Avalanche Rescue

ALPINE GUIDES

AVALANCHE RESCUE

nzski.com™ Mt Hutt™
canterbury new zealand

life as we know it!

Rescue

Westpac Trust
The On-Site Triage And Evacuation Of Avalanche Victims
De Quervain’s Mortality Curve

• 1945 to 1979 and 1979 to 1989
• 2,611 cases, buried at average 1.06 m
  - After 1 hour 30-40% of victims may still be alive
  - After 4 hours less than 10% of victims will survive
Observed Pathology

Not specific to the avalanche:

- **20% of initial deaths**
- **Traumatic in origin**
  - Skull
  - Chest
  - Abdomen
  - limbs
Specific to the avalanche:

• **Asphyxia**
  - 70-80% of fatalities
  - Compression
  - Obstruction
  - Trauma to respiratory system

• **Barotrauma (blast injury)**
  - Eardrums, pharynx and lungs

• **Hypothermia**

• **Frostbite**
Primary Survey......

- **Assess A B C D E**
- **Consider C spine injury**
- **Examine for signs of air pocket**
- **Examine airway for signs of obstruction eg ice/snow**
- **Exclude lethal injury**
• Look-Listen-Feel
• Look for airway compromise
• Listen for stridor or wheeze
• Assess work of breathing
• Count respiratory rate
• Auscultate for breath sounds
• Assess capillary refill time and pulse
• Assess conscious level - AVPU
• Measure core temperature
In the event of cardio-respiratory arrest......

- **Begin resuscitation immediately**
  - Intubate
  - Ventilate
  - External cardiac massage

- **Monitor**
  - ECG
  - Core temperature

- **Defibrillate** - max 3 times at 360J
Manage
-perform life saving manoeuvres

- Airway opening manoeuvres
- Consider suction for foreign bodies
- Consider surgical airway in extremis
- Administer warmed humidified oxygen
- Consider pneumothorax and de-compress
- Secure large bore IV access
- Administer warmed IV fluids (if available)
- Initiate pulse oximetry & other monitoring
### Staging of Hypothermia

<table>
<thead>
<tr>
<th>Stage</th>
<th>Condition</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clear Consciousness With Shivering</td>
<td>35 - 32</td>
</tr>
<tr>
<td>2</td>
<td>Impaired Consciousness Without Shivering</td>
<td>32 - 28</td>
</tr>
<tr>
<td>3</td>
<td>Unconsciousness</td>
<td>28 - 24</td>
</tr>
<tr>
<td>4</td>
<td>Apparent Death</td>
<td>24 - 15 ?</td>
</tr>
<tr>
<td>5</td>
<td>Death due to Irreversible Hypothermia</td>
<td>&lt; 15 ?</td>
</tr>
</tbody>
</table>
## Dead or Alive?

<table>
<thead>
<tr>
<th>STAGE 4</th>
<th>STAGE 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical findings:</strong></td>
<td>No vital signs</td>
</tr>
<tr>
<td><strong>Chest:</strong></td>
<td>Compressible</td>
</tr>
<tr>
<td><strong>Abdominal muscles:</strong></td>
<td>Pliable</td>
</tr>
<tr>
<td><strong>ECG:</strong></td>
<td>V fib or Asystole</td>
</tr>
<tr>
<td><strong>Core temperature:</strong></td>
<td>Above 15°Celsius (?)</td>
</tr>
<tr>
<td><strong>Serum Potassium:</strong></td>
<td>Below 12 mmol /l</td>
</tr>
</tbody>
</table>

*(in the nearest hospital)*
Triage Of Avalanche Victims With Asystole

- Obvious lethal injury
- Burial time greater than 45 mins
- Core temperature 32°C or greater
- Absence of air pocket
- Asystole

= DEATH ☠️
PRE-HOSPITAL TREATMENT

CIRCULATORY ACTIVITY

YES

WARM HUMIDIFIED AIR
42 C

NO

CARDIOPULMONARY RESUSCITATION

LIMITED MEDICATIONS

MASK

INTUBATION

MAX 3 ATTEMPTS DEFIBRILLATION
Evacuation......
Transport of the critically ill patient......

Remember the 5 Ps

- Planning
- Personnel
- Properties
- Procedures
- Passage
• Ensure optimum patient care during transport
  - Protocols
  - Precise timings
  - Communication between teams
  - Point of contact
    • preferably one individual
PERSONNEL...

- Doctor
- Paramedic
- Specialised ‘retrieval teams’
- Rescue personnel
- Appropriate aircrew
PROPERTIES...

- Dedicated equipment
- Appropriate to task
- Team skilled in its use
- Appropriate to environment
- Regularly maintained and checked
Specific Equipment

- **A**
  - Oro/ naso pharyngeal, Oro/ naso tracheal, ‘Difficult Airway’ kit
- **B**
  - Gas - warmed & humidified oxygen
  - Reservoir/ bag/valve/ mask
  - Ventilator & PEEP valves, capnography
  - Suction
  - Pleural Drainage
• **C**
  - Monitor/defibrillator
  - Pulse oximeter
  - BP measurement
  - IV Cannulae

• **D**
  - Drugs/IV fluids

• **Others**
  - NG Tubes / Urinary - Catheters
  - Rewarming kit

• **Patients Notes**

• **Spare equipment/ spare batteries**

• **Emergency Clothing/ Food/shelter for personnel**
PROCEDURES...

• **A**
  - airway secured and patent

• **B**
  - ventilation adequate and alarms set

• **C**
  - IV access adequate, drips secured and infusion pumps functioning if applicable

• **D**
  - drugs administered

• **Patient secured**
• **Vital signs charted**
• Transport team stood-to and receiving hospital notified

• Check and test all equipment

• Final preparations of patient

• Check baseline status of patient prior to transport
- Care of patient
- Care of staff
- Care of relatives/visitors/media etc
- Constant monitoring of patient’s condition
- Modality
  - Road, rotary or fixed wing
- Environment
  - Altitude
Factors to consider

- Minimise transfers to avoid VF
  - Aircraft extraction is most efficient
  - Monitor vital signs throughout flight
  - Ability to intervene if necessary

- Hospital with ICU and cardiothoracic surgery facility (bypass available)

- Communication between referring and receiving personnel
Hypothermia in an avalanche

- H 0 avalanched while ski-touring
- H+1 head freed from snow
- H+1hr 40 helicopter rescue team arrives
- H+2hr 40 admission to hospital - temp. = 19.6°C
- H+4hr 15 active re-warming by ecc
- H+15hr regained consciousness & extubated
- H+9 days discharged fit and well
Hypothermia in a crevasse

- H 0 fall of 10 m into crevasse
- H+15min rescue team arrives
- H+2hr loss of consciousness
- H+3hr15 recovered from crevasse
- H+4hr arrives at hospital
  - temp. = 17.1°C
- H+3 days regained consciousness & extubated
- H+8 days discharged and returns to school !!!
NOBODY RECOVERED HYPOTHERMIC FROM THE FIELD IS DEAD UNTIL THEY ARE WARM AND DEAD