm violence that are of interest to nursing science, in particular the acute clinical management, the consequences of firearm violence, and reintegration back into family and community. Therefore, nurse scholars are well-served to broaden their conceptualization to consider firearm injury and its consequences by incorporating a broader socio-ecological model – a model that is commonly used within nursing and nursing science (Bronfrenbener, 1979; Dahlberg & Krug, 2002). The socio-ecological model's relevance in particular is its value in considering risk, protection and consequences at multiple levels (individual, family and friends, community, and society).

Magnitude of the Problem

Each country has its own profile of firearm violence. Here we focus initially on U.S. firearm violence where firearm homicide is the third leading cause of death for individuals between the ages of 15–34 years. People between the ages of 20–24 years have the greatest risk of experiencing both fatal and nonfatal interpersonal firearm injury, with age-adjusted rates of 13.2 per 100,000 and 76.4 per 100,000 respectively. Black males comprise 6.7% of the population, but in 2016 accounted for 52.5% of all firearm homicides. Legal intervention accounted for only 1.3% of firearm deaths in 2016, but racial and ethnic disparities in those affected has led to significant media scrutiny and has stimulated important societal conversations. In the U.S. from 1999–2016, there were 6,744 legal intervention firearm deaths; 96% of decedents were male, and black and Hispanic males had death rates 2.6 and 1.6 times higher respectively than white males (CDC, 2016).

Intentional self-inflicted firearm injury (suicide) accounts for nearly two-thirds of all firearm deaths in the U.S, totaling almost 23,000 deaths in 2016. Suicide is the 10th leading cause of death among Americans and 2nd among individuals between 10–34 years. Unlike interpersonal violence, self-inflicted firearm injury is much more likely to be fatal; the average case-fatality rate is almost 84% and the majority of completed suicides involve guns (CDC, 2015). White males account for the majority of firearm suicides (78% in 2016) with an age-adjusted rate of 13.5 per 100,000. While females are 3 times more likely than males to attempt suicide (Drapeau & McIntosh, 2016), they are less likely to complete the attempt because they use firearms in suicide attempts at lesser rates than men (30% compared to 55%). The risk for death from firearm suicide increases with age, and is highest among white males over age 75, with an age-adjusted rate of 35.06 per 100,000 (CDC, 2016).

Unintentional firearm death accounts for a small proportion (1%) of total U.S. firearm mortality, and has been steadily declining. The majority of deaths are self-inflicted and occur most commonly during firearm cleaning and hunting (Sinauer, Annet, & Mercy, 1996). For every unintentional firearm fatality, 16 people survive, most likely because these injuries are typically to the legs or arms (Beaman et al., 2000). Despite its comparatively small effect on firearm mortality, unintentional firearm death is noteworthy for its disproportionate impact on children; 26% of unintentional deaths occurred among youth under age 20 (CDC, 2016).

Geographic Distribution of Firearm Violence

Variation within the U.S.

Firearm violence is often misperceived as a phenomenon that primarily impacts urban areas, yet the firearm mortality rate is actually similar between rural and urban America. However, urban areas are disproportionately affected by interpersonal firearm violence, while rural areas have greater risks for firearm suicide and unintentional injury (Branas, Nance, Elliott, Richmond, & Schwab, 2004; Nance, Carr, Kallan, Branas, & Wiebe, 2010). The pervasiveness of firearm violence throughout all communities and the different patterns between urban and rural areas highlight the importance of designing and testing prevention initiatives that are tailored to the firearm injury profile of the community.

U.S. in the International Context.

Firearm violence has a disproportionately high impact on health in the U.S. compared to other industrialized countries. The cultural significance of the Second Amendment of the U.S. Constitution (“A well-regulated militia, being necessary to the security of a free state, the right of the people to keep and bear arms, shall not be infringed.”) and its interpretation likely contributes to this disproportionate burden (Glanz & Annas, 2009). The U.S. firearm homicide rate is 19.5 times higher than the average rates of 23 other high-income countries. A recent report on global violent deaths showed that 44% of all homicides were committed with a firearm and the U.S. joins several African countries (Benin, Cape Verde, Mauritania, Senegal, Togo) and Albania and Thailand as countries where firearms were used in a least half of all lethal violent incidents (McEvoy & Hideg, 2017). While the total U.S. suicide rate is 30% lower than the average of these other high-income countries, firearm suicide is almost 6 times more frequent in the U.S. Unintentional firearm death is more frequent in the

U.S. as well, with a rate 5.5 times higher than other countries. Overall, the U.S. firearm death rate is 7.5 times higher than that of its economic peers (Richardson & Hemenway, 2011).

This wide disparity in firearm-related deaths between the U.S. and other high-income nations is mirrored by a similarly stark difference in firearm availability. The U.S. has more privately-owned firearms than any other country, and is home to 35–50% of all privately-owned firearms in the world (Karp, 2007). Studies demonstrate significant associations between firearm availability and total homicide and suicide rates that are consistent across high-income industrialized nations (Ajdacic-Gross et al., 2006; Hemenway, & Miller, 2000).

International Variation.

Mortality data are the most available internationally, and thus are typically used to examine variations in firearm injury globally. Yet even with mortality data, as many as 100 countries (typically lower middle/lower income) do not report firearm death data, which can lead to reporting biases. Even in countries that do keep firearm death data, there are discrepancies in how data are coded, or other reasons for incomplete or inaccurate reporting (e.g., conflict or political instability) (Richmond, Cheney, & Schwab, 2005). The most recent report on the Global Burden of Disease Study 2013 shows a decrease in the age-adjusted death rate for interpersonal violence (6.6 in 1990 to 5.6 in 2013) but no change in assault by firearm (2.5 in 1990 and 2013). The Global Burden age-adjusted death rate due to self-harm decreased from 15.8 in 1990 to 12.2 in 2013, however the mechanism of self-harm (e.g., firearm, poisoning) is not specified (Naghavi et al, 2015).

Factors Associated with Firearm Injury

The Haddon Matrix categories of host, agent, and environment provide a structure to consider the factors associated with firearm injury that merit consideration in designing and testing preventive strategies.

Host - Individual.

Peer and gang influence and substance use increases risk for firearm injury and indeed risks for firearm violence can spread contagiously through social networks (Cukier & Eagen, 2017). Mental illness is not a significant contributor to interpersonal firearm violence: however, individuals with mental health disorders, such as depression, have an elevated risk of suicide (Swanson, McGinty, Fazel, & Mays, 2014). Suicide among veterans has increased since 2005 from a rate of 10.3 per 100,000 to a rate of approximately 18 per 100,000 (LeardMann et al, 2013), and veterans are more likely to attempt suicide with a firearm than the general population (Hoffmire & Bossarte, 2014). Age is also a risk factor, and older white men have the highest rate of firearm suicide overall. Perceived physical illness, family discord, and employment change are risk factors associated with suicide among persons aged 50 years and older (Duberstein, Conwell, Conner, Eberly, & Caine, 2004).

Alcohol is a risk factor that spans all intents of firearm injury. Firearm owners are more likely to report habits of heavy drinking or binge drinking than the general population (Wintemute, 2015). Heavy drinkers are at 2.6 times higher risk (95% CI: 0.90–7.87, $p < .10$)

of being shot in an assault compared to nondrinkers, and risk increases if heavy drinking occurs near off-premise alcohol outlets (Branas et al., 2009). A meta-analysis of studies on alcohol use and firearm violence found that more than one-third of those who died from firearm injuries had consumed alcohol, and more than one-fourth had heavily consumed alcohol prior to death (Branas, Han, & Wiebe, 2016). In a small randomized simulation trial, intoxicated individuals were less accurate and slower to fire in scenarios testing reaction time, yet were quicker to fire in scenarios requiring judgment of whether to use lethal force relative to non-intoxicated controls (Carr, Wiebe, Richmond, Cheney, & Branas, 2009). The connection between alcohol use, firearm availability, and suicide is of concern; 35% of those who commit suicide consume alcohol prior to their death (Hemenway & Miller, 2000). Suicides are generally viewed as impulsive acts, and alcohol consumption may facilitate acting on impulse or help numb individuals for the anticipated forthcoming pain (Branas, Richmond, Ten Have, & Wiebe, 2011). The preponderance of evidence suggest mixing alcohol and guns is risky and alcohol is a modifiable factor that can serve as a point of intervention.

Agent - Firearm.

The degree to which firearm availability is a risk or protective factor remains a point of contention. The preponderance of evidence supports the fact that the presence of a firearm increases the risk for injury. A positive association exists between firearm availability and rates of homicide, suicide, and unintentional deaths from firearms, as well as violent crime (Duggan, 2001; Miller, Azrael, & Hemenway, 2001; Monuteaux, Lee, Hemenway, Mannix, & Fleegler, 2015). At the individual level, individuals carrying a firearm are more likely to be shot in an assault than those without one (Branas, Richmond, Culhane, Ten Have, & Wiebe, 2009). The risk for suicide is five times greater when a firearm is in the home, and the risk for adolescent suicide is also elevated (Brent, et al., 1991; Brent et al., 1993). A recent study carefully examined the possibility of confounder bias in examining the direct association between firearms in the home and suicide, and concluded that an unrecognized confounding factor is unlikely to explain the association between firearms and suicide (Miller, Swanson, & Azrael, 2016). The rate of firearm suicide is 57 times greater among those who purchased a handgun in the previous week compared to the U.S. firearm suicide rate in general (Wintemute, Parham, Beaumont, Wright, & Drake, 1999). Since suicide can be an impulsive act, there is evidence that background checks for purchasing a firearm can be effective in lowering firearm suicide rate (95% CI = 0.60,0.89) (Sumner, Layde, & Guse, 2008), although this is not consistent across studies (Hahn et al, 2005). It is prudent to conclude that judiciously limiting access to firearms should be considered as a strategy to reduce firearm suicide.

A significant correlation between firearm availability and unintentional firearm deaths exists at the state level (Miller, Azrael & Hemenway, 2001). Children require special protection to prevent unintentional firearm injury. Limiting access to firearms is an important strategy. Keeping a firearm locked and unloaded can significantly decrease risk for unintentional injury and suicide in youth (Grossman et al., 1997). Unloading a gun and keeping it in a locked container requires adults to consistently provide safe storage; and counseling by health care providers can lead to a substantial improvement in safe storage habits among gun

owners (Barkin et al., 2008). The preponderance of evidence shows that teaching children to avoid guns, not pick up guns, or not play with guns is ineffective (Hardy, 2002; Jackman, Farah, Kellerman, & Simon, 2001; Himle, Miltenberger, Gatheridge, & Flessner, 2004); thus it is essential that adults create safe environments when firearms co-exist with children.

Environment – Physical & Social.

Environments in which one lives, works, and plays can increase risk of or confer protection from firearm violence. Income inequality is associated with higher homicide rates, a finding that is consistent across countries (Elgar & Aitken, 2010; Kennedy, Kawachi, Prothrow-Stith, Lochner & Gupta, 1998; Lotufo & Bensenor, 2009; Wang & Arnold, 2008). High rates of homicide in Latin American countries are linked with rapid urbanization and marginalization of certain populations, which has given rise to organized gangs and crime groups (Doyle, 2016). Conversely, communities with a middle class, opportunities for employment, and local investment experience lower homicide rates (Doucet & Lee, 2015). Thus, investment in neighborhoods, enacting policies to mitigate income inequality, and instituting strategies to minimize disenfranchised groups may be effective strategies to reduce firearm violence.

Young black men are at highest risk for firearm injury in the U.S. and this is driven by the fact that racial and ethnic segregation is associated with concentrated poverty, social isolation, and inadequate opportunities for social and economic mobility. These factors all increase the risk for firearm violence in urban U.S. communities (Feldmeyer, 2010; Shihadeh & Flynn, 1996). Because young black men in these communities are deprived of the ability to find meaningful employment and prove their self-worth, they may turn instead to asserting their manhood through acts of aggression and violence.

Risk for injury by a firearm increases in environments with high levels of criminal activity, high density of alcohol outlets, and dilapidated properties (Branas et al., 2009). Communities that experience an influx in illegal drugs experience a proliferation of firearms, since those involved in the drug market buy guns for protection of themselves and their product. This leads other community members to buy guns for self-protection as well (Blumstein, 1995). Further, if there is a lack of trust in the police to protect certain groups of the population (such as urban black men) in risky communities, it may stimulate men to arm themselves in order to “handle” situations personally, rather than turn to authorities (Rich & Grey, 2005). Yet, instead of conferring protection, arming for self-protection in risky environments may increase the risk of a firearm injury.

Factors that increase risk or convey protection do not occur in isolation. An innovative study examined momentary risk over space and time and found that adolescents were more likely to be assaulted and injured with a firearm if they were alone, traversing areas with vacant buildings, violence, and vandalism, and if they had a gun, and that risks were reduced in areas of high neighbor connectedness (Wiebe et al., 2016). High expectations from parents, close relationships with parents and other adults, higher grade point averages in school, and religiosity protects youth from violence (Resnick, Ireland, & Borowsky, 2004). Having strong adult connections with youth in urban environments is associated with lower odds of involvement in violence (Culyba et al., 2016a). Addressing and modifying the social and

physical environments in which people live, play, and travel are fertile areas to study to decrease the risk for violence and homicide (Culyba et al., 2016b).

Consequences of Firearm Violence

Firearm violence can have profound consequences for individuals, families, and communities. On an individual level, the acute injury sustained can be significant and life-threatening. The presence of an organized trauma system improves survival from gunshot wounds and by some reports is associated with the reduction in mortality rates seen over the past decade. A trauma system, by definition, includes multiple phases of care from pre-hospital, emergency, in-patient services, rehabilitation if indicated, and outpatient services (Richmond & Aiken, 2011). Thus the integration of systems and smooth hand-offs by nurses and other health care professionals are central to high quality care. Survival of the acute injury alone is an insufficient goal of care. Individuals who survive firearm injuries can be faced with complex recoveries due to injuries that could result in permanent disability or disfigurement, chronic pain, and other long-term issues creating life-long problems (DiScala & Sege, 2004).

Resuscitation and definitive care of the physical traumatic injury is high priority, but must be provided in concert with a recognition of the psychological effects of a violent injury. Development of posttraumatic stress disorder (PTSD) and depression are serious concerns after injury (Richmond et al., 2009; Shih, Schell, Hambarsoomian, Marshall, & Belzberg, 2010), and experiencing an assault is an independent predictor of posttraumatic stress disorder (PTSD) (Alarcon et al., 2012). The surgical decision about whether bullets are removed or retained can have repercussions since retained bullets are associated with more severe depressive symptoms (Smith et al., 2017). Nurses are central to the assessment, early recognition, and management of psychological needs. Principles of trauma-informed care should be routinely incorporated into patient management.

Experiencing a firearm injury has consequences for future involvement in firearm violence. Being hospitalized, even once, as a result of interpersonal violence elevates the risk for being readmitted for an assault. Risk for readmission is highest within 30 days of the initial assault (Dowd, Langley, Koepsell, Soderberg, & Rivara, 1996). It appears there is a dose-response, with the likelihood of future hospitalization for an interpersonal intentional injury increasing as the number of previous admissions for interpersonal violent injury increases (Schwarz et al., 1994). PTSD resulting from firearm injury or witnessing such violence may lead to future firearm violence perpetration; however, there is limited evidence supporting this assertion and significant research is needed in this area (Montgomerie, Lawrence, LaMotte, & Taft, 2015).

Consequences of firearm violence can be significant for communities. A recent social network analysis reported the likelihood of knowing a victim of firearm violence over one's lifetime in the U.S. is 99.85%; virtually everyone is affected by firearm violence (Kalesan, Weinberg, & Vagle, 2016). Exposure to firearm violence or witnessing a violent event can result in psychological injury to youth and adults even in the absence of a physical injury. Youth living in pervasively violent communities report hearing about (95%), witnessing

(87%), or being directly victimized (54%), and this carries an emotional toll and can have far reaching effects (McDonald, Deatrick, Kassam-Adams, & Richmond, 2011). For example, children who are in direct proximity of shootings and hear gunshots in the night report difficulties sleeping. These children develop a finely tuned vigilance in order to assess if places are safe or not safe, likely contributing to chronic stress (Teitelman et al., 2010). Parents and children report keeping children ‘captive’ in the home, rather than playing outside, because of the violence in their neighborhoods (Jacoby, Tach, Guerra, Wiebe, & Richmond, 2017). Women who witness violence in their communities are twice as likely to experience symptoms of depression and anxiety than unexposed women (Clark et al., 2008), and women reporting high exposure to neighborhood violence report poorer health, smoking, never exercising, and poor sleep habits (Johnson et al, 2009). Nurses in all settings should be attuned to the impact of exposure and assess the needs of both youth and adults.

Nursing Science

Firearm violence is a public health priority. Nurses can take action to change the public discourse from the current pro-gun/anti-gun rhetoric to framing firearm violence as a health issue. This change in discourse opens possibilities of working together across differing viewpoints with the joint purpose of keeping people healthy and safe in a world where firearms are plentiful.

As with any other illness, it is important to focus research across the spectrum, from primary prevention to enhancing long-term recovery. Unfortunately, research funding for firearm violence is significantly restricted in the U.S. because the controversies surrounding firearms are so polarizing (Branas, Wiebe, Schwab, & Richmond, 2005). The dearth of research, limited access to data, and limited funding is highlighted in the National Academy of Sciences report “Firearms and Violence: A Critical Review” (National Research Council, 2005). This report issued strong recommendations for development and maintenance of national data systems, improved data access balanced by minimal risks to privacy concerns, improved research and data methodologies, design and testing of theoretically based prevention programs, and an increase in research funding. A more recent report from the Institute of Medicine and the National Research Council identified research priorities to reduce firearm-related violence over three to five years (2013), and included many priority areas relevant to nursing science (See Table 2 for selected topics). Although this report was published in 2013, these questions have not been answered and remain ripe for research.

Nursing science spans prevention, acute care, and recovery phases of firearm violence. The best strategy to improve outcomes of firearm injury is to prevent the injury from the outset. However, prevention programs that have been rigorously evaluated show limited evidence of effectiveness (National Research Council, 2005). Even programs, such as Cure Violence, that are theoretically based and use a public health approach to change individual and community attitudes and norms to reduce gun violence, show mixed evidence of effectiveness when rigorously evaluated (Butts, Roman, Bostwick, & Porter, 2015). Leveraging policy to reduce firearm violence is an important intervention. Rigorous evaluation of policy and law and their effects on reducing firearm violence is a fruitful area

of research (Ardila-Gomez, Lugo-Palacios, & Vargas-Palacios, 2015; Fleepler, Lee, Monuteaux, Hemenway, & Mannix, 2013; Webster, Cerdá, Wintemute, & Cook 2016).

Three vulnerable populations in particular would benefit from the contributions of nursing science. With the aging of society, it is important to consider the implications of the intersection between firearm availability and older adults. In the U.S. alone, more than 17 million people over the age of 65 years own a firearm (Hepburn, Miller, & Azrael, 2007). The highest rate of firearm suicide is for older white men and in 2016 firearms accounted for 77.4% of all suicides in men 65 years and older (CDC, 2017). Given the prevalence of dementia increases with age, an area ripe for nursing science is the development and testing of strategies to enhance the health and safety of older adults and their caretakers (Mertens & Sorenson, 2012). Another vulnerable population consists of individuals with serious mental illness who are restricted from acquiring firearms. Little is known about how restricting firearm ownership affects suicide risk and how such restrictions might affect treatment seeking (McGinty, Webster, & Barry, 2014). Vulnerable populations that are disenfranchised from the health care system and who live in neighborhoods with limited resources should also be a focus of nursing science. In the U.S. for example, black men describe challenges in engaging with health care and express mistrust of health care institutions (Liebschutz et al., 2010). New science needs to be developed on how to better engage these populations to reduce the physical and psychological consequences of firearm violence and to reduce recidivism.

Engaging community partners in research to reduce firearm violence and its consequences is an important strategy. Members of affected communities bring essential knowledge and insight to research projects, and are central to identifying locally relevant outcomes that may be difficult to capture with existing measures. New methodologies and measures are important to develop in order to capture community-identified outcomes. One innovative approach is to link community-identified outcomes with items extracted from existing measures and to rigorously evaluate those outcomes (Hausman et al., 2013). Since firearm injuries occur in physical environments, integrating geospatial technologies coupled with strong study design can more precisely identify risks and protections for firearm violence (Bell & Schuurman, 2010) in order to inform the development and testing of interventions. Nurse scientists are well-positioned to engage the community as full partners in firearm violence prevention research, from the initial conceptualization of a research project through a study's completion and innovative dissemination of its findings to the community (Vaughn et al., 2013).

Mitigating the consequences of injury from firearms is especially central to nursing science in the realm of symptoms and symptom management. The intersection of the intent and severity of physical injury, psychological effects, and other residual effects such as long-term pain, reduce health-related quality of life (Gross & Amsler, 2011). Psychological effects of firearm violence can be profound and merit further study. In a recent national survey of trauma centers in the U.S., centers rarely screened for PTSD (only 7%) and depression (23%) (Love & Zatzick, 2014). Clearly there are opportunities to better integrate psychological screening and early intervention in acute care of injured patients and to develop and test various models of care, such as trauma-informed care.

Policy research is an important area for nursing science, and lessons can be learned from policy decisions of the international community. For example, while gun buyback programs in the U.S. have not been shown to reduce firearm violence, this is not the case in all countries. After the 1996 massacre of 35 people in Tasmania, the Australian government enacted the national Firearms Agreement, which tightened legislation regulating firearms across states and territories. The associated Australian gun buyback led to a reduction in firearm suicide rates by almost 80% and a reduction in firearm homicides albeit with less precision (Leigh & Neill, 2010). While policy studies such as this and others may not be sufficient to demonstrate cause and effect, they do inform possible strategies to reduce firearm violence (Chapman, Alpers, & Jones, 2016). Another example of the effectiveness of policy interventions can be seen in Israel where firearm access was curtailed for off-duty soldiers in 2006 that resulted in a 40% reduction in suicide among soldiers (Rosenbaum, 2012). Within individual countries, firearm laws vary by states or districts and offer an opportunity to examine the impact of specific laws and policies on firearm deaths. For example, a recent cross-sectional, state-level study in the U.S. found that the laws most strongly associated with reduced firearm mortality are universal background checks for firearm purchase, background checks for ammunition purchase, and identification requirements for firearm purchase (Kalesan et al., 2016). Such comparative research may help illuminate effective strategies to reduce firearm violence.

Summary

Firearm violence is a health and public health concern and is of substantial importance to nursing care and nursing science. Nurses are in a prime position to understand the complex factors leading to firearm violence and the need to produce high quality science to reduce the frequency and impact of firearm violence on individuals, families, and communities. The goal of nursing is to keep people healthy and safe and to help return those injured to their optimal levels of health and well-being. Understanding the factors that come together to injure people with a firearm in various physical, social, economic, and cultural environments, positions nurses to both extend the dialogue beyond pro-gun vs. anti-gun and to design and carry out rigorous studies to reduce firearm violence.

Clinical Resources

American Public Health Association: <https://www.apha.org/topics-and-issues/gun-violence>

National Academy of Medicine: Community Violence as a Population Health Issue. <https://www.nap.edu/read/23661/>

National Academy of Medicine: Priorities for Research to Reduce the Threat of Firearm Violence. <https://www.nap.edu/read/18319/>

National Center for PTSD: <https://www.ptsd.va.gov/>

Small Arms Survey: <http://www.smallarmssurvey.org/>

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Table 1.

The Haddon Matrix applied to Interpersonal Firearm Violence

	Host	Agent	Physical Environment	Social Environment
Pre-Event	Restrict walking alone in high crime areas at night Minimize alcohol use	Instant background checks with complete and reliable data Keep guns in the home unloaded and locked	Add street lights to the environment to enhance lighting Invest in neighborhood development	Remove small arms in post-conflict geographic areas
Event	Withdraw from conflict situations that are escalating and seek shelter	Enforce access restrictions to firearms for people with felony convictions	Identify and clean up illicit drug trade Enhance community policing	Maximize adult presence and supervision in neighborhoods
Post-Event	Maximize bystander rapid call for emergency medical services for rapid transport Teach community members simple strategies to stop bleeding	Post-shooting investigation and tracing of guns involved in shooting events	Locate trauma centers to facilitate rapid provision of definitive care	Ensure funding for trauma systems and pre-hospital transport Provide funding for post-acute care follow-up to address consequences of firearm injury

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Table 2:

Selected Research Topics Identified by the Institute of Medicine Report *Priorities for Research to Reduce the Threat of Firearm-related Violence* (2013)

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- Identify factors associated with youth having access to, possessing, and carrying guns.
 - Evaluate the potential health risk and benefits of having a firearm in the home under a variety of circumstances and settings.
 - Improve understanding of risk factors that influence the probability of firearm violence in specific high-risk physical locations.
 - Improve understanding of the effectiveness of actions directed at preventing access to firearm by violence-prone individuals.
 - Determine the degree to which various childhood education or prevention programs reduce firearm violence in childhood and later life.
 - Determine whether programs to alter physical environments in high-crime areas result in a decrease in firearm violence.
 - Examine the relationship between exposure to media violence and real-life violence
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