



Best Practice Interventions in Childhood Injury Prevention:

A Review of What Works in Developing
Successful Strategies

Pamela Fuselli and Amy Wanounou



Many are surprised to learn that unintentional injuries are the leading cause of death for children in Canada. Injury accounts for 30% of all deaths and the largest environmental burden of disease. On average, this translates to about 300 deaths annually for children less than 14 years of age (Public Health Agency of Canada 2005, 2006). In other words, approximately 25 children die from an injury every month, the equivalent of one classroom.

The good news? Unintentional injuries to children are predictable and preventable. Proven strategies are known and could significantly reduce the rate of injuries if adopted and implemented across all provinces and territories in Canada.

The good news? Unintentional injuries to children are predictable and preventable.

Central to implementing effective strategies to prevent unintentional injuries is knowing what works. Unintentional injuries in children offer a unique and pressing case requiring the implementation of evidence-based, best practice strategies. Best practice strategies enable Canadian injury prevention practitioners to make worthwhile investments in prevention strategies that are known to work and have the greatest probability of success. This article explores the pillars of injury prevention best practices and offers an illustrative case study examining interventions in playgrounds and cycling. It provides guidelines (based on the Canadian edition of the *Child Safety Good Practice Guide* [Mackay et al. 2011]) for decision-makers, practitioners and legislators to inform their work on injury prevention.

Why Are Injury Prevention Strategies Needed?

Unintentional injuries are often described as “accidents,” which by definition are unpredictable and unpreventable random events and the result of chance, bad luck or something else over which we have no control. In reality, we can predict and,

therefore, can prevent unintentional injuries (Drago 2007). Injuries generally result from combinations of adverse environmental conditions, equipment, behaviour and personal risk factors, any or all of which can be changed. Furthermore, injury prevention measures reduce the likelihood and severity of injuries (Baker 1998).

Injury prevention is sometimes erroneously viewed as an attempt to “bubble wrap” children in a “padded world.” On the contrary, injury prevention strategies based on best practices seek to ensure interventions are based on childhood development, of which taking risk is a key component but at age-appropriate milestones. Risk taking in childhood contributes to a child’s holistic development, formulating positive self-image as well as a host of life skills. In order to grow physically, mentally and socially, children need experiences that test their abilities.

Although risk generally carries a negative connotation, it is actually on a continuum that is both positive and negative. Risk can be managed by striking a balance between challenge and hazard. “A hazard is something a child doesn’t see; a challenge is a risk that a child can see and chooses to undertake or not” (Moore et al. 1992). Best practice interventions address the paradox that there is nothing more important than ensuring a healthy, safe setting, but that it is equally important to ensure a challenging setting for children. Danger is not so much related to children taking risks as it is to unforeseen consequences and hazards they cannot control. “Safety is not the absence of risk but rather assumed, calculated, controlled risk” (Maufette 1999: 21).

What Is “Best Practice” for Injury Prevention?

So much is needed to address the safety of Canadian children. There are pressures on time and limited resources, making it all the more important to focus on best practices to provide a road map to the strategies that are most likely to reduce the rate and burden of unintentional injuries in children. Best practice is defined in four separate ways (Mackay et al. 2011):

1. A prevention strategy that has been evaluated and found to be effective
2. A prevention strategy where rigorous evaluation is difficult but expert opinion supports the practice and data suggest it is an effective strategy
3. A prevention strategy where rigorous evaluation is difficult but expert opinion supports the practice and there is a clear link between the strategy and reduced risk
4. A prevention strategy that has been implemented in a real-world setting so that the practicality of the intervention has also been examined

Successful interventions based on best practices contain four key elements. First, context serves as the underpinning of

successful interventions. Broad social determinants of injury, as well as local needs and resources within target populations, are considered. Second, they involve the crucial element of cross-sectoral collaboration, involving action by multiple stakeholders. Third, they run the gamut between active and passive approaches (Mackay et al. 2011). In contrast to active interventions that require conscious action at the individual level to be effective, passive interventions are preferred because they are automatic, protect everyone and require no action or co-operation from the individual. In doing so, they reduce the need for constant vigilance by individuals to protect themselves or their families and allow for human error and fatigue, which are inevitable. Fourth, they emphasize the concept of “layers of protection,” which emphasizes that there is no single tool that is magical and foolproof. Instead, multiple tools working in concert are most effective.

The principle of layers of protection is best expressed through the “three Es of prevention” – engineering, enforcement and education. These three Es are tools for establishing large-scale changes in healthy public policy and the creation of environments, both social and physical, that allow the safe behaviour to be the easy behaviour. The combination of these methods in any one intervention provides for a “synergistic” effect (Towner et al. 2001).

Education is usually the first and most commonly used strategy to implement an intervention. Education seeks to share information, encourage people to change their unsafe behaviours and modify their knowledge and attitudes about injuries. Despite their usefulness, evaluations of educational programs show that our ability to affect significant behaviour change is often limited and that education is most effective as part of a broader set of initiatives that incorporate the other Es of prevention. Similarly, engineering and enforcement approaches are less likely to be effective if they do not include supporting educational elements (Mackay et al. 2011).

Engineering the environment is a particularly useful passive intervention. In the case of product design, it is often easier and more effective to change the design of a product to make it safer, than it is to teach everyone to be careful whenever they use it.

Legislation has proven to be the most powerful tool in the prevention of injury. With strong enforcement and supporting educational campaigns, legislation can help to reinforce and sustain behavioural changes that promote long-term and cost-effective injury prevention (Mackay et al. 2011).

Case Study: Playgrounds and Cycling – Are Helmets Safety Tools or Strangulation Devices?

Playgrounds and cycling are two significant sources of unintentional injuries in children. Although they have similar elements to address in formulating successful interventions, they also demonstrate the importance of determining the most appro-

priate and effective best practice interventions based on data.

In the case of playgrounds, at least 29,000 children under 15 years old receive treatment at hospital emergency departments for playground injuries each year in Canada (Norton et al. 2001). In the period between 1994 and 2004, 44,577 hospitalizations occurred due to cycling incidents in Canada, representing 2% of all hospitalized injuries. Twenty-four percent of these hospitalizations were due to head injuries, of which 61% occurred among those five to 19 years of age (Canadian Institute for Health Information 2006).

Both playgrounds and cycling have benefits to the overall health and development of children. A healthy lifestyle that includes exercise is vital to promoting overall health and preventing chronic health conditions, such as obesity. As a result, play and recreational activities such as cycling are critical to a child's health in the short and long term.

Furthermore, best practice interventions for playgrounds and cycling need to understand children's behaviour in the real world. Children will use equipment in all possible ways, regardless of design intention. For example, rungs at the entrance of slides are used for tumbling, children slide on top of tubes instead of inside them and kids like to experiment and test the limits of their bikes. Best practice interventions for playgrounds and cycling demonstrate the need to strike a balance between challenge and hazard. Well-designed playgrounds and cycling interventions encourage a child to take risks within a semi-controlled environment that protects them from a hazard they may be unable to foresee (Mitchell et al. 2006).

But this is where the similarities between playground and cycling interventions end. The juxtaposition of playground and cycling best practice interventions demonstrates that context is critical and that the same intervention can be both beneficial and detrimental.

Of major importance is an understanding of the mechanism of injury in a particular setting. Playground injuries primarily occur because of falls to hard surfaces. A fall on cement or asphalt from a height of only 30 centimetres (12 inches) can cause severe head trauma. As a result, proper surfacing and overall construction of a playground are crucial elements in an intervention strategy. Ensuring proper surfacing of the landing area in proportion to height decreases the risk of injury but not the child's ability to experiment and therefore develop other life skills (Maufette 1999).

As a result, playground injury prevention is primarily achieved through environmental modification and, specifically, design standards developed by organizations such as the Canadian Standards Association. The goal of the standards is to help manufacturers design child-scaled and hazard-free equipment and to aid installers and operators to position and maintain the equipment so as to reduce the frequency and severity of injuries. Behind each measure prescribed is a

rationale based on injury analysis, anthropometric research (regarding the size of children's body parts) and the study of children's play behaviours. It recommends a number of safety measures, audits, inspection and maintenance routines that should help keep well-designed play spaces as safe as possible at all times. Since falls are the most frequent cause of injury in young children, special attention is given in the standards to the surfaces on which they fall (Norton et al. 2004). Standards are not intended to provide risk-free environments but, rather, to specify the minimal acceptable standard for play equipment and surrounding environments (Mitchell et al. 2006).

Although falls are the predominant cause of injury on playgrounds, the primary cause of death on playgrounds is strangulation (Maufette 1999). Helmets are considered a "hidden hazard" for a child playing on playground equipment, potentially resulting in fatal strangulation, as has been the case in the past. Strangulation deaths to children have occurred in the United States, Canada, Australia and Scandinavia when bike helmets became stuck in openings on playground equipment, resulting in hanging (Consumer Product Safety Division 1999). There have also been incidents on playgrounds when helmet straps led to choking. Openings in playground equipment have been built for bodies, not bodies with helmets (Bicycle Helmet Safety Institute 2011).

On the bicycle, these same helmet straps are necessary to keep a helmet on a child's head during a crash. In such cases, helmets have saved countless lives. Indeed, helmets are considered the most effective means to prevent head injuries while cycling. Research shows that a properly fitted helmet can decrease the risk of a serious head injury by over 85% (Attewell et al. 2001; Thompson et al. 2009). This means that four out of five head injuries could be prevented if every cyclist wore a helmet. The most effective means to ensure everyone wears a helmet while cycling is legislation.

A variety of interventions have been shown to have some impact on helmet-wearing rates among children and the general population. There is some evidence that bicycle training schemes can improve safe riding behaviour. Discount purchase programs and giveaway programs for helmets have been shown to facilitate some uptake and use (Towner et al. 2001). Educational programs have been shown to provide some advantages because they allow educational messages to be targeted to different age groups and have a captive audience ready to learn (Christoffel et al. 1995). Yet, as with other education-based interventions, there has been limited success in changing people's behaviour around helmet use with education alone.

Consequently, the introduction of mandatory laws for helmet wearing has become a principal strategy for promoting helmet use during cycling. The evidence bears out the beneficial effects of helmet legislation. While any legislation will increase the use of helmets (Karkhaneh et al. 2006), universal helmet

legislation, in which helmets are mandatory for all ages, has been shown to have a significant impact on the helmet-wearing rates of children and adults while cycling. In Canada, four of 10 provinces mandate helmet use for all ages and two mandate helmet use for those less than 18 years of age. No territory-wide legislation exists in the three Canadian territories. A recent study found that 95% of children riding with a helmeted adult wore helmets, compared with only 41% of children riding with a non-helmeted adult (Dennis 2010). Furthermore, helmet legislation has not been associated with changes in ridership, thereby maintaining the societal-level health benefits of cycling as a recreational activity. It should be noted that legislation is often the final step in developing an effective intervention strategy for cycling. Legislation in general requires public acceptance and, therefore, needs educational campaigns to influence both public opinion and policy makers (Towner et al. 2001).

Conclusion

Best practice strategies offer opportunities to significantly reduce and prevent unintentional injuries in children while allowing healthy child development. When children are the focus of the work, several important factors need to be considered when implementing intervention strategies:

- Children live in a world built for adults, and the types of injuries that they experience are closely linked to their age and their stage of development, which includes physical, psychological and behavioural characteristics.
- Injuries disproportionately affect the most vulnerable in society, including children. The likelihood of a child being killed or injured is associated with a variety of factors that constitute the social determinants of health.
- Best practice strategies must be based on evidence. Our case study highlights the importance of context and data when developing injury prevention interventions: whereas wearing a helmet prevents head injuries when cycling, the same intervention can be a hazard in the playground.

We encourage decision-makers, practitioners and legislators to base their work and recommendations on the available evidence. The Canadian edition of the *Child Safety Good Practice Guide* (Mackay et al. 2011) is an excellent primary resource to help those working in injury prevention to develop best practice interventions. We owe it to the health of all Canadian children to invest in the interventions with the greatest probability of success. Their lives may depend upon it. **HQ**

References

Attewell, R.G., K. Glase and M. McFadden. 2001. "Bicycle Helmet Efficacy: A Meta-Analysis." *Accident Analysis and Prevention* 33(3): 345–52.

Baker, S. 1998. *Injury Prevention: An International Perspective*. New York: Oxford University Press.

Canadian Institute for Health Information. 2006. *Head Injuries in Canada: A Decade of Change (1994–1995 to 2003–2004)*. Toronto, ON: Author.

Canadian Patient Safety Institute. 1999. *CPSC Press Release: Bike Helmets on Playgrounds*. Ottawa, ON: Author.

Christoffel, T., P.L. Graitcer, A.L. Kellermann. 1995. "A Review of Educational and Legislative Strategies to Promote Bicycle Helmets." *Injury Prevention* 1: 122–29.

Dennis, J., B. Potter, T. Ramsay and R. Zarychanski. 2010. "The Effects of Provincial Bicycle Helmet Legislation on Helmet Use and Bicycle Ridership in Canada." *Injury Prevention* 16(4): 219–24.

Drago, D.A. 2007. *From Crib to Kindergarten: The Essential Child Safety Guide*. Baltimore, MD: The John Hopkins University Press.

Institute for Bicycle Health Safety. 2011. *Playgrounds and Helmets Don't Mix!* Arlington, VA: Author. Retrieved January 9, 2012. <www.helmets.org/playgrou.htm>.

Karkhaneh, M., J.C. Kalenga, B.E. Hagel and B.H. Rowe. 2006. "Effectiveness of Bicycle Helmet Legislation to Increase Helmet Use: A Systematic Review." *Injury Prevention* 12(2): 76–82.

Mackay, M., J. Vincenten, M. Brussoni, E. Towner and P. Fuselli. 2011. *Child Safety Good Practice Guide: Good Investments in Unintentional Child Injury Prevention and Safety Promotion – Canadian Edition*. Toronto, ON: Safe Kids Canada.

Maufette, A.G. 1999. *Revisiting Children's Outdoor Environments: A Focus on Design, Play and Safety*. Quebec, CQ: Coopsc.

Mitchell, R., M. Cavanagh and D. Eager. 2006. "Not All Risk Is Bad; Playgrounds as a Learning Environment for Children." *International Journal of Injury Control and Safety Promotion* 13(2): 122–24.

Moore, R.C., S.M. Goltsman and D.S. Iacofano. 1992. *Play for All Guidelines: Planning, Design and Management of Outdoor Play Settings for All Children*. Berkeley, CA: MIG Communications.

Norton, C., J. Nixon and J.R. Sibert. 2004. "Playground Injuries to Children." *Archives of Diseases in Childhood* 89(2): 103–8.

Public Health Agency of Canada. 2005. *Leading Causes of Death, Canada, 2005, Males and Females Combined*. Ottawa, ON: Author.

Public Health Agency of Canada. 2006. *Leading Causes of Injury Hospitalizations in Canada 2005/2006*. Ottawa, ON: Author.

Thompson, D.C., F. Rivara and R. Thompson. 2009. "Helmets for Preventing Head and Facial Injuries in Bicyclists." *Cochrane Library* 1: 1–31.

Towner, E., T. Dowswell, C. Mackereth and S. Jarvis. 2001. *What Works in Preventing Unintentional Injuries in Children and Young Adolescents? An Updated Systematic Review*. London, England: Health Development Agency.

About the Authors

Pamela Fuselli is executive director of Safe Kids Canada, in Toronto, Ontario.

Amy Wanounou is the coordinator of government relations and public policy for Safe Kids Canada.