PARALYMPIC ATHLETES COMPETING IN EXTREME CONDITIONS

2010 – NPC Team Physician Conference

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Overview

- Trauma and Injury patterns and rates
- Resuscitation issues
- Altitude
- Cold exposure
Injury Epidemiology

- Limited data compared with able-bodied athletic injuries
- 2002 Salt Lake Paralympic Injury survey
- 2006 Torino Paralympic Injury survey
- Non-scientific survey of Canada athletes

- Similar overall sport medicine and trauma injuries as in able-bodied alpine
## Games Comparison

<table>
<thead>
<tr>
<th></th>
<th>Alpine Skiing</th>
<th>Nordic Skiing</th>
<th>Sledge Hockey</th>
<th>Wheelchair Curling</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salt Lake</strong></td>
<td>194 (12%)</td>
<td>134 (3%)</td>
<td>88 (14%)</td>
<td>-</td>
<td>416</td>
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<tr>
<td><strong>Torino</strong></td>
<td>190 (12%)</td>
<td>132 (4%)</td>
<td>132 (11%)</td>
<td>40</td>
<td>474</td>
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### Overall Injury Rate

- **Salt Lake**: 9% (12%)
- **Torino**: 8% (11%)

Salt Lake 2002 Paralympics

- Amongst all Paralympic athletes most common diagnoses were:
  - Sprains (32%)
  - Fractures (21%)
  - Strains and lacerations (14% each)
- Amongst Para-Alpine athletes:
  - Upper extremity injury 33%
  - Lower extremity injury 38%
Within Para-alpine:

- 78% acute traumatic injury
- 22% overuse or chronic injury
- 53% upper extremity, 80% were sit skiers
- 26% lower extremity, all standing

Altitude

- High alt 1500-3500m - very high 3500-5500m

- Normal response to altitude and hypoxia
  - Increased ventilation
  - SOB on exertion
  - Altered breathing at night – secondary to low levels of CO2
  - Diuresis
  - Disturbed sleep
Altitude

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Acute Mountain Sickness

- Due lack of acclimatization to hypoxia
- Ideal altitude is the altitude you last slept
- Above this is a zone altitude to which your body can tolerate the increased hypoxia
- Above this zone the body is not able to compensate for the hypoxia strain
- Develop - acute mountain sickness
Acute Mountain Sickness

- Above 2500 m with the following-
  - Headache
  - Loss of appetite, nausea, or vomiting
  - Fatigue or weakness
  - Dizziness or light-headedness
  - Difficulty sleeping

- AKA BAD HANGOVER

- If you feel unwell and there is no other reason you probably have AMS
Who is at risk

- Anyone - genetic, rate of accent

- Avoid things that will suppress respiration
  - Alcohol
  - Narcotics
  - Sleeping pills

- Can consider prophylaxis with Diamox if regularly get AMS or if ascent rapid
Treatment

- Supportive
- Rest (don’t go higher and decrease O₂ demands)
- Fluids
- NSAIDS
- O₂
- If symptoms more severe
  - Diamox – Acetozolamide
Logistics and Terrain
Just getting there can be risky

TRAVEL
POTABLE WATER
3419 meters

HIGH ELEVATION
ROUGH TERRAIN
Light or UV Exposure

- High altitude
- Reflective surface for nordic and alpine
- UV Keratitis
- Need proper eye wear protection
Cold Exposure

- Cold injury
- Exercise and cold induced bronchospasm
- Hypothermia
  - Weather, clothing, hydration, hypoglycemia
  - Athlete factors – fat composition, muscle mass, SCI– impaired thermoregulation
Hypothermia

- Prevention is key!
- Follow the C-O-L-D clothing principle:
  - Clean
  - Open – when exercising to reduce sweating/wetness
  - Loose/Layers – to retain heat
  - Dry – to limit conductive heat loss
Para Alpine Medical Issues

SIT SKIERS

- Acute and Chronic neck and arm injuries are very common
- Hard to rest!
- Pressure sores or Sit wounds (travel)
Para Alpine Medical Issues

SIT SKIERS

- Bowel and bladder
  - Most athletes volume restrict during training days
  - Timing of bowel care can be an issue

- Autonomic Dysreflexia – less of an issue as athletes on most teams below T6 for alpine
Para Alpine Medical Issues

STANDING SKIERS

- Chronic Musculoskeletal problems
  - Asymmetric gait
  - Overuse problems
  - Neurologic patterning

- Acute Musculoskeletal injuries similar to able bodied:
  - knee, hip, shoulder, back, neck
  - Concussion

- Residual limb hygiene
Para Alpine Medical Issues

VISUALLY IMPAIRED

- 100% injured 2008/9
- 75% > out for >1 month
- Rate of injury highest

- Causes? – multiple concussions, balance impairment, knee and ankle injuries
Canadian - Injury Patterns 2009-10

- 69% = 9/13 athletes injured
- 23% = 3/13 athletes injured > 1 month
- Total of 14 months off snow and competition
  - Concussion, Rotator cuff, pressure – on hill
  - Pressure sore, hip fracture – off hill
On-hill Dx and Management

- Assessment of insensate athletes with careful 2* survey
- Sit-skier extraction
- Mindful environmental exposure
- Volume resuscitation (especially sit-skier)
Conclusion

- Paralympic winter athletes compete in adverse conditions and are at risk of-
  - Cold exposure or injury
  - Altitude sickness but no more than able bodied athlete
  - High rates of injury in sports like alpine and sledge hockey
    - 12% athletes at major games and the majority of team over a season (69%)
- High index of suspicion for injury in insensate athlete
Thank-you!

Acknowledgements:
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