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**POSITION STATEMENT**

**SNOWBOARDING INJURIES**

Dr. Eileen Bridges, MD, Dip Sport Med and Dr. Nancy White MD, Dip Sport Med.

This position Statement was prepared by the Canadian Academy of Sport Medicine Sport Safety Committee. This position statement was approved by the CASM Board of Directors as a CASM position statement in December 2006.

**Introduction**

Snowboarding evolved into a mainstream winter sport in the 1970's and received a further boost in popularity when it was introduced as an Olympic sport at the 1998 Winter Games in Nagano, Japan. In Canada there are over 650,000 snowboarders, representing almost one third of the ski market in the 2003 season<sup>1</sup>.

Snowboarding injury rates (3 to 5 injuries per 1000 snowboarder days) are similar to those seen in Alpine skiing<sup>2,3,4,5,6,7,8,9,10</sup>. However, the injury patterns seen in snowboarding differ from those seen in alpine skiing. Boarders suffer more injuries to the upper extremities (58% vs. 32% in skiers), and ankles (17% vs. 5% in skiers) and fewer injuries to the knees (16% vs. 38% in skiers)<sup>3, 7,8,9,10,11</sup>. The incidence of head injuries in snowboarders is 2-6 times that of skiers<sup>12</sup>.

Thus, it is important for CASM to provide information for medical practitioners and members of the public in order that protective equipment is used and safety guidelines are adhered to.

**Background Scientific Information**

Almost 84% of snowboarders are under 25 years old and more than two thirds are male<sup>1</sup>. The most frequently injured snowboarders are males in their early 20's and beginners<sup>2,3,4,6,7,8,11,13,14,15,16,17,18,19</sup>. Falls account for most injuries, placing the beginner at higher risk<sup>14</sup>; almost a quarter of all injuries occur in first-time snowboarders, and almost one half occur during the first season<sup>2,3,6,7,8,11,14,17,18</sup>. The most common injuries are sprains (44 to 53%), fractures (24 to 31%) and contusions (6 to 12%)<sup>2, 6, 7</sup>. Snowboarders also suffer head, face, chest, abdominal and spinal injuries; these are typically associated with collisions and the aerial maneuvers characteristic of “freestyle” snowboarding. In one study, 50% of chest injuries while snowboarding involved rider error during a jump and half of all chest injuries were rib fractures<sup>13</sup>. Prall et al. estimated the incidence of snowboarding injuries sufficiently severe to require tertiary care referral at 0.03 per 1000 snowboarder days<sup>16</sup>.

Snowboarding equipment differs significantly from ski equipment. The boots may be soft or hard. Soft boots, used by most beginners and freestylers, provide greater maneuverability but increase the risk of ankle injury. Chissell reported that 80% of ankle injuries were sprains<sup>21</sup>; however others have found that almost half of all ankle injuries were fractures<sup>11, 14</sup>. The well-known “snowboarder’s fracture”, which may account for up to 32% of all ankle fractures, is caused when the foot is pushed suddenly upward on impact with the ground while landing a jump or during a fall and the ankle is forced into dorsiflexion and eversion. This results in fracture of the lateral process of the talus; the boarder will complain of pain inferior to the tip of the lateral malleolus. It is often



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difficult to see in standard x-rays of the ankle and diagnosis of this fracture may necessitate CT imaging<sup>22</sup>. If these injuries are not treated by rigid immobilization or internal fixation the boarder may have persistent pain and limitation of movement and, ultimately, degenerative ankle changes<sup>22,23,24,25</sup>.

Hard boots are used by most racers and place the boarder at increased risk for “boot-top” fractures of the tibia and fibula<sup>2,6</sup>. Use of hard boots is also associated with twice the risk of knee injuries compared to soft boot use<sup>2</sup>. It is recommended that the novice snowboarder use soft boots with inserts to support the ankle<sup>3,6,14</sup>.

Because both feet are fixed in non-releasable bindings, knees are not as frequently or as seriously injured<sup>6,8,11, and 14</sup>. Seventy-five percent of all lower extremity injuries occur in the lead leg<sup>3,17,18,26</sup>. The most common injuries are sprains (60%), seldom with meniscal tears or ligament ruptures and rarely with fractures<sup>3,6,11,17</sup>. The knee can also be injured if the boarder is waiting in line and takes his rear foot out of the binding to propel himself. This leaves the lead foot locked to the board at a 45 to 90 degree angle; if the boarder falls, a large torque is placed on the lead knee predisposing it to injury<sup>15</sup>.

Snowboarders do not use poles and therefore rarely suffer from the ulnar collateral ligament injury of the thumb common in skiers. Snowboarders do, however, frequently fall onto the outstretched hand after being catapulted forward or falling backwards while both legs are fixed to the board. This results in a high proportion of injuries to the upper extremity, almost 60% of which are fractures<sup>11,14,19,27</sup>. Wrist (distal radial, ulnar or carpal) fractures are the most common injuries seen in the upper extremities of snowboarders<sup>8,11,14,17,27,28,29</sup>. Sasaki et al characterized “snowboarder’s wrist” as severe and complex; half of the fractures examined were partial articular or intra-articular<sup>29</sup>.

Many investigators advocate that snowboarders use wrist guards, similar to those used by in-line skaters<sup>6,9,10,11,27,30</sup>. They have been shown to have an almost 50% reduction in wrist injuries<sup>27</sup>. These are designed to prevent wrist hyperextension, absorb shock and diffuse kinetic forces, thereby protecting the wrist from sprains or fractures<sup>31</sup>. Beginners are especially likely to benefit from wrist protection<sup>32</sup>, but less than 10% of snowboarders wear such protection<sup>9,11,19,33</sup>. A concern has been raised about potential injuries to the forearm and shoulder resulting from a shift in the distribution of the impact force more proximal to the wrist<sup>34</sup>. Staebler et al, in a cadaver study, found equivocal evidence for this concern but only tested loading in one direction (75 degrees, falling backwards)<sup>35</sup>. Ronning looked at the efficacy of wrist protectors in 2,300 snowboarders and found no injuries that could be attributed to the use of wrist guards<sup>32</sup>.

Shoulder injuries account for 4.8 to 16% of all injuries and 20 to 34% of all upper extremity injuries<sup>3,4,6,7,18,27</sup>. The most common injuries are glenohumeral dislocations, clavicle fractures, acromioclavicular separations, rotator cuff strains and proximal humerus fractures<sup>27,28</sup>. Elbows also may be fractured or dislocated<sup>11,14,17,27</sup>.

Injuries to the head and face (lacerations, contusions, concussions) account for 10-18% of all injuries in snowboarders; concussions make up 1-11% of this group<sup>3,5,7,9,11,19,36</sup>. The incidence of head injuries in snowboarders is about 6.5 per 100,000 visits to a skiing facility<sup>12</sup>, representing a rate that is 2-6 times that of skiers<sup>12</sup>. However, when reviewing data from those head injured snowboarders presenting to a hospital or trauma center, the rates of head injury are even higher than those reported by alpine centers (Shorter et al<sup>20</sup> 44-71%; Sacco et al<sup>8</sup> 15%; Prall et al<sup>16</sup> 54%). Sacco et al<sup>8</sup> found blunt head trauma to be the most prevalent cause of death (54%). The head injuries are more likely to occur in beginners and during a fall; they frequently involve occipital impact<sup>12,37</sup>.



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Helmets reduce the risk of head injuries by 29-56%<sup>38</sup>; but evidence is limited on the relationship between helmet use and the risk of neck injury. In children under 13 years of age, helmet use has not been found to increase the incidence of cervical spine injury<sup>36,39</sup> and does reduce the incidence of head injury requiring investigation and/or treatment<sup>39</sup>. These investigators and others advocate the use of helmets in both skiing and snowboarding, particularly for beginners and children.

Falls are the most common mechanism of injury in snowboarding<sup>2, 7,14,16,28</sup>. The second most common cause of injuries is jumping or “catching air”<sup>3, 11, 28</sup>. The use of protective equipment and instruction in proper techniques may reduce the incidence of these injuries although aerial maneuvers may carry an inherent high risk.

Collisions account for less than 10% of snowboarding injuries<sup>3,7</sup>. Of note, most collisions involving snowboarders occur with a stationary object (tree, pole, snowmaking machine) and not with other skiers. In fact, skiers are more likely to collide with other skiers than with snowboarders<sup>7, 11, 40</sup>.

Most injuries in both snowboarders and skiers occur in the afternoon when fatigue is more likely<sup>13, 16,17,19,40</sup>. Snow conditions may contribute to the incidence of injuries but do not appear to affect the type or location of injury<sup>11</sup>. Individual snowboarding errors (loss of control, catching an edge, carelessness and risk taking) may contribute more to injury incidence<sup>17,36</sup>.

**RECOMMENDATIONS FOR SNOWBOARDERS**

1. For an excellent overview of snowboarding injury prevention strategies and tips please view the A Little Respect: Think First! Web site and video<sup>41</sup>
2. Undertake preseason conditioning and training.
3. Novice snowboarders should take lessons from a qualified CSIA and CASI instructor to learn correct riding and falling techniques.
4. Choose equipment to suit skill level and size. Boots should fit well and novices are advised to wear soft shell boots with ankle supports. The use of nonreleasable bindings limits lower leg torsional injuries. Make sure your snowboard has a safety leash. Check your bindings by making sure all the screws are tight and in place.
5. Wear protective equipment. Wrist guards help prevent wrist sprain and fracture. A helmet should be worn to protect against head injury.
6. Snowboard on slopes suitable to your level.
7. Be cautious when boarding in deep powder among trees. Always do this with a buddy.
8. Adhere to snow conduct and safety codes<sup>42</sup>.
  - Stay in control and be able to stop or avoid other boarders, skiers and objects.
  - It is your responsibility to avoid any boarder or skier ahead of you.
  - You must not stop where you obstruct a trail, half pipe, or park and are not visible from above.
  - When entering a trail, half pipe or park, yield to other boarders and skiers.



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- Always use safety straps to prevent runaway equipment.
- Observe all posted signs and warnings. Keep off closed trails and out of closed areas.

**Primary Authors**

Eileen Bridges

Nancy White

**Bibliography**

1. Canadian Ski Council. Canadian Ski and Snowboard Industry Facts and Stats. 2003 <http://www.gdsourcing.ca/works/Skicanada.htm>.
2. Bladin C, Giddings P, Robinson M. Australian snowboard injury database study, A four-year prospective study. Am J Sports Med 1993; 21(5):701-4.
3. Davidson TM, Laliotis AT. Snowboarding injuries, a four year study with comparison with alpine ski injuries. Western J Med 1996; 164(3):231-7.
4. Sutherland AG, Holmes JD, Myers S. Differing injury patterns in snowboarding and alpine skiing. Injury 1996; 27(6):423-5.
5. MacNab AJ, Cadman R. Demographics of alpine skiing and snowboarding injury: lessons for prevention programs. Injury Prevention 1996; 2(4):286-9.
6. Bladin C, McCrory P. Snowboarding injuries, an overview. Sports Med 1995; 19(5):358-64 Review.
7. Shealy JE. Snowboarding vs. downhill skiing injuries. Skiing Trauma and Safety: Ninth International Symposium, ASTM STP 1182. Johnson RJ, Mote CD, Zelcer J, Eds., American Society for Testing and Evaluation, Philadelphia, 1993, pp 241-54.
8. Sacco DE, Sartorelli DH, Vane DW. Evaluation of alpine skiing and snowboarding injury in a northeastern state. J Trauma 1998; 44(4):654-9.
9. Made C, Elmqvist LG. A ten year study of snowboard injuries in Lapland Sweden, Scand J of Med Sci Sports. 2004;14(2):128-133.
10. O'Neill FD, McGlone MR. Injury risk in first-time snowboarders versus first time skiers. Am J Sports Med 1999; 27(1):94-97.
11. Chow TK, Corbett SW, Farstad DJ. Spectrum of injuries from snowboarding. J Trauma 1996; 41(2):321-5.
12. Nakaguchi H, Fujimaki T, Ueki K, Takahashi M, Yoshida H, Kirino T. Snowboard head injury: prospective study in Chino, Nagano, for two seasons from 1995 to 1997. J Trauma 1999; 46(6):1066-9.
13. Machida T, Hanazaki K, Ishizaka K, Nakamura M, Kobayashi O, Shibata H, et al.



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- Snowboarding injuries of the chest: comparison with skiing injuries. *J Trauma* 1999;46(6):1062-5.
14. Ganong RB, Heneveld EH, Beranek SR, Fry P. Snowboarding injuries; a report of 415 patients. *Physician Sports Med* 1992; 20(12):114-22.
  15. Young CC, Niedfeldt. Snowboarding injuries. *Am Fam Physician* 1999; 59(1):131-6.
  16. Prall JA, Winston KR, Brennan R. Severe snowboarding injuries. *Injury* 1995; 26(8):539-42.
  17. Abu-Laban RB. Snowboarding injuries: an analysis and comparison with alpine skiing injuries. *CMAJ* 1991; 145(9):1097-103.
  18. Pino EC, Colville MR. Snowboard injuries. *Am J Sports Med* 1989; 17(6):778-81.
  19. Calle SC, Evans JT. Snowboarding trauma. *J Pediatr Surg* 1995; 30(6):791-4.
  20. Shorter NA, Mooney DP, Harmon BJ. Snowboarding injuries in children and adolescents. *Am J Emerg Med* 1999; 17(3):261-3.
  21. Chissell HR, Feagin JA, Warne WJ, Lambert KL, King P, Johnson L. Trends in ski and snowboard injuries. *Sports Med* 1996; 22(3):141-5.
  22. Paul CC, Janes PC. The snowboarder’s talus fracture. *Skiing Trauma and Safety: Tenth Volume, ASTM STP 1266*, Mote CD, Johnson RJ, Hauser W, Schaff PS, Eds., American Society for Testing and Materials, 1996:388-93.
  23. McCrory P, Bladin C. Fractures of the lateral process of the talus: a clinical review. “Snowboarder’s ankle”. *Clin J Sport Med* 1996; 6(2):124-8.
  24. Kirkpatrick DP, Hunter RE, Janes PC, Mastrangelo J, Nicholas RA. The snowboarders’ foot and ankle. *Am J Sports Med* 1998; 26(2): 271-7.
  25. Boon AJ, Smith J, Laskowski ER. Snowboarding injuries, general patterns with a focus on talus fractures. *Physician Sports Med* 1999; 27(4):94-104.
  26. Pigozzi F, Santori N, Di Salvo V, Parisi A, Di-Luigi L. Snowboarding traumatology: an epidemiological study. *Orthopaedics*, 1997; 20(6):505-9.
  27. Idzikowski JR, Janes PC, Abbott PJ. Upper extremity snowboarding injuries: Ten-year results from the Colorado Snowboard Injury Survey. *Am J Sports Med* 2000;28:825-832.
  28. Kocher MS, Dupre MM, Feagin JA. Shoulder injuries from alpine skiing and snowboarding: Aetiology, treatment and prevention. *Sports Med* 1998; 25(3): 201-11.
  29. Sasaki K, Takagi M, Kiyoshige Y, Ogino T. Snowboarder’s wrist: Its severity compared with alpine skiing. *J Trauma* 1999; 46(6):1059-61.
  30. Bladin C, McCrory P, Pogorzelski A. Snowboarding Injuries: Current trends and future directions. *Sports Med*. 2004;34(2):133-139.



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31. Schieber RA, Branche-Dorsey CM, Ryan GW, Rutherford GW, Stevens JA, O’Neil J. Risk factors for injuries from in-line skating and the effectiveness of safety gear. *N Engl J Med*; 335(22):1630-5.
32. Ronning R, Ronning I, Gerner T, Engebretsen L. The efficacy of wrist protectors in preventing snowboarding injuries. . *Am J Sports Med* 2001; 29:581-585?
33. Johnson K., Mohtadi NGH. The prevalence of protective equipment use and Injury prevention in snowboarding, *Clin J Sport Med* 2002; 12(1):66 (Abstract)
34. Cheng SL, Rajaratnam K, Raskin KB, Hu RW, Axelrod TS. “Splint-top” fracture of the forearm: a description of an in-line skating injury associated with the use of protective wrist splints. *J Trauma* 1995; 39(6):1194-7.
35. Staebler MP, Moore DC, Akelman E, Weiss APC, Fadale PD, Crisco JJ. The effect of wrist guards on bone strain in the distal forearm. *Am J Sports Med* 1999; 27(4):500-6.
36. Bridges EJ, Rouah F, Johnston KM. Snowblading injuries in Eastern Canada. *Br J Sports Med* 2003; 37:511-515.
37. Fukuda1 O, Takaba M, Takakage S, Shunro E. Head Injuries in Snowboarders compared with Head Injuries in Skiers. *Am J Sports Med* 2001; 29(4); 437-440.
38. Hagel BE Pless IB, Goulet C, Platt RW, Robitaille Y. Effectiveness of helmets in skiers and snowboarders: case-control and case crossover study. *BMJ*, doi:10.1136/bmj.38314.480035.7C (published 4 Jan 2005)
39. Macnab AJ, Smith T, Gagnon FA, Macnab M. Effect of helmet wear on the incidence of head/face and cervical spine injuries in young skiers and snowboarders. *Inj Prev* 2002; 8:324-327
40. Hagel BE, Meeuwisse WH, Mohtadi NGH, Fick GH. Skiing and snowboarding injuries in children and adolescents of southern Alberta. *Clin J Sport Med* 1999 ;( 9):9-17.
41. A Little Respect: Think First! [http://www.thinkfirst.ca/documents/thinkfirst\\_respect.pdf](http://www.thinkfirst.ca/documents/thinkfirst_respect.pdf)
42. Canadian Snowboard Federation. Snowboarders Responsibility Code. 1999.



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**SNOWBOARDING INJURIES**

The Canadian Academy of Sport Medicine (CASM) has undertaken this position statement in an effort to decrease the incidence of snowboarding injuries. These recommendations are based upon the current scientific literature and are discussed in detail in the accompanying discussion paper. It is important for CASM to provide information for medical practitioners and members of the public in order that protective equipment is used and safety guidelines are adhered to.

**Recommendations**

1. Undertake preseason conditioning and training.
2. Novice snowboarders should take lessons from a qualified CSIA and CASI instructor to learn correct riding and falling techniques.
3. Choose equipment to suit skill level and size. Boots should fit well and novices are advised to wear soft shell boots with ankle supports. The use of non-releasable bindings limits lower leg torsional injuries. Make sure your snowboard has a safety leash. Check your bindings by making sure all the screws are tight and in place.
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  - Observe all posted signs and warnings. Keep off closed trails and out of closed areas.

**Primary Authors**

Dr. Eileen Bridges, MD, Dip Sport Med.  
Dr. Nancy White, MD, Dip Sport Med.