

Preventing injuries from all-terrain vehicles

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Abstract

All-terrain vehicles (ATVs) are widely used in Canada for recreation, transportation and occupations such as farming. As motorized vehicles, they can be especially dangerous when used by children and young adolescents who lack the knowledge, physical size, strength, and cognitive and motor skills to operate them safely. The magnitude of injury risk to young riders is reflected in explicit vehicle manual warnings and the warning labels on current models, and evidenced by the significant number of paediatric hospitalizations and deaths due to ATV-related trauma. However, helmet use is far from universal among youth operators, and unsafe riding behaviours, such as driving unsupervised and/or driving with passengers, remain common. Despite industry warnings and public education that emphasize the importance of safety behaviours and the risks of significant injury to children and youth, ATV-related injuries and fatalities continue to occur. Until measures are taken that clearly effect substantial reductions in these injuries, restricting ridership by young operators, especially those younger than 16 years of age, is critical to reducing the burden of ATV-related trauma in children and youth. This document replaces a previous Canadian Paediatric Society position statement published in 2004.

Key Words: All terrain vehicles; Children; Injuries; Prevention; Youth

ATV access and use

Typically, all-terrain vehicles (ATVs) are four-wheeled, motorized vehicles with large, low-pressure tires, designed for a single operator riding in off-road areas. Some recent models have come onto the market with up to six wheels that are designed to carry more than one rider. This position statement pertains only to ATV models intended for a single rider. These vehicles are available in a range of sizes, from 50 cc to over 700 cc engine displacement, can weigh over 300 kg (661

lbs) and are capable of reaching significant speeds. The Canadian ATV industry has endorsed a voluntary standard that recommends youth-sized vehicles for different age ranges, with models classified according to their engine size and maximum speed capabilities. These designations have changed recently. Older recommendations specified an engine size of <90 cc for vehicles used by children and youth <16 years of age, and an engine size of <70 cc for children <12 years of age, with a minimum age recommendation of six years. New industry recommendations indicate that Y-6+ models are designed for riders aged six and older, come with a factory-set maximum speed of 16 km per hour (kph), but can be adjusted to attain a maximum speed of 24 kph. Y-10+ and Y-12+ models are designed for riders aged 10 and 12 (respectively) and older. Both models come with a factory-set maximum speed of 24 kph that can be adjusted to reach a maximum speed of 48 kph. “T” models are designed for riders aged 14 and older. They come with a factory-set maximum speed of 32 kph that can be adjusted to reach a maximum speed of 61 kph ^[1]. As per the manufacturers’ standard, all youth-model vehicles carry warning labels explicitly indicating the age limit for use, the need for mandatory adult supervision and a warning that operation of that vehicle by children under the designated age limit increases their “risk of severe injury or death.” ^[2]

ATVs are used by many children in rural and remote areas of Canada, including First Nations, Inuit and Métis communities. In Manitoba, of 191 rural grade six children surveyed in 1996, 30% reported having a family ATV and 77% reported having access to a vehicle through family or friends ^[3]. Although data are unavailable, ATVs are frequently used as transportation for children of all ages in First Nations communities, as well as for family and farm work-related activities in many rural and remote communities. However, similar to findings from several US studies (outlined below), the vast majority of children and youth using ATVs in Canada probably do so for recreational purposes. Where ATVs provide one of the only means of transportation, as in Canada’s more remote and isolated communities, community education programs that convey their potential dangers to children and youth and that promote safe riding behaviours are especially

essential. Local restrictions should include eliminating recreational ATV use by children and youth.

ATV safety behaviours

Several studies have explored helmet-wearing and other safety behaviours among young ATV riders. Burgus et al surveyed 594 ATV operators 12 to 20 years of age (mean age 16 years) at a national youth-oriented agricultural convention focused on education [4]. Of this sample, 93% indicated that they use an ATV for recreational purposes, with three-quarters also reporting ATV use for work-related activities. The median vehicle size was 350 cc, yet only 24% of responders said they always wore a helmet, 12% never allowed passengers, 16% never rode as a passenger, and 19% never rode on paved roads, all best practices specified by the ATV Safety Institute. Only 22% had ever participated in an ATV safety training program, while 40% indicated feeling that they did not need training or that they were already safe riders.

Another survey of six-to-19-year-old 4-H club members in central Illinois, 76% of whom lived on farms or in rural areas, indicated that 49% used ATVs primarily for recreation and trail-riding, while 24% used them for work and farm duties [5]. Only 40% of respondents always used a helmet, 50% reported carrying passengers, and only 1.8% of operators under the age of 12 – and not one adolescent between 12 and 15 years of age – used an industry-specified age-appropriate vehicle (<70 cc and <90 cc engines, respectively). Similarly, of 228 youth 10 to 17 years of age (mean age 13.5 years), surveyed at agricultural fairs in Connecticut in 2007, 94% rode ‘for fun’, and 37% reported racing informally with friends (6). Seventy per cent rode as or with passengers, 59% reported riding alone without family or friends, 46% rode after dark, and only 5% had taken a certified safety course. Safety practices fared worst among 16 and 17 year olds, who comprised one-fifth of respondents, with 60% riding after dark, and 40% not using a helmet. Overall, only 3% reported using industry-recommended youth-sized vehicles with an engine size <90 cc. [6]

Furthermore, a poll of adult ATV operators in Ohio indicated that almost half (49.3%) had transported a passenger younger than 16 years of age on an ATV within the past year [7]. Among grade six students in rural Manitoba surveyed in 1996, only 35% of riders reported always using a helmet. Riding on inappropriately large vehicles (>90 cc) and on older, three-wheeled models (banned in Canada since the 1980s due to safety concerns) was also common. [3]

ATV crashes and injuries

Much has been published documenting the scale and frequency of ATV-related injuries in children, youth and adults, including injury numbers, types, severity and fatalities. These

statistics are primarily North American but are also, more recently, being published in Europe, Australasia and other regions abroad. A scan of PubMed, with the search terms ‘all-terrain vehicle’ and ‘injuries’, reveals a large increase in the number of articles on such injuries since the early nineties, from an average of one citation per year between 1991 and 1997, to four per year between 1998 and 2003, to 14 per year between 2004 and 2010. When the search term ‘children’ is added, the numbers change to one, two and 10, respectively. Research documenting the rising rates and concerns around ATV-related injuries, especially in children and youth, is ample.

In Canada, the rate of ATV-related injury hospitalizations (for all ages) rose by 57% between 1996 and 2004, with absolute numbers increasing from 1700 admissions in 1996/1997 to over 2800 in 2004/2005 [8]. Thirty-four per cent of these incidents involved children and youth 0 to 19 years of age, with 16% aged five to 14 years and just over 17% aged 15 to 19 years. Since 2004, the numbers have continued to rise, with an overall increase in the hospitalization rate (for all ages) of 17% by 2009 (Canadian Institutes for Health Information, unpublished data). Hospitalizations increased by 19% among children aged five to nine years old and by 13% among 10-to-14-year-olds while remaining static for older youth. Over the past five years, an average of 447 children under the age of 15 were hospitalized every year for ATV-related injuries; for those aged 15 to 19, there was an average of 506 admissions per year.

More sobering still is that from 2000 to 2002, an average of 141 Canadians died each year from ATV-related trauma (ICD-10 code V86, which includes all off-road motor vehicle injuries), increasing by 27% to an average of 179 per year in 2003/2007. Almost 40% of those who died were children and youth (aged 19 years and younger) (9). During both time periods, the average number of deaths from ATV-related injuries decreased by 26% in children and youth younger than 15 years of age (from 17.3/year to 12.8/year) but increased by 46% in youth 15 to 19 years of age (from 15/year to 22/year). The US Consumer Product Safety Commission (CPSC) reports similar trends in ATV-related deaths over comparable time periods. Fatalities rose by 50%, from an average of 505/year from 2000 to 2002 to 760 between 2003 and 2006, with an apparent upward trend continuing [10]. Children and youth under 16 years of age comprised 23% of total deaths for the entire period, with absolute numbers also increasing from 130/year from 2000 to 2002 to 160/year in 2003/2006. Similar trends have been noted for ATV-related emergency department visits. [10]

Many factors have been documented to increase both the risk and severity of ATV-related injuries among children and youth. Males account for 70% to 85% of injuries (involving emergency department visits, hospitalizations and death) with the largest proportion of injuries seen in older youth [11][15].

Carrying or being a passenger, driver error, poor judgment and loss of control are commonly cited as contributing causes in ATV crashes, with rollovers, falling off a vehicle and colliding with an obstacle being the most commonly cited mechanisms of injury ^{[11][15][16]}. Some studies have found a higher risk of severe injuries, including traumatic brain injuries, among youth (when compared with adults), citing driving inexperience and lack of supervision as contributing factors.^{[17][18]}

Inexperience, inadequate physical size and strength, immature motor and cognitive development, and tending to engage in risk-taking behaviours all compound injury risks for children and youth operating ATVs. While industry guidelines suggest that children under 16 years of age should only operate youth-sized models, these vehicles are still heavy and can travel at significant speeds. Also, a higher centre of gravity contributes to instability, making ATVs prone to flips or rollovers ^[15]. Currently, there is little evidence to suggest that smaller youth models are safer when used by children. US CPSC injury data from 2001 showed that the risk of injury per number of driving hours for an operator under the age of 16 is reduced by only 18% when driving a youth-model ATV with an engine size of <90 cc, compared with operating an adult-sized vehicle with an engine size >200 cc ^[19]. In addition, the level of risk for a child or adolescent operating a youth-model ATV is still almost twice as high as for an adult on a larger machine; the risk of injury to a youth using a smaller machine is also five times higher than the risk to an adult on a machine of the same size. In addition to machine size, age appears to play a significant role in the risk of injury.^{[19][20]}

There is emerging literature on engineering options that may improve the safety of ATVs for older youth and adults. Taking into consideration the low tolerance of driver error that must be accounted for with ATVs, better design and more stringent safety testing – both in the laboratory and in real-world settings – are needed to reduce injury incidence and severity. Further studies are also needed on the potential effects of improved stabilization, rollover protection and restraint systems, as well as designs that ensure better rider-vehicle fit.^{[21][22]}

Despite efforts by industry and governments to promote safety courses and safer riding behaviours, and to restrict children's access to ATVs, debilitating injuries and deaths continue to occur in children and youth operating these vehicles. An impressive host of medical and safety organizations have published position statements, all with the consensus that children and youth under the age of 16 should be restricted from operating ATVs. While age is no guarantee of maturity with respect to judgment or vehicle-handling ability, and the great majority of ATV-related injuries are incurred by youth aged 15 to 24 years of age ^[8], most jurisdictions permit 16-year-olds to operate a motor vehicle. The age of 16 has thereby become, by default, the recommended minimum for

operating an ATV according to the Canadian Paediatric Society and the following organizations: the American Academy of Pediatrics ^[23], the Canadian Association of Pediatric Surgeons ^[24], the American Pediatric Surgical Association ^[25], the Canadian Medical Association ^[26], the American College of Surgeons ^[27], the American Association of Orthopedic Surgeons ^[28], Safe Kids Canada ^[29] and Safe Kids USA ^[30]. With so little evidence that youth-sized vehicles significantly reduce injury risk, the Canadian Paediatric Society, along with many others, explicitly recommends that this minimum age restriction apply to **all** ATV sizes and models.^{[24][26][28][30]}

Recommendations

Considering the high risk of injuries to children and youth when operating ATVs, the Canadian Paediatric Society recommends the following:

- Children and youth younger than 16 years of age should not operate an ATV. The lack of evidence that youth models reduce the risk of injury means this recommendation must apply to all vehicle sizes, including youth models.

For youth operators who are **at least** 16 years of age, as well as adults, the following recommendations are made:

- ATV operators should wear a government-certified helmet, eye protection, and protective clothing and footwear at all times.
- Operators of ATVs designed for single riders should **never** take on passengers.
- ATV drivers should not operate a vehicle after drinking alcohol or when potentially impaired by other substances.
- ATV drivers should complete an approved training course. Training should have both theoretical and practical components and include mandatory testing to pass the course. Postcourse evaluations should be instituted to ensure that training courses are producing safer riders.

Provinces and territories must harmonize and pass effective off-road vehicle legislation that mandates:

- a minimum operator age of at least 16 years,
- restricting passengers to the number for which the vehicle was designed,
- compulsory helmet use with no exemptions, and
- training courses, licensing and registration.

No jurisdiction in Canada currently reflects all of these recommendations (Table 1).

In regions where ATVs provide one of the only means of transportation, such as Canada's remote and isolated communities, local education programs that convey their potential dangers to children and youth and that promote safer riding behaviours are essential. Community-based programs should include prohibiting ATV use as a form of recreation by children and youth.

For the ATV industry, the Canadian Paediatric Society recommends that:

- ATV manufacturers improve vehicle design and operating standards to address the large margin for driver error. Until the safety record is significantly improved for older youth and adult operators, consideration cannot be given to permit the marketing of any ATV model to youth under the age of 16.
- ATV manufacturers be governed by mandatory and stringent product safety regulations and monitored by the federal government. More specifically, while the Canadian Paediatric Society does not support the use of youth-model ATVs by anyone under the age of 16, the fact that these vehicles are being marketed for use by children must make them subject to federal product safety regulations and monitoring, as for other children's products.

TABLE 1
Summary of provincial/territorial all-terrain vehicle legislation: Age restrictions and helmet requirements

Province/territory	Minimum operating age	Mandatory safety training for children <16 yrs	Mandatory helmet use
British Columbia	No minimum operating age on private or public land.	N	N
Alberta	No restrictions on private land. Children under 14 years of age require adult supervision when driving on public property.	N	N
Saskatchewan	No restrictions on private land owned by an immediate family member. Minimum age 12 years of age to drive on public property, with adult supervision or safety training required for those under the age of 16.	N	Y (on public land only)
Manitoba	Children under 14 years of age require adult supervision on private and public lands.	Y	Y
Ontario	No restrictions on private land owned by the vehicle's registered owner. Children under 12 years of age require adult supervision when driving on public property.	N	Y (on public land only)
Quebec	Minimum 16 years of age for adult-sized ATVs. Children under 16 years can operate 'youth model' ATVs as specified by the manufacturer.	Y	Y
New Brunswick	Children under the age of 16 can only drive 'age-appropriate' models, as specified by the manufacturer, and require adult supervision at all times; children under 14 years of age can only drive on closed courses.	Y	Y
Nova Scotia	Children under the age of 16 require adult supervision at all times; children under 14 years of age can only drive on 'age-appropriate' models on closed courses.	Y	Y
Prince Edward Island	Minimum age 14 years of age, with adult supervision at all times for ages 14 to 15.	Y	Y

Newfoundland and Labrador	Minimum 16 years of age for adult-size ATVs. Minimum age 14 years of age for 'youth model' ATVs, with adult supervision required for 14 to 15 year-olds.	N	Y
Yukon	No territorial ATV legislation.		
Northwest Territories	Minimum age 14 years of age to drive ATVs on highways.	N	Y
Nunavut	Minimum age 14 years of age to drive ATVs on highways.	N	Y
Y-Legislation present N -Legislation lacking			

Acknowledgements

This position statement has been reviewed by the Adolescent Health, and the First Nations, Inuit and Métis Health Committees of the Canadian Paediatric Society.

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