ISMM
International Society for Mountain Medicine

CANADIAN UPDATE WINTER, 2014-15

INSIDE THIS ISSUE:

Avalanches

Be aware:

- 95.6% survive partial burial.
- 91% of victims survive if extricated within the first 18 minutes of burial.
- In Canada, the cause of death is asphyxia in 66% of those involved in avalanches, trauma In 23%, both trauma and asphyxiation in 10% and hypothermia in 1%.
- Wetter snow pack may increase the chance of asphyxia and trees may contribute to trauma (felt to explain the difference in statistics between Canada and Switzerland). (Boyd, 2011)

Survival is dependent on:

- Avoidance - consideration of consequence of terrain
- Protection against trauma - helmet, backpack, releasable bindings, staying on snowmobile
- Protection against asphyxia - AvaLung, making an air pocket, swimming for the surface
- Early extrication - transceivers, probes, shovels, training
- Earlier rescue - communication - SPOT, hand-held ham radio, satellite phone
- Better clinical skills and medical treatment - at the scene, in trauma resuscitation and with ECMO for hypothermia

Airbag photo courtesy of www.avalancheresearch.ca

Airbags were designed to reduce the chance of critical burial by the principle of inverse segregation where larger particles are sorted toward the surface

A recent study by Haegli et al (Resuscitation 2014; 85: 1197-1203) showed:

- **Overall adjusted mortality was found to be 11% in those with inflated airbags and 22% in those without airbags**
- Overall adjusted mortality was 14% taking non-inflated airbags into account.
- **Non-inflation rate was 20%.**

- 60% of non-inflation was due to deployment failure by user.

- The remainder of failures were found to be due to maintenance errors (attachment of the canister), failure of the device (which usually led to changes by the company) and destruction in the event.

Question: Do deployment failures occur for the same reason that parachutists fail to deploy their reserve chute 11% of the time in main chute failures (ie stress-induced cognitive dysfunction)?

Resuscitation of Avalanche Victims

Benefit versus Risk

In 2010 in Circulation (122: S359-360) it was stated that **avalanche victims <u>unlikely</u> to survive (relates to chance of asphyxia)** are those:

-Buried >35 minutes in cardiac arrest with an obstructed airway on extrication

- Buried initially and in cardiac arrest with an obstructed airway on extrication and an initial core temperature of <32 C

- Buried initially and in cardiac arrest on extrication with an initial serum potassium of >8 mmol/L

Full resuscitative measures, including extracorporeal re-warming, are indicated for all other victims without evidence of an unsurvivable injury

Changes in Recommendations

Potassium in Hypothermia	**ALS Meds in Hypothermia**	**Defibrillation in Hypothermia**
High potassium is associated with asphyxia and poor survival . < 8 mmol/L continue care >12 mmol/L terminate resuscitation 8-12 mmol/L consider with other factors	*2010 ERC guidelines – no ALS drugs due to the increased risk of arrhythmia and frostbite and decreased drug metabolism *2010 AHA guidelines – use vasopressors *2013 ICAR MEDCOM – use vasopressors with rewarming	*2010 ERC guidelines - max 3 defibrillations at <30 C *2010 AHA guidelines - standard defibrillation while rewarming *2013 ICAR MEDCOM - standard defibrillation - delay more than 3 attempts until >30C - should not interrupt CPR

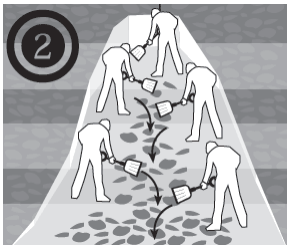
"Remember, the avalanche does not know that you are an expert."

Avalanche Dogs

V-Shaped Conveyor Belt Shoveling

The term was coined and developed in 2008 by Manuel Genswein and Ragnhild Eide.

The goal was to decrease rescuer fatigue, speed up extrication and allow a victim to be removed horizontally (rather than lifting the victim up through a vertical hole in the snow).



Development of D-shaped shovels by a variety of companies has made the technique more efficient.

Photo courtesy of ortovox.com

ABCDE once victim is found

#1 **Dig in from the side of the victim**

Is there an air pocket?

#2 **Expose the face**

Is the airway patent?

#3 **Establish an airway** if no spontaneous respiration

Depends on equipment available and skill level (endotracheal intubation, cricothyrotomy in trauma, supraglottic device, mouth-to-mask or bag-to-mask)

#4 **CPR**

#5 **ATLS**

Spinal stabilization
IV or Intraosseous cannulation
Chest decompression for pneumothorax
Thoracostomy
Hemorrhage control
Tourniquets in exanguinating limb injuries
Permissive hypotension in shock
Splinting
Analgesia

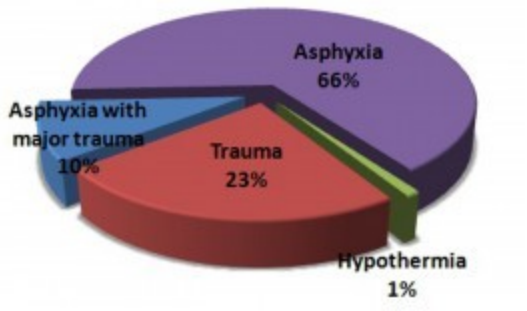


Diagram courtesy of avalancheresearch.ca

Air pocket, airway patency, short time of burial and rapid cooling are of the utmost importance in increasing chances of survival.

The Importance of the Crotch Strap

The fall 2014 edition of the CAA's, *The Avalanche Journal*, detailed the death of a skier in Revelstoke. It is believed that failure of use of the airbag crotch strap was a key factor in the skier's death.

"The deceased was near the surface with his airbag inflated and clearly visible from 100m away…. the airbag was lifted away from his back and above his head. This caused two serious problems. As the balloons and pack were pushed forward and downhill it lifted the pack, causing the chest strap to catch on his chin and impede his airway. Secondly, the buoyant airbag also pulled the victim's arms above his head, restricting movement and the ability to use hands to clear his own airway."

Some of the older airbags did not have a crotch strap or leg strap. Check yours.

Continuation of CPR?

In trauma:

- 5.6% survival in traumatic cardiac arrest
- CPR > 16 minutes is associated with poor outcome

Therefore, initiate CPR while looking for manageable cause

When to terminate CPR:

- Situation unsafe for rescuers
- Lethal trauma – decapitation, truncal transection
- Completely frozen body
- Valid DNR order
- Futile transport logistics
- Unwitnessed cardiac arrest after 20 min resuscitation with no ROSC, no shock advised by AED, asystole on ECG **and no hypothermia**

Photo courtesy of snowbrains.com

The Winter of 2014 - 2015

There were 12 reported incidents involving 13 people in Canada:

- 8 deaths; 5 injured

The activities in the incidents included :

- 8 backcountry skiing, 2 ice climbing, 2 snowmobiling

Future Considerations

2014 was the warmest year globally on record, with 5 months breaking records. March 2015 was also the warmest on record.

Question: Will global warming affect the likelihood of avalanches?
There will be bigger storms and more snow in some areas, less in others.
The temperature gradient will not be affected but seasonal patterns will change.

Changes to the 3 Avalanche Websites

Canadian Avalanche Association :

A new website was launched during the summer at a new address - www.avalancheassociation.ca. Staff email addresses changed to ...@avalancheassociation.ca.

The CAA's distinctive logo (affectionately called the boomers) was retained and there was no change in mandate with a continuing focus on supporting the professional avalanche community in Canada through training, industry & membership services.

Avalanche Canada (formerly the Canadian Avalanche Centre):

In the fall the CAC changed its name to Avalanche Canada and introduced a new logo and website.

Their website is at avalanche.ca. Their mandate is also unchanged, being a focus on public avalanche safety.

*It is Avalanche Canada who publish the Public Avalanche Forecasts

Avalanche Canada Foundation (formerly the Canadian Avalanche Foundation):

The Avalanche Canada Foundation is a federally registered charity that supports the work of Avalanche Canada.