

## Improving bicycle safety in Canada

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### EXECUTIVE SUMMARY

Cycling is a popular recreational and transportation option, especially in urban areas in Canada. Unfortunately, injuries resulting from cycling are common and result in many Emergency Department (ED) presentations, ranging from minor to life threatening.

While it may not be possible to eliminate all cycling injuries in Canada, it should be possible to mitigate their severity and frequency, by addressing a number of important contributing factors.

The most important of these factors are the built environment, the visibility of the cyclists, and the use of bicycle helmets. Addressing and improving each of these factors will help reduce injuries to cyclists.

As emergency physicians, we have a responsibility to advocate for public policy changes that can prevent injury and save lives.

### CAEP POSITION

- CAEP advocates that the recommendations of the Office of the Ontario Chief Coroner's Cycling Death Review be adopted in full by the Province of Ontario, and that the recommendations be distributed to all other provinces for similar adoption.
- CAEP has identified cycling safety issues that should be considered priorities. Specifically, CAEP recommends that:

- A) A "complete streets" approach should be adopted to guide the development and redevelopment of communities to give consideration to enhancing safety for all road users, and

should include creation of cycling networks (incorporating strategies such as connected cycling lanes, separated bike lanes, bike paths, and other models appropriate to the community), as well as designation of community safety zones in residential areas, with reduced posted maximum speeds and increased fines for speeding;

- B) An educational campaign regarding cyclist visibility, especially at night, should be implemented;
- C) Bicycle helmet legislation should be amended in all provinces to make helmets mandatory for cyclists of all ages;
- D) Bicycle helmet legislation should be approved in provinces without any current law, as soon as possible.

### BACKGROUND

Cycling is a popular recreational and transportation option, especially in urban areas. Unfortunately, injuries resulting from cycling are common. Many of these injuries result in Emergency Department (ED) presentations. These injuries range from minor to severe; unfortunately, death from cycling remains a concern for all who participate in and promote this activity.<sup>1</sup> A combination of environmental, mechanical, and behavioural factors are involved in most cycling injuries; however, improving the built environment, improving cyclist visibility and mandating helmet use are three important injury prevention initiatives that form the basis of this position paper.

The Office of the Ontario Chief Coroner's Cycling Death Review was released in June 2012. This important provincial review was undertaken as a result

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of concern, both from the public and within the Coroner's Office, surrounding the issue of cycling safety, and mirrors a previous publication that focused on cycling fatalities.<sup>2</sup> It examined the circumstances of 129 deaths that occurred from January 1, 2006 to December 31, 2010.<sup>3</sup> The findings of the review include recommendations that target infrastructure, education, legislation and enforcement. The main findings of the review were:

- The vast majority of cycling deaths are preventable. The review data supported the conclusion that all of the 129 deaths in this Review could have been prevented.<sup>1</sup>
- Cycling deaths are more likely to occur in those not wearing helmets. Those cyclists whose causes of death included a head injury were three times more likely to not be wearing a helmet compared to those who died of other injuries.<sup>3</sup>
- The proportion of helmet use was very low – only 26 percent of those cyclists killed during the study period were wearing a helmet.

There is a combination of environmental, mechanical, and behavioural factors involved in most cycling injuries in the transportation and recreational setting; understanding these factors can contribute to the development of multifaceted prevention strategies unique to the region of implementation.

### **IMPROVING THE BUILT ENVIRONMENT**

The “built environment” refers to the surroundings in which human activity such as cycling occurs and includes roads, bike paths/trails, obstacles, intersections and cycling lanes. Evidence from between-country comparisons and from injury research show that modifications to the built environment for cycling offer the greatest opportunity for decreasing cycling injuries and deaths. Such interventions are a primary prevention measure that reduce the risk of crashes occurring and thus prevent injuries to the whole body. Northern European countries, including the Netherlands, Denmark, Germany, Sweden, and Finland have implemented a “complete streets” approach to cycling safety that includes separated bike lanes on major city streets and rural roads to encourage people of all ages to cycle to diverse destinations (e.g., work, school, shopping, social activities). A consequence of this protected infrastructure is dramatically decreased cycling injuries and fatalities compared to statistics in Canada and the United States (2 to more than 10-fold lower).<sup>4-6</sup> The

value of separated bike lanes and other bicycle-specific infrastructure (i.e., painted bike lanes, off-street bike paths, and residential street bikeways) has also been demonstrated in analytical studies.<sup>7-11</sup> In locations where safer infrastructure is only starting to be implemented, large reductions in injuries have been observed within 5 years.<sup>12</sup>

Building safe cycling infrastructure attracts more people to cycling. This has both a safety advantage and a health advantage. International comparisons, among and within-cities over time, demonstrate that increased cycling volumes reduce cycling injuries, called the “safety in numbers” effect.<sup>13</sup> The health benefits of cycling have also been demonstrated repeatedly.<sup>14-18</sup> Cycling as a daily transportation option is an easily sustained way to meet physical activity requirements to maintain or reduce weight. These benefits in turn reduce the incidence of the most common chronic diseases of our time, including heart disease, diabetes, dementia, and certain cancers. Studies of the benefits and risks of cycling have overwhelmingly found that these health benefits outweigh injury risks (even in countries with less safe infrastructure). Benefit to risk ratios range from 9:1 to 96:1.<sup>14-18</sup> These wide-ranging benefits of safe cycling infrastructure have led to a change in transportation design philosophies in cities throughout North America, with the emphasis on bicycle-specific facilities that are both safe and attractive to those of all ages and abilities.<sup>19</sup>

### **VISIBILITY**

The use of cycling for transportation and recreational purposes has meant that cycling increasingly occurs during periods of sub-optimal lighting. Night-time cycling is particularly problematic, and most jurisdictions legislate the use of reflective clothing, lights and reflective devices. Clear evidence for the most effective strategies for conspicuity is sparse<sup>20</sup>; however, there are some important issues to consider. First, cycling at night represents a particularly high risk activity, which is often exacerbated by concomitant alcohol use.<sup>21</sup> Second, high visibility clothing (i.e., white, yellow, orange, red) should be encouraged, especially when riding at night and times of limited visibility; however, Canadian data suggests only 33% of cyclists use these conspicuous colours.<sup>22</sup> Third, while cyclists themselves advocate visibility aid use by cyclists, they report less than optimal and less frequent use of these aides.<sup>23</sup> In summary, clothing colour, reflectivity, and lights are

strongly encouraged for cyclists at all times to increase visibility and reduce the risk of interactions with motorized vehicles.

Despite the efforts of urban planners to retrofit many Canadian cities to improve the built environment for cyclists, and educational efforts to increase conspicuity of cyclists, crashes remain a major safety concern. Most problematic of these crashes is the motor-vehicle vs cyclist collision. Efforts to protect cyclists in the event of a crash require continued vigilance.

### **HELMET STRATEGY**

There is now relatively strong evidence that bicycle helmets reduce face and head injuries.<sup>24</sup> A Cochrane systematic review reported that helmets reduce the risk of head, brain and severe brain injury for all cycling ages by 63-88%. Helmets appear to provide protection for crashes involving motor vehicles (69%) and crashes from all other causes (68%). Injuries to the upper and mid facial areas are reduced 65%.<sup>24</sup> While many reports suggest cycle helmet wearing is not compliant with recommendations,<sup>25</sup> the use of *any* helmet provides protection.

Despite the knowledge above and public relations campaigns, convincing cyclists to wear helmets remains difficult. This is particularly so for adolescents, males and adults. For example, observations and surveys reveal low helmet use in both adults and adolescents. In Alberta, prior to helmet legislation overall cyclist helmet wearing was 55%,<sup>26</sup> which mirrors a recent Quebec observational result where helmet use was 46%.<sup>27</sup> Many researchers and injury prevention advocates suggest that without legislation, a “ceiling effect” has been reached in helmet wearing.

The evidence for helmet legislation increasing helmet use has been summarized in two systematic reviews.<sup>25,28</sup> In both reviews, helmet legislation increased helmet use, especially in locations where helmet use was previously low. Much debate exists about legislation, and much of it focuses on the role of children-only compared to universal helmet legislation. Various jurisdictions have introduced mandatory helmets for all ages. Nova Scotia enacted all-age bicycle helmet legislation in 1997. Bicycle helmets are mandatory in all states and territories in Australia for all ages; the same is true for New Zealand. Conversely, in Canada, some provinces have legislation that covers children/adolescents while others have none (see Table).

**Table. Bicycle helmet legislation in Canadian provinces and territories**

Province/territory	Legislation	Year
New Brunswick	All ages	December 1995
British Columbia	All ages	September 1996
Nova Scotia	All ages	July 1997
Prince Edward Island	All ages	July 2003
Ontario	Under 18 only	October 1995
Alberta	Under 18 only	May 2002
Manitoba	Under 18 only	May 2013
Saskatchewan	None	
Quebec	None	
Newfoundland	None	
Yukon, Northwest, and Nunavut Territories	None	

Opponents of legislation often ask: What is the evidence for the effectiveness of helmet legislation? In the state of Victoria, Australia, a new law requiring helmets in 1990 increased the use of helmets from 31% to 75% in adult recreational cyclists in less than a year. These changes were associated with a 47% reduction in overall head injuries and lower hospital admissions (a measure of severity) for head injuries in cyclists.<sup>29</sup> A 2010 Canadian study showed that youth and adults are significantly more likely to wear helmets as the comprehensiveness of helmet legislation increases, and that helmet legislation is *not* associated with changes in ridership.<sup>30</sup> Alberta’s helmet law was met with increased helmet use, especially in the target age groups.<sup>31</sup> More importantly, a study of two juxtaposed regions with children-only and universal helmet laws in Alberta demonstrated increased helmet use in the municipality with a universal helmet law.<sup>32</sup> Finally, and importantly, another Canadian study demonstrated reduction in ED visits and hospitalizations for head injury following the introduction of a mandatory child/adolescent only helmet law.<sup>33</sup>

### **INCREASING HELMET USE**

A recent literature review by the Cochrane Collaboration suggested that bicycle helmet legislation appears to be effective in increasing helmet use and decreasing head injury rates in the populations for which it is implemented. There are very few high quality evaluative studies that measure these outcomes, and none that reported data on possible declines in bicycle use.<sup>34</sup>

Helmet legislation is not without theoretical risks. For example, some wonder if the inconvenience of

helmets will deter participation in this recreational activity and contribute to the obesity epidemic.<sup>35</sup> While some initial decline in participation has been reported following the implementation of helmet laws, cycling activity recovery appears to be rapid for most jurisdictions. Second, while the costs of helmets have declined over the years, this may remain a barrier for some lower socioeconomic regions. Moreover, subsidy programs in such locations may counter this barrier. Third, the heavy, uncomfortable helmets of earlier years have been replaced by sleek, colourful, and more comfortable helmets. Nonetheless, these features may represent barriers for some cyclists and further design changes may be possible. Fourth, enforcement has been problematic with one province reporting virtually no tickets issued.<sup>31</sup> Others prefer a positive reinforcement program of rewarding good behaviour. Finally, given the multi-factorial nature of most cycling crashes, the focus on helmets cannot be at the exclusion of other important injury prevention considerations (e.g., bike lanes, speed restriction, visibility aides, and bike maintenance).

Finally, the immediate and long-term costs and consequences of caring for anyone who sustains a bike-related severe injury is high, especially when head injury is involved. The health economic perspective of this issue is beyond the scope of this paper; however, the prevention of even one injury seems “cost effective.” Nonetheless, economic evaluations have been performed specifically on helmet laws and suggest preventing childhood head injuries achieves the greatest savings.<sup>36</sup> In addition, any bike injury prevention intervention that reduces ED visits and hospitalizations would likely save money; calls to implement effective injury prevention strategies like these have been made for decades.<sup>37</sup>

## SUMMARY

Road safety is a paramount concern for emergency physicians. Cyclists are among the most vulnerable road users and are at risk for potentially catastrophic injuries. As emergency physicians, we regularly witness the consequences of failures to adequately protect cyclists by providing street safety infrastructure as well as the lack of universal helmet use. These consequences include, but are not limited to: scalp lacerations, concussions, facial injuries, and other life threatening brain and torso injuries. Most of the

recommendations contained in the review fall outside the jurisdiction of cities and municipalities and require changes to provincial legislation. As emergency physicians, however, we have a responsibility to advocate for public policy change that could mitigate the consequence of cycling crashes.

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