

## Trampoline Injuries (Backyard & Trampoline Parks)

### Purpose

*The intent of this paper is to provide an overview of the evidence regarding trampoline-related injuries (both residential- recreational backyard and trampoline parks) in children under the age of 14 years and the current best practice recommendations for preventing trampoline-related injuries. This paper is not meant to be distributed to parents and caregivers.*

### Introduction

Trampoline use has become a very popular source of recreation for children, however injuries from trampoline use are on the rise and these injuries can be significant.<sup>1,2,3,4,5</sup> Injuries have resulted from the use of residential backyard trampolines and trampoline parks and can vary in severity. The most common injuries are to the extremities.<sup>6,7</sup> Although most injuries are associated with residential backyard trampolines, a growing number of injuries now occur in trampoline parks. Emerging data find that trampoline park-related injuries may be even more severe than injuries from backyard trampolines.<sup>4,8</sup>

Both the Canadian Paediatric Society<sup>2</sup> and the American Academy of Pediatrics<sup>9,10</sup> have developed position statements recommending against recreational backyard trampoline use. In addition, Health Canada and other stakeholders advise that children under six years of age should not use trampolines at all.<sup>2</sup> However, trampoline parks are a relatively new phenomenon and therefore an opinion on the use of trampoline parks is not included in those older publications.

### Background: The Difference between Backyard Trampolines and Trampoline Parks

#### Backyard (Residential) Trampolines

Backyard trampolines have increased in popularity since they were originally developed in the 1950s.<sup>8,11</sup> A backyard trampoline is a piece of sports equipment that you jump up and down on. The equipment consists of a piece of strong material joined by springs to a frame<sup>12</sup> and is most often used recreationally in the backyard of homes. Backyard trampolines are fitted with beds with lower tensile strength, providing a softer bounce with less pressure on an individual's joints.<sup>11</sup>

#### Trampoline Parks

Trampoline parks are a more recent amusement device and were introduced in Canada in 2011.<sup>1,13</sup> Trampoline parks are indoor entertainment centers that feature numerous connected trampolines.<sup>8</sup> Visitors of all ages can bounce from one trampoline to another, jump into pits filled with foam blocks and play trampoline-based games.<sup>8</sup> Trampolines are often in a room surrounded by padded or trampoline walls. Trampoline parks use spring free formats, which use beds with higher tension. Enclosed springs means less exposure to springs that could cause injuries. However, the tensile strength may cause an increased load on individuals' joints due to more jarring stops.<sup>11</sup>

## Magnitude of the Problem

### Overview

Trampoline-related injuries produce frequent hospital admissions.<sup>14</sup> In the United States, trampolines result in about 100,000 emergency department visits each year.<sup>14</sup> The majority of trampoline-related injuries occur either at home (38%) or at another home (i.e. neighbors house) (47%).<sup>2</sup>

Trampoline-related injuries are typically more severe than other sports and recreation-related injuries.<sup>11,15</sup> Fractures are the most common trampoline-related injury.<sup>2, 15, 16</sup> The smallest and youngest participants are usually at greater risk for significant injury, specifically children 5 years of age or younger. Forty-eight percent of injuries in this age group resulted in fractures or dislocations.<sup>17</sup> More serious injuries including damage to the skull or spinal cord are more likely to occur while using a trampoline.<sup>5</sup> Chronic repetitive changes and early fusion of growth plates in children's bones of the lower extremities may occur with axial forces from trampoline use.<sup>18</sup> Infants and children between two and five years of age are at a higher risk to suffer from tibia fractures.<sup>18</sup>

There are several ways injuries can occur while playing on a trampoline, including (but not limited to):

- landing improperly on the trampoline mat, frame or springs;
- landing on a surface other than the trampoline mat (e.g. cement, ground); or
- a collision with another person, are among the leading injuries.<sup>11</sup>

Up to 83% of trampoline-related injuries occur while more than one person is on the trampoline because the heavier participant can create a greater upward force on the trampoline mat than the lighter participant could create themselves.<sup>2</sup> When more than one person is on the trampoline, the lighter participant is up to 14 times more likely to be injured than the heavier participant.<sup>2</sup> Injury often occurs when the trampoline mat is coming up as the participant is coming down, creating a harder landing surface than the ground.

Injuries also occur when there are multiple jumpers on the trampoline. Children are also injured by crashing into others on the trampoline at the same time as them or falling on the mat or springs around the trampoline. Safety enclosures, such as netting, have not lead to a decrease in trampoline-related injuries as two-thirds of trampoline-related injuries occur in the center of the mat.<sup>17</sup> In Victoria, Australia trampoline-related injuries in children and adolescents continue to rise despite increased regulations, distribution of safety information to trampoline owners, and changes in trampoline design focused on increasing safety.<sup>19</sup>

To compare trampoline injuries and costs of injuries sustained at a commercial trampoline park versus backyard trampolines, a study was conducted at a major Austrian children's hospital over a one year period.<sup>3</sup> Researchers concluded that children at commercial trampoline parks appear to be more severely injured (i.e. they required an ambulance transport, had longer average length of hospital stay, had a surgical operation and sustain a higher proportion of fractures and lower limb injuries).<sup>3</sup> Nearly 30% of injuries at commercial trampoline parks were due to attempting acrobatics, which could be prevented by commercial parks banning acrobatic stunts.<sup>3</sup>

### Canada

Trampoline-related injuries are increasing in Canada.<sup>1</sup> The Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) is an injury surveillance system established in 1990 by the Public Health Agency of Canada that currently operates in 11 paediatric and seven general hospitals across the country.<sup>20</sup> According to CHIRPP, trampoline-related injuries continue to increase in Canada despite safety measures such as spring free trampolines

and safety net recommendations.<sup>1,15</sup> CHIRPP found an increase in the number of trampoline injuries from 459/10,000 CHIRPP records in 1999 to 649/10,000 CHIRPP records in 2005.<sup>15</sup>

In 2007, the Canadian Pediatric Society (CPS) released a report that compared the prevalence of injuries requiring admissions to hospital in various sports and recreational activities<sup>2</sup>. Trampolines ranked high out of the activities CPS examined, with an injury hospitalization prevalence of 12.4 per cent, just behind alpine skiing (12.9 per cent) and above snowboarding (12 per cent).<sup>2</sup>

In a review of trampoline injuries among children age 17 years and under between 2012 to 2016, there were a total of 6044 injuries (5481 cases from backyard trampoline injuries and 563 cases from trampoline parks).<sup>1</sup> Examining time trends over the past 5.5 years, the proportion of trampoline injury cases has been rising for both backyard trampolines and trampoline parks.<sup>1</sup> The average age of injury for trampoline park injuries was 10.2 years old versus 8 years old for backyard trampolines.<sup>1</sup> Hospital admissions for trampoline-related injuries occur most frequently in those 5-14 years.<sup>21, 22</sup>

### *Atlantic Canada*

Injury hospitalization data collected over a 10 year period (2004-2013) showed that playground-related injuries continue to be a leading cause of hospitalization for children under the age of 14 years old.<sup>23</sup> The overall hospitalization rate for playground-related injury in children aged 0-14 years in Atlantic Canada increased an average of 1.1% annually between 2004 to 2013, (with an average of 104 hospital admissions per year). In terms of the specific causes of playground injuries, trampolines were a significant cause. Where the type of playground equipment was identified, 40% of playground injuries were a result of playing/falling from a trampoline.<sup>23</sup>

### *IWK Health Centre (Halifax, NS)*

The IWK Health Centre (IWK) has been part of CHIRPP since it started in 1990. A recent CHIRPP study from the IWK comparing trampoline injuries from both backyard trampolines and trampoline parks concluded that backyard trampoline injuries presenting at the IWK decreased, while the number of overall trampoline-related injuries increased in the same time period (indicating an increase in trampoline park injuries).<sup>11</sup> From 2001-2015, the IWK recorded 999 trampoline-related injuries.<sup>11</sup> Other findings included:

- Females (n=520) experienced slightly more trampoline-related injuries than males (n=459).
- Most injuries took place at home (n=831) and among children ages 10-14 years (n=419).
- There was a decrease in the proportion of trampoline-related injuries at home corresponding with an increase in trampoline-related injuries in trampoline parks/playgrounds and other similar facilities.
- Fractures (n=451) were the most common injury, with the ankle (n=213) the most commonly affected.
- The most common mechanism of injury was landing incorrectly (n=284).
- The most common mechanisms of injury were incorrect landing (28%), falls on the trampoline (24%), and colliding with another person (20%).
- 85% of all trampoline-related injuries occurred on the trampoline itself.
- There was a significant increase in the number of trampoline-related injuries that occurred among children under 4 years old from 2001-2005.

In 2019, the IWK collected some additional trampoline injury data. At the IWK Health Centre, trampoline data were collected through CHIRPP. From 2007-2014, there were 639 cases of trampoline related injuries. Of the known locations, 95% occurred at a home. At the end of 2014, indoor recreational facilities (which include trampolines),

opened in the Halifax Regional Municipality. Of the trampoline-related injuries tracked from 2015-2018, there were 492 cases with 59% of the known locations occurring at a home and 24% occurring in a trampoline park or indoor playground.<sup>24</sup>

## Arguments Supporting Trampoline Use

While there is strong evidence that trampoline use is a high-risk activity, there are many who believe there is no solution to stopping children from using trampolines. In a study focusing on trampoline-related injuries in Switzerland, the authors felt that a ban on backyard trampolines is impossible.<sup>25</sup> These same supporters also indicated that while sporting activities for children should be encouraged, trampoline use should be undertaken with adult supervision and in accordance with safety procedures.<sup>25</sup>

## Conclusion

The increase in injuries related to the use of trampolines by children and adolescents is evidence that current preventive strategies are ineffective to prevent the majority of injuries.<sup>2</sup> Trampoline safety recommendations have consistently advised adult supervision when children are on the trampoline, however adult supervision alone has not been effective for prevention.<sup>4 25</sup> As outlined by the American Academy of Pediatrics<sup>26</sup>, multiple studies reveal that approximately one-third to one-half of trampoline-related injuries occurred despite reported adult supervision.<sup>26</sup>

Trampoline parks are not currently regulated as an amusement device in any province in Atlantic Canada<sup>22</sup> while regulatory oversight can enhance the safety of amusement rides. Regulation of facilities and equipment can offer mechanisms for reporting and investigating incidents, and making improvements to safety.<sup>27</sup> Regulation, however cannot remove all risk. Safety is a shared responsibility between the owner/operator of an amusement device, the user, and regulators. In Canada, trampoline parks are not regulated, therefore there is no enforcement to ensure parks meet consistent and evidence-informed safety standards.<sup>22 28,</sup>

The use of trampolines is a high-risk activity with the potential for serious injury.<sup>2</sup> As noted above, trampoline-related injuries are typically more severe than other sports and recreation-related activities.<sup>2</sup> It may be perceived that using a trampoline is a low-impact/low-risk activity, however injury often occurs when there are multiple jumpers and the trampoline mat is coming up as the participant is coming down, creating a harder landing surface than the ground.<sup>2</sup> This force can cause severe injuries in children<sup>29</sup>.

## Recommendations

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### The E's of Injury Prevention

A common planning model used to address injury prevention is called the Three E's of injury prevention. The three E's includes enforcement, education and engineering.<sup>30</sup> This model shifts the focus of injury prevention from being an individual responsibility to one of collective responsibility by acknowledging the roles that stakeholders, such as government and communities, have in injury prevention.

**Education** involves providing the public with education and skills training to prevent injuries.

**Engineering** involves developing or modifying products and environments to prevent injuries.

**Enforcement** includes policies, laws, and regulations which aim to reduce injuries.

Sometimes this model is expanded to include more E's such as Economics, Evaluation, Enablement, and Empowerment. Overall, prevention strategies for trampoline-related injuries should focus on common injuries such as lower extremity sprains and fractures, as well as strategies to prevent serious injuries.<sup>3</sup>

Evidence-based recommendations for action are described below by E of injury prevention. There may be other actions for injury prevention not outlined in this document. There is an overall need for additional research to support injury prevention initiatives focusing on trampoline-related injuries.

## **E: Education-education initiatives to develop personal habits - education or behavior change strategies<sup>30</sup>**

### **Backyard Trampolines**

Raise awareness through the following key messages for families and caregivers:

- Promote that children under the age of 6 years do not use trampolines<sup>2</sup>.
- Discourage the purchase of trampolines for the home because enclosures and adequate supervision alone do not guarantee against serious injury.<sup>2, 26</sup>
- Do not use mini and full-sized trampolines at home, in routine gym classes, or on playgrounds. Mini and full-sized trampolines should only be used in supervised training programs for gymnastics, diving, or other competitive sports.<sup>26</sup>

For families who continue to use home trampolines, the following guidelines are currently recommended for stakeholders who have the opportunity to educate and inform families and/or who can conduct research:

- Provide adult education on trampoline supervision.<sup>3</sup> Supervising adults should be willing and able to enforce safety guidelines (e.g. no somersaults, single jumper).<sup>26</sup>
- Promote the safe use of trampolines at home focusing on one user at a time and no objects on the trampoline.<sup>3, 26</sup>
- Provide age appropriate education on trampoline safety through general practitioners and hospitals<sup>3</sup>
- Encourage health care professionals, including family physicians and paediatricians, to counsel patients/families about the dangers of trampolines at routine health care visits.<sup>2, 26</sup>
- Provide education to parents encouraging them to check their homeowner's policy regarding trampolines. If trampoline-related injuries are not included in the basic policy, encourage them to obtain a rider (an add on to the primary policy) to cover trampoline-related injuries.<sup>31</sup> Home owners may need to pay around 10% more premiums on insurance due to injury risks.<sup>32</sup>

### **Research**

- Conduct research on trampoline injuries sustained in supervised settings, such as schools, gym clubs and training programs, to assess the risk of injury in these settings.<sup>2</sup> The results of this research can be used to inform safety messaging and education.
- Conduct research to investigate trampoline play by specific age and stage of child development.<sup>3</sup> The results of this research can be used to inform safety messaging and education.

### **Trampoline Parks**

- Provide age appropriate education to caregivers through general practitioners and hospitals.<sup>3</sup>

- Conduct research and surveillance of data to better understand potential risks associated with trampoline parks. Use the results of this work to guide prevention initiatives<sup>3</sup> including understanding features and mechanisms of trampoline park injuries.<sup>1, 14</sup>
- Incorporate education on trampoline safety in schools.<sup>3</sup>

#### E: Engineering-modification of a product or environment; ensuring access to appropriate services<sup>30</sup>

- Improve padding to provide protection from landing on trampoline frames.<sup>14</sup>
- Encourage 'spring-free' and 'soft-edged' trampolines at parks.<sup>3</sup>

#### E: Enforcement-policy/legislation and measures to ensure compliance

##### Backyard Trampolines

- Advocate for legislation to require warnings of trampoline dangers to be put on product labels.<sup>2</sup>
- Advocate for legislation that requires mandatory safety measures for backyard trampolines, including enclosures and spring-free or soft-edge trampoline formats.<sup>11</sup>
- Advocate for legislation to prevent trampolines from being installed as play equipment in public spaces, including outdoor playgrounds.<sup>2</sup>

##### Trampoline Parks

- Establish strict regulations including enforcing a no flip rule at trampoline parks<sup>2,14</sup> and minimize the number of jumpers on trampolines.<sup>14</sup>
- Advocate for consistent and evidence-informed safety regulations for trampoline parks provincially and nationally.

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## About Child Safety Link

Child Safety Link (CSL) is an injury prevention program at the IWK Health Centre dedicated to reducing the incidence and severity of unintentional injury to children and youth in the Maritimes. CSL is committed to working with community organizations, governments and other partners to ensure children are as safe as necessary at home, on the road and at play. The team does this through capacity building & partnerships; communication and public relations; advocacy and healthy public policy; and research and evaluation.

- Child Safety Link supports the Canadian Pediatric Society's position on backyard trampolines and recommends that parents should not buy backyard trampolines to use at home or at cottages;
- Child Safety Link also strongly recommends that children 5 years and under do not use trampolines.
- Child Safety Link strongly urges the development of consistent and evidence-informed safety regulations for trampoline parks provincially and nationally.
- Child Safety Link encourages research to support the prevention and reduction of serious injuries due to trampoline use.

#### Child Safety Link/Other Trampoline Resources

##### CSL Resources:

CHILD SAFETY LINK POSITION STATEMENT: under development

Website: [www.childsafetylink.ca](http://www.childsafetylink.ca) [information available by topic or age/stage]

Facebook: [www.facebook.com/ChildSafetyLinkIWK](https://www.facebook.com/ChildSafetyLinkIWK)

Twitter: @childsafetylink

YouTube: [www.youtube.com](https://www.youtube.com)

### Data Report and Report Infographic:

Atlantic Canada Child & Youth Unintentional Injury Hospitalizations: 10 Years in Review [2004-2013]. Available in English & French <http://childsafetylink.ca/library/atlantic-canada-injury-reports/2004-2013/>

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