Australian Ski Patrol Models of Casualty Care, Medication Administration and our Medical Milieu.

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Presentation Outline

- Australian Ski Resort ‘Models of Care’ for casualties;
- Ski Patrol medication administration;
- The ASPA Medical Advisory Committee;
- Links with the Australian Resuscitation Council; and
- Snowsports research in Australia.

Ski Patrol 'Models of Care'

- Large Resorts:
  - Victoria:
    - Mt Buller (Downhill)
    - Falls Creek (Downhill/X-C)
    - Mt Hotham (Downhill)
  - New South Wales:
    - Thredbo (Downhill)
    - Perisher Blue (Downhill)

Ski Patrol 'Models of Care'

- Larger resorts:
  - Medical Centre with 24 hour service (local rural GPs and locum doctors);
  - Nursing and Radiology services; and
  - Ambulance Station;
- These GPs are usually highly experienced at managing emergencies and many have a sub-specialty as a 'GP anaesthetist';
- 'Locum doctors' are often emergency medicine or anaesthetic doctors; and

Ski Patrol 'Models of Care'

- In the larger resorts ski patrollers primarily adopt a "scoop and run" approach and deliver casualties to the Medical Centre for definitive care.

Ski Patrol 'Models of Care'

- 'Blended model': *Mt Baw Baw* (Victoria):
  - Mt Baw Baw is a smaller resort (downhill and X-C);
  - It has a 'First Aid Centre';
  - Paid patrollers work during the week and a combination of paid and volunteer patrollers cover the weekends;
  - Most weekends a volunteer doctor (GPs and emergency doctors) will come up to the mountain to provide support to the patrollers; and
  - A successful pilot program was initiated in 2013 to station an ambulance crew up at the mountain during the weekends of the peak period of the winter season.

Ski Patrol 'Models of Care'

- Smaller Resorts:
  - Victoria:
    - Mt Baw Baw (Downhill/X-C)
    - Lake Mountain (X-C)
    - Mt Stirling (X-C)
    - Mt St Gwinear (X-C)
  - New South Wales:
    - Mt Selwyn (Downhill)
    - Charlotte Pass (Downhill)
  - Tasmania:
    - Ben Lomond (Downhill)
    - Mt Mawson (Downhill)

Ski Patrol 'Models of Care'

- Smaller Resorts:
  - In general, no regular medical or ambulance presence;
  - Long waits for ambulance attendance (in general from around 45 minutes to several hours);
  - Ski patrollers must care for casualties for extended periods (increased responsibility for casualty care);
  - Although prompt packaging and evacuation to the patrol base or first aid centre is still best practice, these patrollers have no option other than to "stay and play" in terms of caring for the casualty; and

Ski Patrol 'Models of Care'

- This need for extended care was a driving force in establishing an extended skill set for medication administration beyond that of a general first aid responder.

Interesting Facts

- Ski patrollers in Australia come from a wide variety of backgrounds;

- The health professions are well-represented, including:
  - Doctors;
  - Nurses;
  - Paramedics; and
  - Allied Health e.g., Optometry, Physiotherapy;

Interesting Facts

- Quite a few people have been inspired by their work as ski patrollers to become professional paramedics;

- Being a health professional does not necessarily entitle you to any extended scope of practice over and above that of a qualified ski patroller;

Interesting Facts

- Under Australian drugs and poisons law, doctors can carry and administer emergency medications as they see fit in a particular situation;

- However, registered nurses and paramedics draw their scope of practice from their employment and the clinical practice guidelines of their employer so they do not have any independent right to carry and administer medications;

Interesting Facts

- Therefore non-medical health professionals are bound by the same protocols as other ski patrollers; and

- In general doctors who are also ski patrollers will adopt and follow ski patrol protocols when on duty and will only use their “special skills” where a particular situation warrants this.

Medications Scope of Practice

- Ski patrollers may provide to a casualty:
  - *Oxygen*;
  - *Methoxyflurane* (Penthrane/Penthrox); and
  - *Entonox* (50% nitrous oxide/50% oxygen).

- Patrollers must recertify their competency to use these substances on an annual basis.

Medications Scope of Practice

- Patrollers may assist a casualty with administration of:
  - Salbutamol (or other) inhaler/spacer;
  - Epi-Pen or AnaPen;
  - Glucose-containing substances; and
  - The casualty's own medications e.g., GTN.

- With prior authorization, aspirin may be administered for a suspected acute myocardial infarction.

Ski Patrol Medications

Oxygen

Presentation	• High pressure black cylinder with white shoulder • **C** cylinder - 440 litres
Indications for use	• Treatment of hypoxia/hypoxaemia • To assist organ oxygenation in patients with injury or illness
Contraindications	• Nil of significance for the above indications
Precautions	• Beware of fire or explosive hazards, oils and grease
Dose/route	For immediate use: • Via face mask at 8 lpm: moderate concentration (40% - 60%) • Via Bag Valve Mask device with reservoir bag at 8 - 15 lpm: high concentration (60% - 95%) For longer term use and also allows for other procedures (e.g. pain relief): • Via nasal cannula at 3 lpm
Side effects	• Drying of the mucous membranes of the upper airway

Ski Patrol Medications

- *Methoxyflurane* (Penthrane/Penthrox):
  - Methoxyflurane was originally used as an anaesthetic agent in the 1960s and 70s and was noted to have good analgesic (pain relieving) qualities;
  - It is no longer used in anaesthetics but is still useful in the first aid setting;
  - The inhaler is self-administered by the casualty;

Ski Patrol Medications

- *Methoxyflurane* (Penthrane/Penthrox):
  - Methoxyflurane is a liquid but volatile inhalational agent;
  - 'Volatile' means that it spontaneously forms a vapour;
  - This vapour is inhaled, and the agent is absorbed by the lungs into the blood and is transported to the brain, where it acts as an analgesic.

Ski Patrol Medications

Methoxyflurane (Penthrane)	
Presentation	• 3 ml glass bottle with plastic seal
Indications for use	• Pre-hospital pain relief
Contraindications	• Pre-existing kidney disease • Exceeding total dose of 6 ml in any 24 hour period • Lowered level of consciousness (or if the casualty is unable to understand the instructions)
Precautions	• Pregnancy • Penthrox inhaler must be held by patient so that if unconsciousness occurs it will fall from patient's face • Patient must be supervised at all times during Methoxyflurane administration
Dose/route	• 3 ml via Penthrox inhaler. This will provide approximately 25 minutes of pain relief and may be followed by one further dose once the original dose has expired, if required.
Side effects	• Drowsiness • Exceeding maximum total dose of 6 ml in 24 hour period may lead to kidney damage
Special notes	• Analgesia commences after 8 - 10 breaths and lasts for approximately 3 - 5 minutes once discontinued • Concurrent administration of Oxygen 3 - 8 lpm through the inhaler during use is recommended where appropriate

Ski Patrol Medications

- *Methoxyflurane*:
  - ASPA-qualified ski patrollers normally carry and administer Methoxyflurane on scene to casualties, who are then stabilised and transported to either the medical centre, first aid room or a location where handover to ambulance personnel is possible.

Ski Patrol Medications

Entonox (Nitrous oxide and oxygen)

Presentation	• High pressure blue cylinder with white and blue quadrant shoulder (contains 50% nitrous oxide and 50% oxygen) • **C** cylinder - 440 litres
Indications for use	• Ongoing pain management
Contraindications	• Chest injuries (tension pneumothorax) • Lowered level of consciousness (or if the casualty is unable to understand the instructions)
Precautions	• Check cylinder before use: no damage, correct colour, intact heat tab • Beware of fire or explosive hazards, oils and grease
Dose/route	• Via demand valve mask
Side effects	• Nausea • Drowsiness
Special notes	• At temperatures below -7°C the gases in the cylinder may separate. Therefore, the cylinder must be stored in a warm place. When used in the snow, the cylinder must be laid on its side and well insulated. The separation of components can be prevented from occurring by shaking the cylinder before use.

Ski Patrol Medications

- *Entonox*:
  - Due to issues around storage and transportation, in general, Entonox is used as a ‘second-line’ agent in the first aid room or other location (according to local protocols) to manage only those casualties that require further pain relief beyond the limits of other drug and supportive methods, and where a delay is expected before ambulance handover can be effected.

Assisted Administration

- Salbutamol (or other inhaler) with a spacer as per protocol for acute asthma.

Assisted Administration

- Asthma metered-dose inhalers are normally a prescribed medication, but salbutamol inhalers (Ventolin) can also be bought from a pharmacy (chemist/drugstore) “over the counter” at a higher price; and

- It is permitted to carry a ‘generic’ salbutamol inhaler in a first aid kit so patrols have the option to stock ‘a spare’ in case someone with known asthma is not carrying an inhaler.

Assisted Administration

- Epi-Pen or Ana-Pen (adrenaline/epinephrine auto-injector device) as per protocol for suspected anaphylaxis.

Assisted Administration

- Adrenaline/epinephrine auto-injectors are normally a prescribed medication, but these can also be bought from a pharmacy (chemist/drugstore) “over the counter” at a higher price; and

- It is permitted to carry a ‘generic’ adrenaline auto-injector in a first aid kit so patrols have the option to have ‘a spare’ in case someone with known allergies is not carrying an Epi-Pen or a casualty with a severe anaphylactic reaction requires a second dose of adrenaline.

Assisted Administration

- Glucose-containing substances for suspected (or detected) hypoglycaemia in a conscious casualty.

Assisted Administration

- The casualty's own medications, e.g., Glyceryl Trinitrate for angina or acute myocardial infarction.


Medications Scope of Practice

- In the case of a suspected acute myocardial infarction, after first contacting a medical advice provider for authorisation, patrollers may administer prophylactic dispersible aspirin 300mg to a casualty;

- This is a recommendation of the Australian Resuscitation Council as early administration of aspirin has been shown to improve survival; and

- Prior to administration, patrollers must first check for relevant allergies and contraindications.

Legal Framework

- Under Australian drugs and poisons legislation, both Entonox (nitrous oxide/oxygen) and Methoxyflurane (Penthrane/Penthrox) are classed as Schedule 4 (Restricted Substances) (“S4”)drugs;

- As a result there are restrictions on purchase, carriage, access to and administration of these drugs;

- Entonox and Methoxyflurane must be kept in a secured cabinet in the ski resort First Aid facility, under a separate key that is held by suitably qualified staff;

Legal Framework

- The authorised person will hold responsibility for the security of all stock, the allocation and recording of any drugs from the secured cabinet, the recording of all use, and the return of all used and unused stock at the finish of the season;
- All S4 drugs must be regularly checked for expiry, volume and signs of tampering, with the results recorded in a register;
- All usage must be recorded in the register as well as in the casualty records; and
- Only a suitably approved form may be used for this register, which must be available for inspection (audit) at all times.

Legal Framework

- The legislation providing specific authority for ski patrollers to administer Entonox and Methoxyflurane differs between States in Australia.

Legal Framework - Victoria

- In Victoria, the *Drugs, Poisons and Controlled Substances Regulations 2006* apply.
  - "The Secretary has given approval in general for an Australian Ski Patrol Association Inc. qualified ski patroller to be in possession of the following Schedule 4 Poisons and administer them to persons in the performance of his or her duties for the treatment of emergencies:
    - Methoxyflurane
    - Nitrous oxide".

Legal Framework - NSW

- In New South Wales, authority is provided by the *Poisons and Therapeutic Goods Regulation 2008*:
  - Schedule 98 - 14 Ski rescue:
    - "A ski patroller who holds a valid first aid certificate issued by the Australian Ski Patrol Association for use in ski patrol duties is authorised to possess and use methoxyflurane, nitrous oxide if required for use in connection with the carrying out of ski rescues".

Legal Framework - Tasmania

- In Tasmania, 'Division 5A – Possession and supply of nitrous oxide and methoxyflurane' of the *Poisons Regulations 2008* deals generally with use of these substances by first aiders in a workplace.

ASPA Medical Advisory Committee

- The ASPA MAC is a group of volunteer doctors with over-arching responsibility for:
  - The content of the ASPA Advanced Emergency Care Manual and Course curriculum (including regular reviews and updates);
  - Keeping patrollers and their educators ‘up-to-date’; and
  - Reviewing areas of ski patrol practice which are identified as being of concern or contentious (and issuing new or updated practice guidelines as appropriate).

Members of the ASPA MAC

- Currently six active members (including the Chair);
- The Chair is a “first amongst equals” and acts both as coordinator for the Committee and liaison person with the ASPA Executive Committee and Education Committee;
- The current Chair is also Chief Editor for the ASPA Advanced Emergency Care Manual and chief medical writer for practice guidelines;

Members of the ASPA MAC

- All members have a strong interest in wilderness and pre-hospital medicine;
- All members are encouraged to contribute to MAC's activities, such as the recent comprehensive update of the ASPA Advanced Emergency Care Manual (340 pages);
- MAC aims for consensus decisions following open discussion;

Members of the ASPA MAC

- Four members are also active patrollers;
- Five members act as Honorary Medical Officers for patrols in Victoria, NSW and Tasmania;
- Two specialist anaesthetists and two members with GP Anaesthetist qualifications; and
- Other backgrounds include rural and urban general practice, emergency medicine, sports medicine and paediatrics.

The Australian Resuscitation Council

- ASPA regards the Australian Resuscitation Council Guidelines as the “gold standard” for its first aid practices;

- Both the ASPA Advanced Emergency Care Course and Manual are updated (usually annually) when there are changes to the ARC Guidelines;

The Australian Resuscitation Council

- The current Chair of the MAC has been a member of the ARC Victorian Branch for several years;

- This provides enhanced awareness of developments, updates and discussions in relation to resuscitation and first aid practices; and

- The MAC Chair is able to act as a liaison point between the ARC and ASPA to assist in keeping ASPA's first aid practices 'up-to-date'.

A final word about research …

- Australia lags behind many other nations in terms of undertaking and publishing research related to snowsports;
- There are multiple challenges relating to:
  - Lack of:
    - Standardised data collection sheets;
    - A standardised ‘data set’ for classifying and analyzing injuries; and
    - A national database for snowsports injuries;

A final word about research …

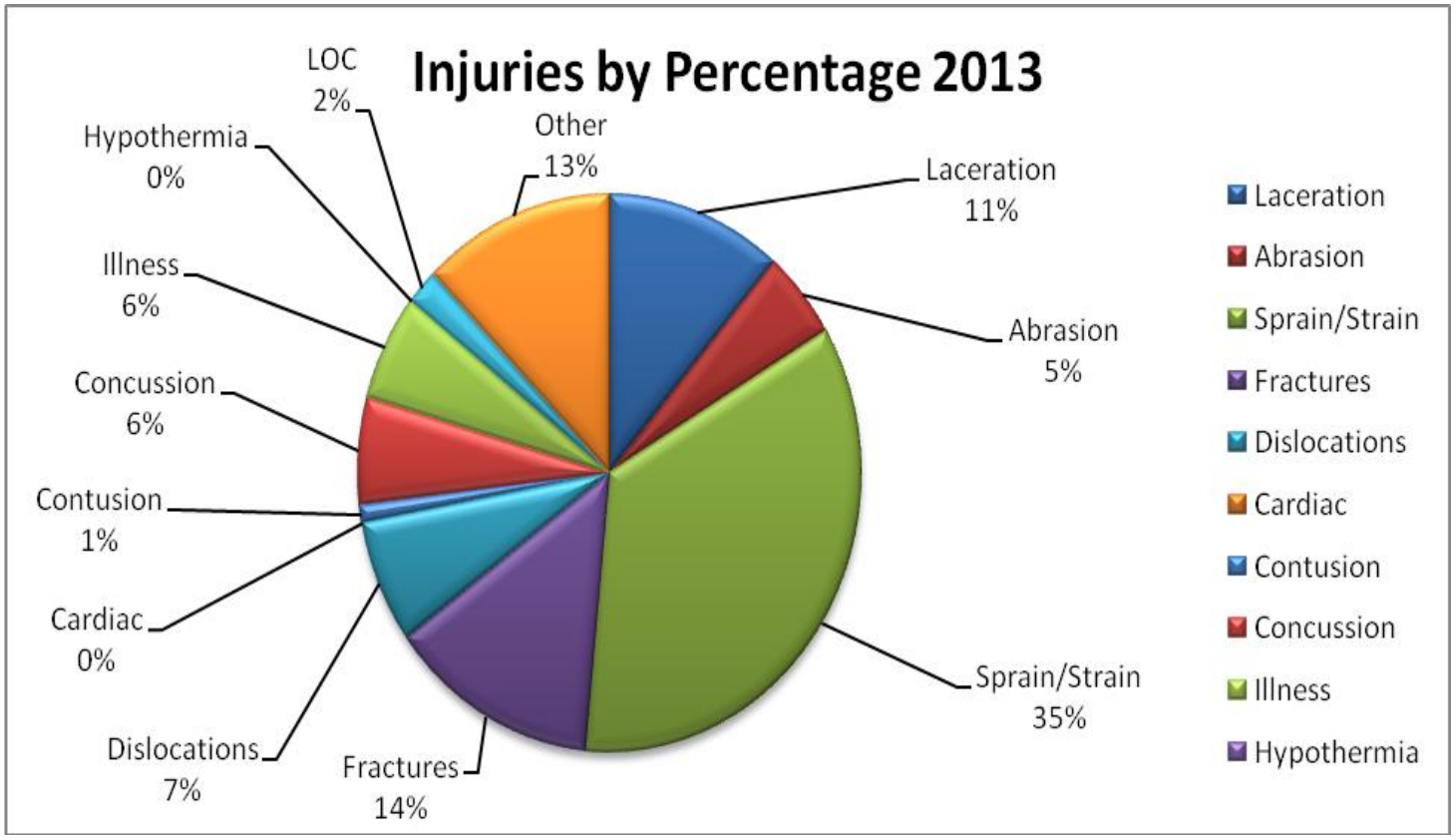
- (Anecdotally) there is a reluctance of resorts to release data as the public may see snowsports as ‘dangerous’;
- Lack of funding for research:
  - Two key reasons identified for lack of success in obtaining funding are:
    - The perception of snowsports as an elitist and expensive minority pursuit; and
    - As it is not a mainstream emergency service, ski patrol has struggled for recognition and inclusion ‘in the club’.

Some information is 'in the public domain': Victorian Ski Resort Demographics 2010

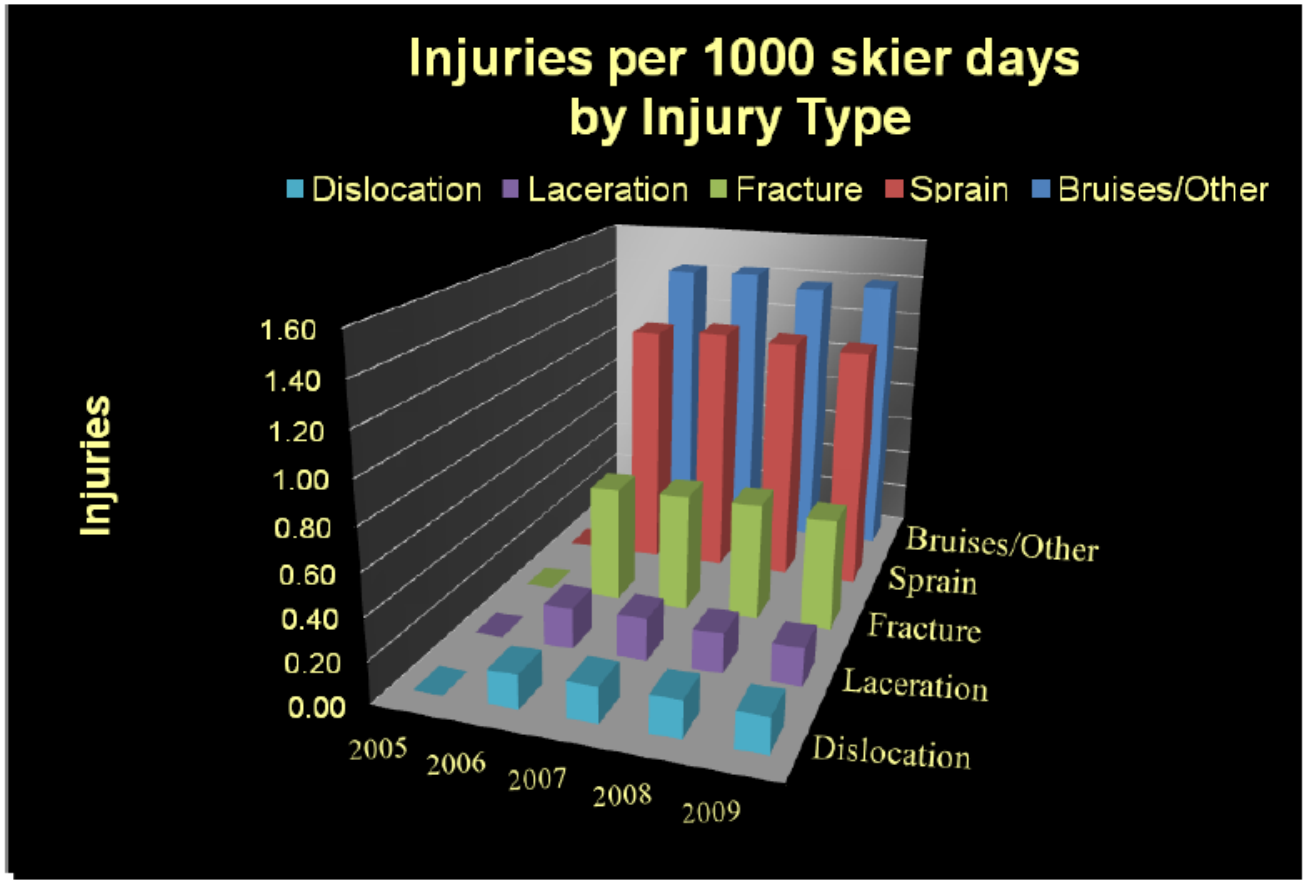
- 86% of visitors under 50 years of age;
- 80% have an income over $35,000 p.a.;
- 85% speak only English at home;
- 86% are White or Caucasian;
- Most popular activities (ranked):
  - Downhill skiing;
  - Snowboarding;
  - Tobogganing;
  - Snowplay and sightseeing; and
  - Cross-country skiing;
- 33% first-timers or beginners, 67% intermediate and advanced; and
- 25% first or second visit; 75% 'frequent flyers'.

Approaching individual resorts

- Mt Baw Baw (Victoria)



The failed 'National Injury Survey' (2009)



Alpine Skiing and Snowboarding (2008)

Table 2 Type of Injury and Top Six Injury Locations – Percentage of Cases

	n	Alpine skiing *n* = 273	Snowboarding *n* = 250	Other *n* = 26	Total
			% of snowsport activity		
All injuries	549	49.7%	45.5%	4.7%	
Type of injury					
Bruise	55	9.2%	13.5%	11.5%	11.4%
Sprain	292	69.0%	51.8%	3.8%	60.6%
Laceration	23	2.9%	6.8%	46.2%	4.8%
Dislocation	37	9.2%	6.3%	3.8%	7.7%
Fracture	104	13.8%	29.3%	23.1%	21.6%
Other	38	10.0%	5.0%	3.8%	7.9%
			% of injury location		
Location (top 6)					
Knee	119	75.6%	20.2%	1.6%	21.7%
Shoulder	73	56.2%	42.5%	1.4%	13.3%
Wrist	65	12.3%	84.6%	3.0%	11.8%
Lower leg	34	58.8%	32.4%	8.8%	6.2%
Back / spine	33	24.2%	72.7%	3.0%	6.0%
Hand / finger	33	69.7%	27.3%	3.0%	6.0%

Tracey J. Dickson, Tonia Gray, Greg Downey, Jeni Saunders & Cath Newman. "Profiling Australian Snowsport Injuries: A Snapshot from the Snowy Mountains". *Journal of Sport & Tourism*, Vol. 13, No. 4, November 2008, pp. 273–295.

Alpine Skiing and Snowboarding (2008)

Table 3 Location of Injury and Type of Injury – Percent of Cases

	n	Bruise *n* = 55	Sprain *n* = 292	Laceration *n* = 23	Dislocation *n* = 37	Fracture *n* = 104	Other *n* = 38
				% of injury location			
Body location:							
Knee	119	2.5%	85.7%	0.8%	2.5%	0.8%	7.6%
Shoulder	73	1.4%	49.3%	0.0%	32.9%	8.2%	8.2%
Wrist	65	0.0%	32.3%	1.5%	0.0%	61.5%	4.6%
Lower leg	34	11.8%	38.2%	29.4%	0.0%	20.6%	0.0%
Back / spine	33	27.3%	57.6%	0.0%	0.0%	6.1%*	9.1%
Hand / finger	33	6.1%	36.4%	0.0%	21.2%	30.3%	6.1%

Tracey J. Dickson, Tonia Gray, Greg Downey, Jeni Saunders & Cath Newman. "Profiling Australian Snowsport Injuries: A Snapshot from the Snowy Mountains". *Journal of Sport & Tourism*, Vol. 13, No. 4, November 2008, pp. 273–295.

Alpine Skiing and X-C Skiing (1987-91)

Table 1: Comparison of injuries in alpine and cross-country skiing

Diagnosis	Skiing style		Body part	Skiing style		
	alpine %	cross-country %		alpine %	cross-country %	ratio (of alpine to cross-country)
Strain/sprain	42.7	42.9	Head/face/neck	9.5	5.9	1.6
Abrasion/bruise	23.4	17.7	Shoulder	7.7	10.1	0.8
Fracture	21.7	25.2	Hand/wrist/ arm/elbow	7.5	13.4	0.6
Laceration	5.0	7.6	Finger/thumb	17.0	10.9	1.6
Dislocation	2.6	5.0	Torso	7.8	10.1	0.8
Concussion/ head injury	2.6	1.7	Upper leg	1.7	0.8	2.1
All others	2.1	0.0	Knee	26.5	26.1	1.0
			Lower leg	11.2	4.2	2.7
			Ankle	9.0	11.8	0.8
			Foot/toe	2.1	6.7	0.3

Source of table: (Shealy and Miller, 1991)

Table 2: Comparison of alpine and cross-country skiing injuries in Australia

Type of injury	Alpine skiing %	Nordic skiing %	Body region	Alpine skiing %	Nordic skiing %
n	1545	88	n	1538	88
Sprain/twist	41	45	Head/face	16	9
Bruise	14	16	Shoulder	9	9
Fracture	15	19	Arm	9	18
Laceration	20	11	Thumb	7	8
Dislocation	6	5	Trunk/spine	7	5
Concussion	3	3	Leg	17	11
			Knee	31	25
			Ankle	4	15

Source: Sherry and Asquith, 1987

Limited conclusions from the literature: Common types of snowsports injuries

- Downhill skiing:
  - Knee ligament sprains, tears and ruptures (mainly ACL/MCL);
  - Tibia/fibula fractures;
  - Shoulder sprains and dislocations;
  - Humerus/clavicle fractures;
  - Hand and thumb injuries (use of ski poles);
  - Bruises/abrasions/lacerations; and
  - Head injuries e.g., falls and collisions (helmet usage is increasing).

Limited conclusions from the literature: Common types of snowsports injuries

- Snowboarding:
  - Wrist and scaphoid sprains/fractures (wrist guards are available);
  - Knee sprains (mainly ACL/MCL);
  - Shoulder sprains and dislocations;
  - Bruises/abrasions/lacerations; and
  - Head injuries e.g., falls and collisions (helmet usage is increasing).
- Cross-country skiing:
  - Knee and ankle sprains; and
  - Upper limb injuries.

Working in 'silos' – Data Collection projects

- For a long time the issue of standardised data collection, data set and national database has been of interest to ASPA;
- For several years the ASPA MAC Chair has been pursuing this project and attempting (unsuccessfully) to obtain funding for research into the topic;
- Contact has also been made with a research group which is in the process of developing exactly these tools for guided outdoor adventure activities and would be interested in collaborating with ski patrol;

Working in 'silos' – Data Collection projects

- Only recently became aware of the enormous amount of work that Duncan has put into developing his smartphone app;

- Also only recently became aware that Mt Baw Baw is planning to launch an iPad app for the 2014 season to collect incident report information and transmit it directly to the resort database; so …

- It appears that we have some work to do in terms of communicating on a national level but there are exciting things to talk about which will benefit us all.

Mt Kosciuszko is Australia’s highest mountain at 2,228m.