The prevention of firearm injuries in Canadian youth

Katherine Austin, Margo Lane; Canadian Paediatric Society, Adolescent Health Committee

Posted: Mar 27 2017

Abstract
Firearm injuries are a significant and preventable cause of death in Canadian youth. Adolescent and young adult males are disproportionately affected; however, firearm-related deaths occur in youth of all ages. Canada’s rate of firearm ownership is lower than that of the United States, but high compared with other upper-income countries. The availability of firearms to youth is an important factor in adolescent suicide, unintentional firearm deaths, gang homicide and school shootings. Guns should not be kept in homes or environments where children and adolescents live or play. Screening for the presence of a firearm in the home is an essential part of the safety assessment of a depressed or suicidal youth, and removal of the firearm from the home must be recommended in this situation. Legislative measures to strictly control the acquisition, transport, ownership and storage of firearms, and to reduce smuggling of firearms, are also recommended.

Key Words: Adolescent; Child; Firearm; IPV; Non-powder firearm; Targeted school violence

Firearm injuries are a significant and preventable cause of death in Canada, both in the general population and in youth. This statement reviews the burden of firearm-related injuries in Canadian youth and the elevated risk of completed suicide associated with the presence of a firearm in the home. It also examines the issues of homicide and gang violence, and the risk factors for school shootings. The dangers of non-powder firearms (such as BB guns and air guns), are also reviewed.

Scope of the problem and international comparisons
From 2008 to 2012, 3,688 Canadians of all ages died from firearm injuries[1]. This number includes injuries from unintentional (accidental) and intentional (suicides and homicides) firearm injuries. A total of 635 of these deaths occurred in youth age 24 and under. Young males, in particular, are at disproportionate risk of firearm injuries: of all firearm deaths among 15- to 24-year-olds, 94% were in males. In the same time period, males in this cohort were more likely to die from firearm injuries (601 deaths) than from fires, falls and drowning combined (350), or from cancer (511).[2]

Risk for various types of firearm death changes with age (Figure 1). From 2008 to 2012, among adolescents (15 to 19-year-olds), the majority (56%) of firearm deaths were suicides, whereas among young adults (20 to 24-year-olds), homicides comprised the majority of firearm deaths (55%). In the same time period, in younger children (under 15 years of age), there were 15 suicides, 10 homicides, 7 unintentional deaths and 2 whose type was undetermined.
The firearm death rate (for all ages) in the United States (10.2/100,000) is much greater than in Canada (2.3/100,000).\(^{[3]}\) However, it should not be assumed that a lower rate of firearm deaths in Canada means there is no problem. A study of firearm mortality rates in the United States and 22 other high income countries, using WHO data, showed that Canada ranked fifth overall in firearm death rate. To demonstrate important differences among the non-US countries, US data were removed from chart. When the US data are removed, Canada is seen to be fourth among the non-US countries in firearm mortality rates (Figure 2).

In the 2007 Small Arms Survey, Canada ranked 13th (out of 178 countries studied) for civilian firearm ownership (Figure 3). While the Canadian rate of guns owned/100 persons (30.8) is well below that of the United States (88.8), it exceeded those of New Zealand, Australia, England and Wales and Japan (0.6).\(^{[4]}\)
The most recent estimate of home ownership of firearms in Canada (2002), based on survey findings, was that 17% of households in Canada owned a gun. While the mean number of guns owned by an individual gun-owner was 3.22, the top 3% of firearms owners owned 15% of all guns. These 3% owned, on average, 15.5 guns per owner. [5]
In September 2011, the RCMP released the last report which was able to utilize data from registration of firearms. At that time, there were 7,865,994 firearms registered in Canada. The Canadian Firearms Program data show a wide variation in firearm ownership by province/territory (Figure 4). The Yukon had the highest per capita number of registered guns (87.278/100,000 persons) and Prince Edward Island had the lowest (18.029/100,000).[6]

The majority of firearms in Canada are long guns (rifles and shotguns). Of the 7,865,994 firearms registered in Canada in 2011, 7,137,386 (91%) were rifles or shotguns.
Data from reference 6

**Child and adolescent development and the risk of a firearm in the home**

Children and adolescents have developmental characteristics that put them at increased risk for firearm injury. Children lack the experience, cognitive development and impulse control to distinguish a toy gun from a real one, to understand the consequences of gun handling, and to consistently avoid doing something they have been told not to. While adolescents have more advanced cognitive capacity than children, they remain vulnerable to injury because they have incompletely developed self-regulation skills, such as impulse control. Self-regulation skills can be particularly impaired in situations involving peers, high levels of emotion and substance use.

**Suicide, homicide and unintentional death in the home**

**Suicide and homicide:** There is a strong positive correlation between the availability of a firearm in the home and the risk of completed suicide and homicide. A 2014 meta-analysis of 15 studies from the United States, New Zealand and Ireland analyzed the relationship between access to a firearm in the home and the risk of suicide and homicide for family members. The odds ratio (O.R.) for a completed suicide of a family member with access to a firearm, versus no access to a firearm, was 3.24. The O.R. for being a victim of homicide was 1.94.

**Intimate partner violence:** Family violence and intimate partner violence cause suffering, physical
harm and long-lasting behavioural consequences for youth.\textsuperscript{[10]-[12]} Intimate partner violence (IPV) is the most common form of violence against women in Canada.\textsuperscript{[13]} In 2014, there were 83 intimate partner homicides in Canada.\textsuperscript{[14]} A Canadian report on family murdersuicides from 2001 to 2011 found that firearms were the most common cause of death in spousal murdersuicides and in murder-suicides involving child and youth victims.\textsuperscript{[15]} The availability of a firearm to a perpetrator is a risk factor for fatal IPV.\textsuperscript{[16]} Compared with other methods, such as knives or bodily force, the use of a firearm in a family or intimate assault is associated with a higher likelihood of a fatal outcome\textsuperscript{[17]} The Society of Obstetricians and Gynaecologists of Canada, in their Intimate Partner Violence Consensus Statement, recommended that: 

"[health care] providers should include queries about violence in the behavioural health assessment of new patients, at annual preventive visits, as part of prenatal care, and in response to symptoms or conditions associated with abuse".\textsuperscript{[18]} When there is concern regarding IPV or family violence, the presence of a firearm in the home must be determined and, if present, should be considered a risk factor for homicide of a family member.

**Unintentional deaths:** A Canadian study of mortality from unintentional firearm injury found a strong positive correlation between death rates from unintentional firearm injuries and provincial rates of firearm home ownership.\textsuperscript{[19]}

Adolescents are especially vulnerable to the risks of having a lethal method accessible in the home. Impulsivity is an important factor in adolescent suicide and most people who fail a suicide attempt do not repeat.\textsuperscript{[20]-[22]} Because firearms carry the highest case-fatality rate of all suicide methods, it is not surprising that the availability of a firearm in the home has been shown to be a strong risk factor for adolescent suicide completion.\textsuperscript{[23]-[27]}

**Anticipatory guidance**

Considering the risks associated with a firearm in the home of children and adolescents, anticipatory guidance on this issue by health care providers is essential. Every family, rural and urban, should be screened for gun ownership. Physicians must make parents aware of the risks of firearms availability, and counsel that firearms not be kept in environments where children and adolescents live and play. Parents who decide to keep a gun in the home should be counselled to store firearms unloaded, with a trigger lock or in a locked container, and separate from ammunition. There is evidence to indicate that physician guidance can be effective. A randomized clinical trial involving an office-based violence prevention intervention showed that physician counselling was associated with a substantial increase in the percentage of families reporting the use of cable locks for storing firearms.\textsuperscript{[28]}

Screening for the presence of a firearm in the home should be done as a part of a routine safety assessment in all children or youth struggling with – or at risk for – mood disorders, substance abuse or self-harm behaviours (including a history of suicide attempt). In those cases, a strong recommendation must be made to remove any firearms that are present.

**Youth and gangs and guns**

In a 2008 report to the Toronto District School Board, the School Safety Advisory Panel found a strong correlation between exposure to firearms and gang involvement.\textsuperscript{[29]} In this survey, only 1% of students who had never been involved in a gang reported having had a gun pointed at them at school in the past two years, compared with 11% of former gang members and 19% of current gang members. Gang involvement is an important risk factor for firearm-related youth homicide perpetration. Youth accused of homicide are more likely to be involved in gang-related homicides than adults. According to Statistics Canada, almost one-third (30%) of youth accused of murder in 2012 were involved in a gang-related homicide compared with 13% of adults accused.\textsuperscript{[30]} Gang-related homicides are much more likely to involve a firearm, usually a handgun. In 2012, 75% of gang-related homicides involved a firearm, compared with 21% of homicides that were not gang-related. Of firearm-related homicides, handguns were used in 80% of gang-related homicides compared with 48% of non-gang-related homicides. The origin of the majority of guns considered by Canadian police to be "crime guns" is the United States.\textsuperscript{[31]} The flow of illegal handguns over the border results in availability of firearms to Canadian youth who are gang-involved, increasing their risk of being the perpetrator or victim of firearm-related injury.

Public Safety Canada’s National Crime Prevention Centre provided funding to community-based organizations for youth gang intervention projects in communities across Canada from 2007 to 2012. These projects were evaluated for effectiveness. The youth
who received the interventions showed improvements in attitudes (e.g., understanding crime-associated risks), risk factors (e.g., unemployment) and behaviours (e.g., gang involvement, police contact).[32]

**School shootings (targeted school violence)**

On January 22, 2016, a 17-year-old student shot and killed two fellow students in a private home before going to La Loche Community School, in La Loche, Saskatchewan, and fatally shooting two teachers and wounding seven other persons. Responding police officers arrested the suspect on the school premises. He later pleaded guilty to four counts of murder and seven counts of attempted murder. According to news reports, the suspect was bullied for his physical appearance and, before arriving at the school, had sent a social media message stating his intention to shoot at the school.

Since 1975, the following incidents of youth-perpetrated targeted school violence have also occurred in Canadian schools:

- **1975:** At Centennial Secondary School, in Brampton, Ontario, a 16-year-old male shot and killed a student and a teacher, injured 13 students and committed suicide.

- **1975:** At St. Pius X High School, in Ottawa, Ontario, an 18-year-old male killed one student and injured five, and committed suicide. He also killed a 17-year-old friend just before the school shooting.

- **1989:** At École Polytechnique, in Montreal, Quebec, a 25-year-old male killed 13 students and one school employee, injured 14, and committed suicide.

- **1999:** At W.R. Meyers High School, in Taber, Alberta, a 14-year-old male killed one student, injured another and was arrested.

- **2006:** At Dawson College, in Montreal, Quebec, a 25-year-old male killed one student and injured 19, and committed suicide.

In all, there have been six incidents of youth-perpetrated targeted school violence in Canada since 1975, resulting in 25 dead and 59 injured.

While school shootings represent only a small fraction of homicides, they have a tremendous impact on the schools and communities in which they occur, as well as the nation. “Targeted school violence” is a term that was developed to describe homicidal violence in which a school is specifically selected as the site of attack, while the target may be a specific individual or a group or category of individuals.[33]

Youth who perpetrate targeted school violence are usually male; however, they otherwise show a wide range of demographic, family and social characteristics.[33][34] Some common findings are:

1. Two-thirds of adolescent perpetrators had experience with weapons use and had a firearm available to them in their own home or that of a relative.
2. Many attackers felt bullied or persecuted by others.
3. Many had depressive symptoms or suicidal ideation before the incident, though only a minority had received a mental health evaluation or diagnosis.
4. The incidents were preceded by advance planning and were usually not impulsive. Most of the adolescents made one or more peers aware of their plans in advance.

Strategies to prevent targeted school violence have been instituted in a number of countries. Considering the infrequent nature of these incidents, it is impossible to evaluate programs for effectiveness in preventing further incidents. However, based on typical characteristics of targeted school violence, the following interventions have been suggested:

- The removal of firearms from the homes of adolescents and children, and prohibition of the sale or possession of semi-automatic (military style) firearms to reduce the lethality of incidents.
- Training students and teachers to identify and report threats of and planning for school violence.
- Addressing bullying in schools.
- Providing mental health services which can identify and respond to students experiencing depression and suicidal ideation.

It must be emphasized that mental illness is not a root cause of gun violence. The majority of mentally ill persons do not commit violent acts, and most violent individuals do not have a mental illness.[35][36] Clinicians who assess youth for risk of violence should be guided by use of evidence-based risk-assessment tools, which focus on individual risk factors for violence.
as opposed to the presence or absence of mental illness.[37][38]

**Non-powder firearms: Air guns, BB guns, paintball and airsoft guns**

Air guns and BB guns that shoot a projectile at speeds less than 182 metres per second are not considered 'firearms' for the purposes of the licensing, storage and transportation regulations of Canada's Firearms Act.[39] They are also not regulated by the Canada Consumer Product Safety Act. However, some modern-day air guns and BB guns have projectile velocities only slightly under 182 metres per second. Many of these weapons achieve velocities adequate to penetrate the eye and skin.[40][42] Multiple case series of air and BB gun injuries have shown that they can cause serious injuries to the head, heart, brain, eye and neck, and may result in death.[43][47] Non-powder firearms should not be considered as toys, and their injuries should be as promptly assessed and managed as for gunshot wounds.

Considering their potential to cause serious bodily harm or death, non-powder firearms that have projectile velocity adequate for skin and eye penetration should be classified as firearms and regulated as such, while non-powder firearms with lower projectile velocities should be brought under the control of the Canada Consumer Product Safety Act.

The sport guns used in airsoft and paintball are also associated with ocular injuries, which can be particularly severe and complex and lead to permanent visual deficits or blindness.[48][52] The use of masks and eye gear is generally protective, and most injuries occur either when goggles are removed prematurely or during informal recreational play, when eye protection is not worn. Youth should only use paintball and airsoft guns in reputable arenas, with adult supervision. Informal use of paintball or airsoft guns by youth should be strongly discouraged.

**Recommendations for the clinician**

Health care providers can help reduce risk for firearm-related injuries and deaths by using the following best practices:

- Counsel families that firearms should not be present in homes or environments in which children and adolescents live and play. When a firearm is present, it must be stored according to the regulations of Canada’s Firearms Act: unloaded, locked and separate from its ammunition.

- Ask routinely about the presence of a firearm in the home and inform parents of the risks of home ownership if one is present. Highlight the developmental characteristics that make children and youth particularly vulnerable to death by firearm.

- Screen for the presence of a firearm in the home as part of routine safety assessment for all children or youth struggling with or at risk of mood disorders, substance abuse issues or self-harming behaviours (including a history of suicide attempt). In such cases, a strong recommendation must be made for the removal of any firearms that are present.

- Inform parents that non-powder firearms (e.g., air guns and BB guns) are dangerous weapons; children and adolescents must never use these weapons unless they are supervised closely by an adult. Inform parents that paintball and airsoft guns must be used only in supervised arenas with proper safety gear.

- When assessing children with injuries caused by non-powder firearms, be aware that the pellets can cause significant internal injury.

- When there is concern regarding intimate partner or family violence, inquire about the presence of a firearm in the home and if one is present, recommend its removal.

**Recommendations for government**

The Canadian Paediatric Society urges all levels of government to legislate stricter controls on the acquisition, transport, ownership and storage of firearms. To reduce the availability of firearms to youth, the CPS specifically recommends the following:

1. Measures to reduce the illegal importation of firearms into Canada, especially from the United States.
2. Tighter restrictions on semi-automatic (military style) firearms; their use increases the lethality of mass shooting incidents.
3. Evidence-based, appropriately funded gang prevention initiatives in communities where youth are at high risk for gang involvement.
4. Research on risk factors for targeted school violence, along with evidence-based programs to prevent bullying in schools and improve access to
mental health services for children and youth at risk.
5. Classify air guns and BB guns whose projectile velocity is great enough to cause eye or skin penetration as firearms under Canada's Firearms Act. Regulate air guns and BB guns with lower projectile velocities under the Canada Consumer Product Safety Act.

Acknowledgements
This position statement has been reviewed by the CPS Action Committee for Children and Teens (ACCT), as well as by the the Injury Prevention, Community Paediatrics and Mental Health and Developmental Disabilities Committees of the Canadian Paediatric Society.

References

CPS ADOLESCENT HEALTH COMMITTEE

Members: Giuseppina Di Meglio MD, Natasha Johnson MD, Margo Lane MD (Chair), Karen Leis MD (Board Representative), Mark Norris MD, Ellie Vyver MD

Liaison: Christina N Grant MD, CPS Adolescent Health Section

Principal authors: Katherine Austin MD, Margo Lane MD