Snow Sports Injuries

Gary Hooper
Christchurch
Major sports

• SKIING
  - 200 million participants

• SNOWBOARDING
  - 70 million participants
Injury rate

• Injuries per thousand skier days (IPTSD)
• Mean Days Between Injury (MDB)

• SKIING <3 IPTSD
• SNOWBOARDING >4 IPTSD
MDBI

Can be used to define the frequency of specific injuries eg the MDBI for ACL rupture while skiing is approx 2100 days
Overall Injury Rate Scotland 1999-2005

Copyright www.ski-injury.com

Study year

99-00 00-01 01-02 02-03 03-04 04-05

IPTSD

3.72 3.20 3.17 2.64 2.40 2.24

All sports
Injury Rates 1999-2005

Study year: 99-00, 00-01, 01-02, 02-03, 03-04, 04-05

- Alpine ski: 3.64, 2.75, 2.20, 2.35, 1.92, 1.74
- Snowboard: 6.21, 6.85, 8.65, 4.71, 5.63, 4.97

[Copyright www.ski-injury.com]
The top five injury sites

- Knees (39%)
- Shoulder (14%)
- Lower leg (8%)
- Upper and lower arm (7%)
- Hand/wrist (5%)
Cost of the problem in NZ

• 2006/2007 year, ACC spent $12 million attending to 11,633 snow sport injury claims received that year, with $8 million of that going on 1200 serious or moderate injuries (what ACC calls “entitlement claims”).
• In that year, 61% of new ACC snow sport claims for serious or moderate injuries (what ACC calls “entitlement claims”) were for skiing injuries
Injury distribution all snow sports

**Injury location**
by snow sport

<table>
<thead>
<tr>
<th>Location</th>
<th>Alpine ski</th>
<th>Snowboard</th>
<th>Skiboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial</td>
<td>23.0</td>
<td>28.1</td>
<td>9.5</td>
</tr>
<tr>
<td>Lower limb</td>
<td>49.4</td>
<td>21.8</td>
<td>70.4</td>
</tr>
<tr>
<td>Upper limb</td>
<td>27.5</td>
<td>50.0</td>
<td>20.1</td>
</tr>
</tbody>
</table>

% of total
Type of injury all snow sports

![Injury classification by snow sport](chart)

- Fracture
- Laceration
- Sprain
- Joint injury
- Contusion
- LoC/Concussion

Copyright: Dr. Mike Langran 2005
Injury related to experience

% of first day participants by snow sport

<table>
<thead>
<tr>
<th>Sport</th>
<th>Cases</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpine ski</td>
<td>14.1</td>
<td>6.5</td>
</tr>
<tr>
<td>Snowboard</td>
<td>23.7</td>
<td>8.4</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skiboard</td>
<td>33.6</td>
<td>16.5</td>
</tr>
</tbody>
</table>
Fatalities
Fatalities

Extremely rare

- USA from 1991-2004 there were 469 traumatic deaths within the boundaries of ski resorts
- 401 skiers and 58 snowboarders
- rate of 0.71/million skier days
- collisions with trees commonest
- 2003 rates decreased to 1/2.5 million skier days
Head Injuries

Helmets
- compulsory for Vale ski field employees from 2009-10 season
- USA 48% use helmets, higher in children
- CPSC study 7,000 head injuries/year could be prevented or reduced by use of helmets
Spinal injuries

THE NEW ZEALAND MEDICAL JOURNAL
NZMJ 24 June 2005

Are snowboarders more likely to damage their spines than skiers? Lessons learned from a study of spinal injuries from the Otago skifields in New Zealand

Simon Donald, David Chalmers, Jean-Claude Theis
Spinal injuries

<table>
<thead>
<tr>
<th>Vertebrae</th>
<th>Skiers</th>
<th>Boarders</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1-T2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3-T4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T5-T6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T7-T8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T9-T10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T11-L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2-L3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L4-L5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L6-L7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L8-L9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L10-L11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L12-L5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Age</th>
<th>Male</th>
<th>NZer</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skiers</td>
<td>7</td>
<td>31.3</td>
<td>3</td>
<td>3</td>
<td>0.01/1000</td>
</tr>
<tr>
<td>Boarders</td>
<td>18</td>
<td>23.4</td>
<td>11</td>
<td>10</td>
<td>0.04/1000</td>
</tr>
</tbody>
</table>
Skiing injuries
Injury type

![Injury Classification Chart](https://www.ski-injury.com)

- Fracture: 17.2%
- Laceration: 9.6%
- Sprain: 48.9%
- Joint injury: 6.1%
- Contusion: 13.6%
- LoC/Concussion: 4.6%
Region injured

Main injuries by snow sport

<table>
<thead>
<tr>
<th>Region</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
<td>33.2</td>
</tr>
<tr>
<td>Head/face</td>
<td>13.7</td>
</tr>
<tr>
<td>Shoulder</td>
<td>9.1</td>
</tr>
<tr>
<td>Lower leg</td>
<td>7.6</td>
</tr>
<tr>
<td>Wrist</td>
<td>5.4</td>
</tr>
<tr>
<td>Thumb</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Copyright Dr Mike Langran 2005
ACL Rupture

- High index of suspicion
- Haemarthrosis
- Positive Lachman
Patellar tendon v Hamstrings

- Graft morbidity
- Graft fixation
- Graft laxity
- Graft rupture
Knee injuries and braces

ACL protective
  - do they work?

Some evidence in ACL reconstructed knees with x2.74 less re-rupture
  - do people use them?
Skiing – knee injuries

ACL rupture
- from 1970-1990 rate increased by 240%
- since 2000 rate has declined
- long ski tail + bindings not releasing in rotation
  = ‘Phantom Foot’
- shorter skis have lower incidence of rupture
Ski bindings

- Effective in decreasing stress across leg with resultant decrease in tibial fractures BUT are poor at sensing force applied to the knee
- International call to decrease settings 15% in at risk groups eg females
- Release in a forward twisting fall which protects the MCL but fail in a backwards twisting fall which is the commonest (70%) cause of ACL rupture
Ski bindings

• Release in a forward twisting fall which protects the MCL but fail in a backwards twisting fall which is the commonest (70%) cause of ACL rupture

• Bindings with 2 pivot points front and back may sense forces across the knee better
Snowboarding injuries

Commonest injuries to upper limb followed by head injuries and lower limb (ankle)

Usually young male from non-skiing background with no professional instruction
Type of injury in snowboarding

Injury classification
Snowboard

- Fracture: 32.2%
- Laceration: 11.9%
- Sprain: 27.8%
- Joint injury: 8.6%
- Contusion: 15.0%
- LoC/Concussion: 4.4%
Snow boarding injuries - region

Main injuries by snow sport

<table>
<thead>
<tr>
<th>Body Part</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist</td>
<td>24.9</td>
</tr>
<tr>
<td>Head/face</td>
<td>14.3</td>
</tr>
<tr>
<td>Shoulder</td>
<td>13.1</td>
</tr>
<tr>
<td>Knee</td>
<td>11.8</td>
</tr>
<tr>
<td>Ankle</td>
<td>5.9</td>
</tr>
<tr>
<td>Back</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Copyright www.ski-injury.com
Snowboarding injuries

Commonest injury is to the wrist - 1/1135 days compared to 1/3000 days for a lower limb injury

Both feet in non releasing bindings with poor balance in novice boarders
Prevention of wrist injuries

- Wrist guards
  - evidence in in-line skaters
  - Colorado Snowboard study with 7000 boarders showed those that wore wrist guards suffered 50% less wrist injuries
<table>
<thead>
<tr>
<th>Reason for not wearing wrist guards</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No need</td>
<td>32.8</td>
</tr>
<tr>
<td>Can't get hold of them</td>
<td>16.2</td>
</tr>
<tr>
<td>Too expensive</td>
<td>10.8</td>
</tr>
<tr>
<td>Don't like the look of them</td>
<td>2.5</td>
</tr>
<tr>
<td>Uncomfortable to wear</td>
<td>27.0</td>
</tr>
<tr>
<td>Won't protect against injury</td>
<td>8.3</td>
</tr>
<tr>
<td>Wasn't aware of them</td>
<td>22.1</td>
</tr>
</tbody>
</table>
Snow boarding injuries - ankle

- Fractured lateral process of the talus (2% of all injuries)
  - combination of compressive and inversion forces
  - diagnosis difficult may look like ankle sprain
  - high index of suspicion if ‘ankle sprain’ does not heal within 1-2 weeks
Bone scan and MRI
The vast majority of snow sports injuries happen when someone falls over, and that’s usually through user error. Most falls are from loss of control, perhaps because the skier is going too fast for the weather conditions or their abilities.
Factors to address

- Helmet use mandatory in those <20 years
- Wrist guards for all snow boarders
- Improving release bindings for snowboarders
- Improved bindings for skiers
- Education especially young male first time participant
Thank you
• Potentially Serious Head Injuries (PSHI) at Sugarbush, Vermont: 1981 - 1997

All Injuries 11,795 100% 135,000
All Injuries, Excluding PSHI 11,486 97.4% 131,463
PSHI 309 100% 2.6% 3,537
Fatal head injuries 30.97% 0.04% 34
Skull Fracture 103.2% 0.08% 114
Severe brain injury 82.59% 0.07% 92
Concussion: moderate to severe 3511.33% 0.3% 401
Concussion: mild 23877% 2% 2,724
Concussion: unclassified 154.85% 13% 172
Injury location
by snow sport

% of total

Axial | Lower limb | Upper limb
--- | --- | ---
23.0 | 49.4 | 27.5
28.1 | 21.8 |
9.5  | 70.4 | 20.1

Alpine ski: blue
Snowboard: red
Skiboard: green

copyright: www.ski-injury.com
Major sports

USA 2009/10 season
59.7 million visits