

Booster Seats: Child Safety in a Motor Vehicle

The Alberta Centre for Injury Control & Research (ACICR) has been in partnership with Alberta Wellness, Alberta Transportation and the Royal Canadian Mounted Police (RCMP) since January 2002 in assuming the administrative and financial responsibility for the Alberta Occupant Restraint Program (AORP). The program began in 1995, with a focus on child injury programming.

The ACICR is adopting AORPs public position on child booster seats for Alberta, which was completed and ratified by the Provincial Committee in March 2002. The full document is as follows:

Position

It is the position of the Alberta Occupant Restraint Program (AORP) that at a minimum all child passengers under 8 years of age, who weigh less than 37 kg (80lb) and are less than 125 cm should be in an approved and properly used booster seat while traveling in a motor vehicle.

AORP will take a staged approach including providing information to health and enforcement professionals, practitioners, parents and caregivers, encouraging product availability through increased consumer knowledge and future supportive legislation.

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Abstract

Safety experts and advocates currently recommend the use of booster seats for children who have outgrown child safety seats but are too small to fit into the existing adult seat belt systems. In Alberta these recommendations have not been clearly articulated into a single reference document for distribution and use by health and enforcement professionals, educators and practitioners. The development of a position paper would provide the basis for a consistent approach and focus to awareness and education campaigns aimed at parent/care-givers and providers on the benefits of booster seats.

Introduction

Motor vehicle crashes (MVC's) are the leading cause of injury, disability and death in Canadian Children. ¹ In Alberta, motor vehicle collisions are the leading cause of death for children over 1 year of age and are the second leading cause of injury hospitalization for all children under the age of 16. ^{2,3} The societal costs associated with these collisions have been estimated to be in excess of 57 million dollars per year. ⁴

Safety experts and advocates currently recommend the use of booster seats for children who have outgrown child safety seats but are too small to fit into the existing adult's seat belt system. ^{5 6 7 8 9 10 11 12} In Alberta these recommendations have not been clearly articulated into a single reference document for distribution and use by health and enforcement professionals, educators and practitioners.

The main objective of developing the position paper is to increase the number of safety stakeholders and public prepared with the same basic information on the effectiveness of booster seats in reducing significant injuries to children. A second objective is to consider from both a health and enforcement perspective an acceptable position reflecting best practices and public readiness for effective legislation.

The Research & Evaluation Committee and Education Committee for the Alberta Occupant Restraint Program were convened to discuss; purpose, objectives and parameters of a phased approach to the development and dissemination of a booster seat position paper for Alberta. In Phase One a literature search focusing on a) injuries to children in relation to seat belts, seating position, child safety seats and booster seats was conducted. The literature searched for b) behavioral barriers to booster seat use and c) legislation on booster seats (North America) and d) strategies to increase the use of booster seats.

In Phase Two the approach was to articulate a position on booster seats and prioritize a strategic direction incorporating findings of the literature review, public media campaigns, legislation, product availability and public readiness within an environmental context specific to Alberta.

Method:

Phase One: The literature review searched for national and international papers focusing on motor vehicle injuries to children in relation to seat belts and booster seats.

As the development of the position paper was to be within an Alberta context, particular attention was paid to Canadian articles and the expert opinion of traffic safety "champions" in Alberta.

a) Injuries to children in relation to seat belts, seating position, child safety seats and booster seats.

While motor vehicle collisions remain a significant health issue for children in Alberta, collaborative efforts between government departments and non-government groups have contributed to positive changes in levels of awareness. A five-year evaluation of a child restraint education and enforcement program (Think...Think Again) has indicated a significant improvement (57% increase) in the awareness of parents and caregivers of the need for the correct and consistent use of child restraints for children between 9 kg and 18 kg.¹³ The Final Report for the Think...Think Again program (TTA report) suggests that education and enforcement strategies targeting parents and caregivers of children birth to 6 years of age of the need to use child restraints has met with some measure of success.

The TTA Report also identified non-use/incorrect use of restraints for children over 6 as a critical emerging issue and recommended that strategies to address this issue be developed. Over a 5-year period the rates of restraint non-use for children over 6 years of age consistently exceeded the rates of misuse for children over 6 years. The report also revealed that for a 12 month reporting period, 40% (1404) of all child occupant restraint tickets were issued for children over 6 years not using a child restraint system. This Alberta data is consistent with international research indicating a dramatic decrease in proper restraint use with increasing child age.^{14 15 16 17} A second factor for consideration is the body of evidence that improper fit or improper placement of existing adult seat belt systems can cause serious injury. Research shows that adult seat belts provide inadequate protection for children less than 8 years. An adult seat belt is designed for the adult body, contributing to fitting problems when used by children.

Young children restrained in seat belts alone are over 3 times more likely to be injured in a motor vehicle collision than children in age appropriate restraints are.¹⁸ Even in low speed collisions in urban areas, children are still at risk. Most injuries to restrained children are attributed to incorrectly fitting restraints.¹⁹ These mechanical problems can be corrected by the use of a booster seat.

According to Winston, Durbin, Kallan and Moll (2000), a vehicle seat belt fits correctly “when the lap portion of the belt rides low over the hips and is held in place by mature anterior superior iliac spines. A well-fit shoulder portion of the belt crosses the sternum and shoulder.”²⁰ Upon restraining a young child in an adult seat belt, the risks of injury and severity of injury increase.

For children, the frequency of head injuries, brain injuries, spinal fractures, and other characteristic injuries labeled “seat belt syndrome” increase if placed in an adult seat belt. The term “seat belt syndrome” encompasses characteristic cervical and lumbar spinal cord injuries and intra-abdominal injuries resulting from ill-fitting or incorrectly positioned lap and shoulder seat belts.²¹

It is difficult for a child to sit properly against the back of the seat because the seat is long in relation to the child's femur. To compensate for this, children will often slouch, moving the correct placement of the seat belt. If restrained in an adult seat belt, slouching causes the lap belt portion to move up, over the abdomen instead of across the pelvis. In the event of a collision, direct force will be transferred to the abdomen and lumbar spine rather than the stronger iliac wings of the pelvis. This type of injury could result in serious fractures of the spine and even paraplegia. When the lap belt is worn high, the child is also at increased risk for sliding out of the lap belt during a collision.⁵

Children have a smaller torso and narrow shoulders compared to an adult. This causes the shoulder portion of the seat belt to ride up and across the child's neck or face. To compensate for this discomfort, children will either put the shoulder portion behind the back or under an arm, eliminating its protective function. Both of these practices increase the risk of injury to the bony cervical spine or to the spinal cord in the event of a collision.⁴ Without the proper protection of a shoulder belt in a crash situation, the child's torso remains unrestrained. Upon sudden deceleration, a child's body will jackknife forward, placing full force on the pelvis or abdomen. Impact could be made between the head and knees, or with the vehicle's interior, resulting in a head or brain injury.⁵ The increased pressure on the abdomen also puts the child at risk for intraabdominal injuries and seat belt syndrome. When a child puts the shoulder belt under one arm, the resulting forces are known to result in serious internal injuries as well.²² A booster seat eliminates the need to displace the shoulder portion of the seat belt, decreasing the rate of seat belt misuse by children.

Mature anterior superior iliac spines are strong enough to absorb the forceful velocity of the body in a collision. The bone composition of children is less developed, providing insufficient strength to properly anchor the belt. Virtually no child between 6 and 8 years would be big/strong enough to be adequately protected by an adult seat belt. It is not until children are 37 kg (80 lb) that an adult seat belt will fit correctly and provide adequate protection.²³

b) Behavioural barriers

Several key articles were reviewed in relation to behavioural issues and use of booster seats. Simpson, Moll, Kassam-Adams, Miller and Winston (2002) reported that although knowledge of the benefits and purpose of booster seats is an important issue in promoting booster seat use, differences in risk perception, awareness/knowledge and parenting style must be considered as well. This article included media campaigns, improved laws, parenting education and extending the use of child restraints to older ages as strategies suggested by parents. Parental knowledge, parenting skills, child behaviour and cost were identified as potential barriers to booster seat use.^{24 25}

c) Legislation

Child safety seat laws and enhanced enforcement programs have been identified in the literature as “strongly recommended” interventions based on their effectiveness in reducing fatal and nonfatal injuries and increasing child safety seat use.^{26 27 28} In Alberta, there is no legislation requiring the use of booster seats.

In the United States, several States have enacted booster seat legislation. In Canada the Canadian Council of Motor Transport Administrators (CCMTA), which is comprised of all Ministers responsible for transportation safety in each of the provinces and territories, has charged the National Occupant Restraint Program with providing recommendations on draft model legislation for booster seats. Concurrently several provinces, including Alberta are drafting position papers on booster seats. To date only Quebec has enacted legislation for booster seats. Through this legislation, Quebec hopes to increase the survival rate for children over 5 years, but less than 63 cm (sitting height), by 5%.²⁹

In developing this paper, provincial child restraint specialists provided expert opinions on the importance of ensuring legislation follows and is consistent with best practices. The expectation is that provincial legislation sets a reasonable standard to which all drivers of vehicles with child passengers must comply and serves as a guide for best practices. Best practices set a higher standard and vision of safety to which we strive to achieve the optimum occupant restraint protection for children.

d) Strategies to increase use of booster seats.

Strategies and interventions identified as potentially having success in increasing the use of booster seats included; product availability, identifying and communicating risks associated with non-use, involving community based organizations in delivering the message, gathering data on those most at risk for non-use of booster seats, legislation, enhanced enforcement campaigns and media/awareness campaigns. The literature indicated communication messages from health care providers, emergency medical services or law enforcement as being the most effective in delivering a credible message.³⁰

Conclusions

Phase One:

1. Research and injury data indicate that children under 39 kg (88 lb), 12 years of age, are best protected in a properly used booster seat incorporating lap and shoulder belt in a rear seating position
2. Children prematurely graduated to adult seat belt systems are at risk of injury from the seat belts in the event of a collision.
3. Children in Alberta over the age of 6 are not being restrained and are prematurely graduated into the adult seat belt system.

4. Legislation and enhanced enforcement campaigns are an effective strategy to increase use of booster seats.
5. Health and enforcement professionals are credible sources for the delivery of key communication messages for child restraints.

Phase Two:

Phase Two approach was to articulate a position on booster seats and prioritize a strategic direction incorporating the findings of the literature review, public media campaigns, legislation, product availability and public readiness within an environmental context specific to Alberta.

Historically the approach to occupant restraint legislation in Alberta has been conservative. Although injury data would support an upper age/weight limit of 12 years and 39 kg (88 lb) in the Alberta context this would be supported as a best practice. The literature suggests legislation is viewed as setting the guidelines for best practices, as such the advocacy for legislation should reflect a reasonable standard to which all drivers could be expected to comply. Within this context, it is the position of the Alberta Occupant Restraint Program (AORP) that at a minimum all child passengers under 8 years of age, who weight less than 80lbs (37 kg) and are less than 125 cm should be in an approved and properly used booster seat while traveling in a motor vehicle.

Literature supports legislative changes as the most effective and immediate means of increasing the use of booster seats. In Alberta the successful advocacy for the introduction of booster seat legislation will require a staged approach. Stage one would involve the distribution of information and support materials within existing networks of health care providers, enforcement professionals, practitioners and injury prevention coordinators. A strong network and collaborative partnership between health and enforcement professionals exists in Alberta. This network has proven successful in the delivery of child restraint education and information.³¹ Disseminating information to this network is a priority as they are front line information providers to communities, parents and caregivers.

Stage two involves the distribution of information to parents and caregivers. In Alberta the use and knowledge of booster seats is increasing, although a high percentage of children over 6 years continue to ride unrestrained or inappropriately restrained.

Providing parents and caregivers with information through the existing network of health and enforcement professionals provides a consistent and credible information source for parents. It is expected that informed parents and caregivers as consumers can affect product availability through demand.

Stage three would assess levels of booster seat use and public readiness for legislation and provide recommendations for next steps.

Conclusions and Findings:

It is the position of the Alberta Occupant Restraint Program (AORP) that at a minimum all child passengers under 8 years of age, who weigh less than 37 kg (80lb) and are less than 125 cm should be in an approved and properly used booster seat while traveling in a motor vehicle.

AORP will take a staged approach including providing information to health and enforcement professionals, practitioners, parents and caregivers, encouraging product availability through increased consumer knowledge and future supportive legislation. *A final conclusion is consideration for the immediate implementation of the phased approach. Changes in legislation can be a time consuming process. Far too many children in Alberta are prematurely taken out of child safety seats and placed in adult seat belts systems placing them at increased risk for injury. Education and awareness can begin immediately.*

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