Sledding deaths in Ontario

BRIAN H. ROWE, MD, CCFP(EM)
GARY W. BOTA, MD, FRCPC

SUMMARY

Traumatic injury from sledding and tobogganing can be reduced. The objective of this study was to determine the incidence of sledding and tobogganing deaths in Ontario. Operator, vehicle (sled), and environmental factors associated with these events were also examined. A retrospective series of cases from the Provincial Chief Coroner's Office identified all patients fatally injured while sledding or tobogganing in Ontario between 1986 and 1991. Communities should pay careful attention to injury prevention when planning organized sledding areas.

RÉSUMÉ

Il est possible de réduire les blessures traumatiques attribuables aux accidents de traîneau et de toboggan. Cette étude visait à préciser l'incidence des décès attribuables aux accidents de traîneau et de toboggan en Ontario. L'étude a également analysé les conducteurs, les véhicules (traîneaux) et les facteurs environnementaux associés à ces accidents. Une série rétrospective de cas fournie par le bureau du Coroner en chef de la province a identifié tous les patients blessés mortellement en Ontario suite à des accidents de traîneau et de toboggan entre 1986 et 1991. Dans leur planification et l'organisation des surfaces destinées à ce type d'activités, les communautés devraient accorder une attention spéciale à la prévention des blessures.

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SLEDDING AND TOBOGGANING are popular outdoor winter recreational activities. Sledding injuries are frequent,[1-6] although more people are injured in other winter sports, such as skiing[4] and snowmobiling.[7,8] Approximately 45 000 injuries resulting from sledding are treated in emergency departments each year in the United States.[3] Moreover, sledding injuries can be severe and even result in death.

Many factors contribute to sledding injury. First, the rider has little control over the direction of the sled or its speed, which can become quite considerable. Second, few sledders use protective equipment, aside from warm clothing. Sleds offer very little protection to the rider, and any body part has the potential for injury. Body parts most exposed to serious trauma in sledding are the trunk and head. In one study, head, neck, and face injuries accounted for one third of sledding injuries.[2] Injuries to the limbs are the most common non–life-threatening injuries.[1-3]

Finally, environmental conditions, such as bare spots and objects in the path of sleds, can cause rapid decelerations and lead to traumatic injury. People who fall from sleds onto snow tend to have fewer severe injuries to the limbs and spine, because the kinetic energy generated during the slide is dissipated as friction.[1] However, when a rider strikes a stationary object, the kinetic energy is absorbed by the rider's body, resulting in potentially serious injury.[1-6]

In any activity, traumatic deaths generally represent less than 5% of all accidents[9] and admissions to hospital less than 10% to 15%; most injuries are minor. This distribution is known as the "pyramid effect." While it might apply to sledding,[1-6] there is some indication of a higher hospitalization rate with sledding injuries. In any case, examining traumatic deaths in any area can give insights into the extreme of trauma danger. Little is known about death resulting from sledding, and the characteristics of these deaths might help to identify strategies that can reduce injury overall.

We undertook a study of sledding deaths in Ontario, paying attention to the categories generally used in trauma epidemiology: factors relating to the environment, to the vector or vehicle, and to the behaviour of the operator.[10] Our objectives were:

- to determine the incidence of such deaths,

Dr Rowe *is Research Director for the Northeastern Ontario Family Medicine and Trauma Programs in Sudbury, Ont.* **Dr Bota** *is Director of the Emergency Department and Northeastern Ontario Lead Trauma Program at Sudbury General Hospital.*

- to examine the demographic data and circumstances, and
- to identify preventive strategies.

METHODS

Coroner's records

A retrospective case series approach was used to identify deaths from sledding trauma from 1986 to 1991 inclusive. Under the Coroner's Act, all trauma-related and sudden, unexplained deaths within Ontario's eight regions must be reported to the provincial Chief Coroner.[11] These deaths are registered using a code designating the "environment" and the "death factors."

The environment refers to the activity that led to death and is divided into a number of subgroups. The subgroup heading used in this study was "Recreation and Sporting," which includes biking, skiing, and snowmobiling. No separate code exists for sledding, which is listed as "Recreation (other)."

The death factor refers to the action, force, instrument, or disease that led directly to death. For example, patients might have drowned, been shot, or been involved in a motor vehicle collision. (This classification system is unique to the Ontario coroner's office.) We did not exclude any charts on the basis of death factor alone.

Inclusion and exclusion criteria

We included only traumatic deaths that occurred during some form of sledding or sliding activity. We excluded deaths unrelated to sledding or in which no obvious signs of trauma were identified. Final decisions were made on the basis of the summary provided by the regional coroner involved with each case.

Data collection

All charts were examined, and a checklist was completed on all eligible patients. Descriptive data are reported.

RESULTS

Twenty-seven charts were identified from the Coroner's Information System; all charts were located and examined. Only five cases (18%) met the inclusion criteria for sledding deaths. These are summarized in *Table 1*.

All victims were male, and three patients were younger than 20 years. Three deaths occurred in the partial darkness between 6 PM and 8 AM. Only one death occurred on a designated sledding hill; four occurred in unsupervised areas. Poor weather conditions were not encountered in any cases.

Three riders struck an object (tree, person, and ditch); two were struck by motor vehicles. Two children were killed as they came out of driveways and were struck by cars. A 19-year-old died after sliding into a ditch. The two adult deaths occurred on unsupervised hills. Alcohol was not detected or believed to be involved in any of the cases.

All cases involved the rider striking his head. Four died of massive head injury;

Table 1. **Sledding deaths in Ontario, 1986 to 1991: *All victims were male.***

YEAR	AGE (Y)	TIME (H)*	DAY	MONTH	LOCATION	HEAD INJURY?	TYPE OF VEHICLE
1991	4	1900	Monday	December	Road/driveway	Yes	Sled
1991	19	2150	Saturday	December	Designated hill	Yes	Carpet†
1989	41	1450	Monday	December	Road/intersection	Yes	Carpet†
1988	2	1020	Tuesday	February	Driveway/road	Yes	Toboggan
1986	27	0100	Tuesday	January	Undesignated hill	Yes	Toboggan

**Time of injury is listed as nearly as could be determined from police records.*

†Carpet refers to a fragment of carpet or a plastic device that simulates a carpet.

the fifth died as a result of a cardiac laceration (nonpenetrating injury). One case involved cervical cord transection as well as head injury. No serious extremity injuries were identified in this series. Only one of the sledders was wearing a helmet of any kind (a hockey helmet).

Three patients were dead at the scene of the crash, while two patients survived for 1 day.

DISCUSSION

In northern areas of Ontario, where the winter is long, death from winter recreational activities heavily burdens the health care system. While skiing, hockey, and snowmobiling are more common activities,[4,7,8] sledding and tobogganing remain popular and are generally perceived to be "safe." However, sledding injuries are common yet have been studied little.

While sledding deaths are rare, they occur in the young and healthy and result in an important loss of productive years of life. Moreover, most of these fatalities are preventable. We present potentially useful countermeasures under the three main categories of trauma etiology: operator factors, the vehicle, and the environment.

Operator factors

In this series, deaths from sledding occurred in young males, including two very young children. A number of studies suggest a male dominance to sledding injuries, and children have been most frequently studied.[1,5,6] However, adults also sled, and preventive measures must consider them as well.

Unlike other recreational activities in which traumatic death is more prevalent,[4,7,8] alcohol use is not seen in toboggan and sledding deaths. We cannot, of course, state that sledders never drink; we simply suggest that alcohol is not closely associated with sledding death. While we cannot comment on abuse of other substances, this seems unlikely as a significant factor, because alcohol leads all substances of abuse as a causative factor in traumatic events overall.[12]

Speed appears to be a great contributor to at least some of the crashes in this series. Three of the sleds were reported by investigating police to be traveling at "excessive speeds." Speed is partly controlled by the operator but also relates to environmental conditions, such as the slope of the hill and the type of surface (soft snow, packed snow, or ice).[1] It would, however, be difficult, if not impossible, to limit speed, because it is speed that makes sledding exciting.

The most notable feature of this study is that all cases involved head injury, which was the direct cause of death in all but one case. It is not surprising that head injuries are common, because the head is the body part most exposed to trauma. Some authors have shown that young riders are more prone to head and face injuries.[2] One child was killed despite wearing a hockey helmet. However, this type of helmet is not designed to protect against head injury as well as helmets designed for activities where skull impact might occur, such as skiing, snowmobiling, and biking.

Riders, especially young children, should be encouraged to wear a helmet when sledding.[2,5] However, helmets might prove to be impractical. Although helmets could be worn over winter hats, they could be awkward, and their effectiveness in this setting is not as clear as it is for other sports, such as cycling.[13] Compliance would be difficult to attain.

Vehicle

Sledding devices that cannot be controlled by the rider are more likely to be involved in serious trauma.[3-5] For example, sliding down a hill on an inner tube has been described as "the most dangerous winter sport yet developed" and is responsible for a multitude of non-fatal injuries.[6] However, inner tubes do not seem to be used often. One study found that the most commonly used device was the standard metal-runner sleds, which were, therefore, involved in most injuries.[5]

In this case series, two of the "vehicles" were carpetlike sleds. Along with flying saucers, snow disks, and inner tubes, these "sleds" appear to create more danger for the rider than regular sleds or toboggans. The speed attained and lack of control could prevent the rider from reacting to obstacles in the path of travel. Moreover, such devices often spin, propelling the

rider down the hill backward, which makes control even more difficult and increases the risk of head injury. The use of these devices should be discouraged, especially on supervised hills and wherever surveillance is possible.

Environment

Environmental countermeasures appear to be the most practical and feasible way to limit injury. While one might assume that poor visibility caused by precipitation would present a hazard, in fact weather conditions played little or no role in the deaths seen in this series. All occurred during clear weather or light snow. It is not surprising that death occurred more frequently during nighttime sledding. Similar results have been seen with snowmobiling injuries.[7,8]

Location is also important: three deaths occurred on streets or at the end of driveways. All sledders, especially children, should be taught about the danger of sliding sleds near roads or on driveways.

The slope of the hill and the condition of the surface could also create hazards by increasing speed. This concern is particularly important for children.

People sled in both public and private places. While it is difficult to enforce guidelines for safe sledding on private properties, communities can control conditions at designated sledding areas.

We suggest that communities where sledding is popular provide designated, supervised sledding hills. In public areas where sledding is performed without authorization, it would also be useful to post signs warning "sledding not advised". Such hills should be well lit; be free of all obstacles, including trees, walls, and cars (both moving and stationary); and have ample clear space at the base. Some authors have recommended that the slope of the hill not exceed 30 degrees.[2] Finally, protective barriers could be used, as in skiing.

Limitations

Several limitations exist with this study. Most importantly, the size of the sample is small. We endeavoured to collect all cases of fatal sledding and tobogganing over a period for which the coroner's records are known to be complete (personal communications from Ms June Frank). No misclassified cases were found, and experience tells us that the coroner's records are complete and accurate.[7,8] This small sample makes generalizations and recommendations difficult. However, some practical countermeasures seem intuitive and reasonable and are supported by other sledding trauma studies.[1-6] Further surveillance will determine whether these are well founded.

CONCLUSION

Overall, sledding and tobogganing can and should be safe sports. Strategies outlined here might help communities avoid tragedy. ■

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Requests for reprints to: *Dr Brian H. Rowe, Research Director, Northeastern Ontario Family Medicine Program, Laurentian University, 6th Floor, Suite 608, Ramsey Lake Rd, Sudbury, ON P3E 2C6*

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