How can injury surveillance inform advances in sport safety: The case of Alpine skiing

Professor Wayne Derman MBChB, PhD, FFIMS
Stellenbosch University
Developing injury prevention programs?

Step 1
Quantify the problem:
Incidence
Severity

Step 2
Establish the aetiology
and mechanism of injury

Step 3
Introduce a preventive measure

Step 4
Assess it effectiveness

Sports Injury Prevention Example

Welcome back!
Thank you for your ongoing commitment to this project. If you experience any problems with data entry please contact us.

**Step 1:** Select one of the three options below.
- Record an INJURY for the team today (or on the date selected below)
- Record an ILLNESS for the team today (or on the date selected below)
- No Injuries or Illnesses are recorded for the team today (or on the date selected below)

**Step 2:** Click on the date in the calendar below on which you wish to report an injury or illness.

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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<tbody>
<tr>
<td>August 2012</td>
<td>20</td>
<td>21</td>
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<td>26</td>
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<td></td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>26</td>
<td>26</td>
<td>31</td>
<td></td>
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<td>September 2012</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tr>
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<td></td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

**Key**
- Red: Data INCOMPLETE (past days)
- Yellow: Data INCOMPLETE (today)
- Green: Data COMPLETE
- Grey: Future days
Illness and injury in athletes during the competition period at the London 2012 Paralympic Games: development and implementation of a web-based surveillance system (WEB-ISS) for team medical staff

Wayne Derman,1,2 Martin Schwellin,3,4 Esmé Jordaan,3 Cheri A Blauwet,4,5 Carolyn Emery,6,7 Pia Pit-Grosheide,5 Norma-Angelica Patino-Morgues,5,6 Olivo Martinez-Ferrer,5,9 Jaap Stomphorst,10,11 Peter Van de Vliet,5,11 Nick Webborn,12 Stuart E Willick13

The incidence and patterns of illness at the Sochi 2014 Winter Paralympic Games: a prospective cohort study of 6564 athlete days

W Derman,1,2,3 M P Schwellin,3,4,5 E Jordaan,3 P Runciman,1 P Van de Vliet,5 C Blauwet,7 N Webborn,8 S Willick,9 J Stomphorst10

ILLNESS proportion (%) and ILLNESS rate (/1000 athlete days)

<table>
<thead>
<tr>
<th></th>
<th>Summer Olympics</th>
<th>Summer Paralympics</th>
<th>Winter Paralympics</th>
<th>Winter Olympics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness proportion (%)</td>
<td>7</td>
<td>15.1</td>
<td>17.4</td>
<td>8</td>
</tr>
<tr>
<td>Illness rate (/1000 athlete days)</td>
<td>5.2</td>
<td>13.2</td>
<td>18.7</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Summer Olympics</th>
<th>Summer Paralympics</th>
<th>Winter Paralympics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury proportion (%)</td>
<td>11</td>
<td>15</td>
<td>29.3</td>
</tr>
<tr>
<td>Injury rate (/1000 athlete days)</td>
<td>9.2</td>
<td>12.7</td>
<td>24.4</td>
</tr>
</tbody>
</table>
High precompetition injury rate dominates the injury profile at the Rio 2016 Summer Paralympic Games: a prospective cohort study of 51 198 athlete days

Wayne Derman,1,2 Phoebe Runciman,1,2 Martin Schwellnus,2,3 Esme Jordaan,4 Cheri Blauwet,5 Nick Webborn,6 Jan Lexell,7,8,9 Peter van de Vliet,10 Yetso Tuakli-Wosornu,11 James Kissick,12 Jaap Stomphorst13

- A total of 510 injuries recorded
- Incidence rate: 10.0/1000 athlete-days
  - Team physician with delegation of 100 athletes can expect to see 10 injuries over 10 days
- 12.1% of all athletes at the Games encountered an injury

(Willick et al, BJSM 2013)
Results

- Countries: 45 \( \frac{34}{45} = 71.2\% \)
- Participating athletes: 547 (516 on WEB-IISS) of the athletes \( 94.3\% \) of athletes
- Compliance: 100% participating countries

<table>
<thead>
<tr>
<th></th>
<th>Number of athletes</th>
<th>Athlete days</th>
</tr>
</thead>
<tbody>
<tr>
<td>All athletes</td>
<td>547</td>
<td>6564</td>
</tr>
<tr>
<td>Alpine / snowboard</td>
<td>219</td>
<td>2628</td>
</tr>
<tr>
<td>Cross country/bi-athlon</td>
<td>149</td>
<td>1788</td>
</tr>
<tr>
<td>Ice sledge hockey</td>
<td>129</td>
<td>1548</td>
</tr>
<tr>
<td>Curling</td>
<td>50</td>
<td>600</td>
</tr>
</tbody>
</table>

Derman W, Schwellnus M, Jordaan E, Runciman P et al., BJSM, (50); 2016
High incidence of injury at the SOCHI 2014 Winter Paralympic Games: a prospective cohort study of 6564 athlete days

- 174 injuries
- 134 athletes injured
- 24.5% of athletes sustained an injury

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>IP (%) athletes</th>
<th>IR (per 1000 athlete days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All injuries</td>
<td>174</td>
<td>24.5%</td>
<td>26.5</td>
</tr>
<tr>
<td>Alpine / Snowboard</td>
<td>108</td>
<td>37.0%</td>
<td>41.1</td>
</tr>
<tr>
<td>Ice sledge hockey</td>
<td>41</td>
<td>24.0%</td>
<td>26.5</td>
</tr>
<tr>
<td>Wheelchair curling</td>
<td>10</td>
<td>14.0%</td>
<td>16.7</td>
</tr>
<tr>
<td>Bi-athlon / Cross country</td>
<td>15</td>
<td>10.1%</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Derman W, Schwellnus M, Jordaan E, Runciman P et al., BJSM, (50); 2016
Mitigating risk of injury in alpine skiing in the Pyeongchang 2018 Paralympic Winter Games: the time is now!

Wayne Derman,1,2 Cheri Blauwet,3 Nick Webborn,4 Martin Schwellnus,2,5 Peter Van de Vliet,6 Dimitrije Lazarovski6

Figure 1 Injury incidence rate (IR) in Para alpine skiing at the Sochi 2014 Paralympic Winter Games.
Mitigating risk of injury in alpine skiing in the Pyeongchang 2018 Paralympic Winter Games: the time is now!

Wayne Derman,¹,² Cheri Blauwet,³ Nick Webborn,⁴ Martin Schwellnus,²,⁵ Peter Van de Vliet,⁶ Dimitrije Lazarovski⁶

<table>
<thead>
<tr>
<th>Event</th>
<th>Course segment</th>
<th>Upper part of course (IR 15.9)</th>
<th>Lower part of course (IR 10.2)</th>
<th>Finish area (IR 4.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downhill (21 injuries, IR 39.7)</td>
<td></td>
<td>13/8 DNF</td>
<td>5/3 DNF</td>
<td>3/1 DNF</td>
</tr>
<tr>
<td>Super G (7 injuries, IR 7.3)</td>
<td></td>
<td>3/2 DNF</td>
<td>2/2 DNF</td>
<td>2/2 DNF</td>
</tr>
<tr>
<td>Combined (6 injuries, IR 7.4)</td>
<td></td>
<td>3/1 DNF</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Giant slalom (4 injuries, IR 2.9)</td>
<td></td>
<td>2/1 DNF</td>
<td>2/1 DNF</td>
<td></td>
</tr>
<tr>
<td>Slalom (8 injuries, IR 6.0)</td>
<td></td>
<td>4/2 DNF</td>
<td>4/1 DNF</td>
<td></td>
</tr>
</tbody>
</table>

DNF, did not finish; IR, injury rate (injuries/1000 athlete-days).
Mitigating risk of injury in alpine skiing in the Pyeongchang 2018 Paralympic Winter Games: the time is now!

Wayne Derman,¹,² Cheri Blauwet,³ Nick Webborn,⁴ Martin Schwellnus,²,⁵ Peter Van de Vliet,⁶ Dimitrije Lazarovski⁶

- Amputation/limb deficiency: no info - snow conditions – loss of control
- Spinal Cord Injury
  Loss of control – snow conditions
- Visual Impairment
  collided with safety nets – snow conditions
Environment
**Course Setting**

- **Wide (w)**: > 28 m
- **Medium (m)**: 26-28 m
- **Narrow (n)**: ≤ 26 m
- **Sinuous (si)**: > 6.3 m
- **Straight (st)**: ≤ 6.3 m

**Steepness**

- **Steep**: ≥ 18.9°
- **Medium**: 13.5-18.9°
- **Flat**: < 13.5°
So what about Pyeongchang?: Steps Taken

- Increase in number of training runs esp downhill. Earlier start times in the day to take advantage of more optimal snow conditions.
- The Alpine venue allows for a more optimal start location on the course avoiding steep grades in response to previously reported high injury risks on steep sections in Sochi.
- Based on experiences during the 2017 test event, the course design will be widened, given that narrow courses are associated with tighter turns and by inference higher incidence of injury. This 2017 course setting has been accurately replicated through GPS methodology.
- The course design and preparation includes ‘waves’ as opposed to jumps—a particularly high-risk manoeuvre for Paralympic monoskiers.
- Members of the IPC Medical Committee will be in constant radio communication with the race officials to understand race conditions and race facts in real time.
- Official pre-Games technical and medical briefings will include an education programme for team medical and coaching staff.
- Appointment of an independent race director, who will facilitate an independent view regarding safety issues and will have the final call to amend start times, postpone or cancel an event if the conditions are deemed too hazardous.
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International Paralympic Committee

THANK YOU FOR YOUR ATTENTION