Applicability of treatment recommendations in adverse environment

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Goals of modern pre-hospital emergency medicine:

- emergency physician to the patient
- early stabilisation of vital functions:
  - respiration
  - circulation
- Start of intensive care on the site of accident
- early fluid replacement
- sufficient analgesia
- quick transportation and optimised treatment in hospital
Is the concept of urban emergency medicine feasible in mountain rescue?

Is emergency medicine at all practicable in mountain rescue?
Limitations in mountain rescue missions

- **How much medical equipment is available in remote places?** (weight, volume)
- **Duration** of rescue mission
- **Extreme temperature**
  Electronic devices, silicon tubes, fluids freeze, tape fixations?....
- **Handling** during evacuation and rescue mission
- **Danger**
- **Useful indication** for emergency medicine interventions?
- **Evidence ??**
Best clinical practice ...
&
Treatment recommendations
Best clinical practice ...
&
Treatment recommendations

How can we apply evidence-based medicine in European mountain areas?
International Commission for Mountain Emergency Medicine (ICAR MEDCOM)
Official recommendations for issues of mountain rescue medicine, since 1996
ICAR Recommendations 1


ICAR Recommendations 2


Tomazin I, Kovacs T. **Medical Considerations in the Use of Helicopters in Mountain Rescue**. High Altitude Medicine & Biology 2003;4/4:479-83.


Hypothermia and Avalanche accidents

The Medical On-site Treatment of Hypothermia*
ICAR-MEDCOM Recommendation

BRUNO DURRER,¹ HERMANN BRUGGER,² and DAVID SYME³

On-Site Treatment of Avalanche Victims
ICAR-MEDCOM-Recommendation

HERMANN BRUGGER¹ and BRUNO DURRER²
Hypothermia, treatment algorithm

FIG. 2. Algorithm Hypothermia for Emergency Doctors and Professional Rescuers.
ASSESSMENT OF THE EXTRICATED PATIENT

Conscious?

Yes

Hypothermia I–II:
- Administer hot, sweet drinks
- Change clothing if practicable
- Transport to nearest hospital with intensive-care unit

No

Breathing?

Yes

Hypothermia III:
- Intubate, ventilate with warm humidified oxygen
- Transport to hospital with hypothermia experience or unit with cardiopulmonary bypass

No

Obvious fatal injuries?

Yes

Start CPR, intubate

Check burial time and/or core temperature

$\leq 35\text{ min and/or } \geq 32^\circ\text{C}$

Continue resuscitation; follow standard ACLS protocol

$>35\text{ min and/or } <32^\circ\text{C}$

Ventricular fibrillation

Asystole

No

Air pocket and free airway

Yes or uncertain

Hypothermia IV:
- Continue resuscitation
- VF: apply 3 DC shocks
- Transport to unit with cardiopulmonary bypass

Pronounce patient dead
Avalanche, treatment algorithm

ASSESSMENT OF THE EXTRICATED PATIENT

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Start CPR, intubate

Check burial time and/or core temperature

≤35 min and/or ≥32°C

Continue resuscitation; follow standard ACLS protocol

>35 min and/or <32°C

Ventricular fibrillation

ECG

Asystole

Air pocket and free airway

No

Pronounce patient dead

Yes or uncertain

Hypothermia IV:
- Continue resuscitation
- VF: apply 3 DC shocks
- Transport to unit with cardiopulmonary bypass*
ERC Guidelines 2010
Part 8d: hypothermia and avalanche burial

Free and unblocked airways!
Fluid Management

Fluid Management in Traumatic Shock: A Practical Approach for Mountain Rescue

Official Recommendations of the International Commission for Mountain Emergency Medicine (ICAR MEDCOM)

Günther Sumann,¹,² Peter Paal,² Peter Mair,² John Ellerton,³ Tore Dahlberg,⁴ Grégoire Zen-Ruffinen,⁵ Ken Zafren,⁶ and Hermann Brugger⁷

HAMB 2009
Volume resuscitation in the field?

- **FORCED VOLUME RESUSCITATION**
  “Immediate resuscitation“?  
  Aggressive volume resuscitation through several venous lines

- **NO prehospital VOLUME RESUSCITATION**
  “Delayed resuscitation“?  

- **Concept of „permissive Hypotension“?**  
  Infusion of small volumes  
  not in order to reach normal blood pressure
Algorithm for Fluid Management in Traumatic Shock in Mountain Rescue

**SUSPECTED TRAUMATIC SHOCK**
(hypotension + tachycardia or mechanism of injury)

- Safety first!
  - In case of danger
  - Rapid evacuation of patients & rescuers

- Check Airway, Breathing and Circulation
  - Ensure oxygenation
  - Control blood loss
  - Call helicopter
  - Administer oxygen
  - Administer bolus of 500-1000 ml fluid
  - Use large bore i.v. lines

- Severe Traumatic Brain or Spinal Injury
  (GCS < 9)*

  - **Yes**
    - Forced Fluid Resuscitation
      - Target SABP ≥ 110 mmHg
      - Liberal use of fluids
      - Consider vasopressors & hypertonic/hyperoncotic fluids

  - **No**
    - Permissive Hypotension
      - Target SABP of 90 mmHg**
      - Rapid evacuation
      - Restrictive use of fluids & vasopressors
      - Consider hypertonic/hyperoncotic fluids
      - Analgesics

- During transport
  - Re-evaluate Airway, Breathing and Circulation
  - Restabilize if deteriorates
  - Take the patient to an appropriate hospital
  - (Level I Trauma Center if possible)
Immobilization and splinting

Immobilization and Splinting in Mountain Rescue

Official Recommendations of the International Commission for Mountain Emergency Medicine, ICAR MEDCOM, Intended for Mountain Rescue First Responders, Physicians, and Rescue Organizations

John Ellerton,1,2 Iztok Tomazin I,2,3 Hermann Brugger,2 and Peter Paal2,4

HAMB 2009
Immobilization and splinting

- Vacuum mattress
- cervical collar
- external compression with pelvic fracture
- splintage of extremities fractures

Only in exceptional circumstances, where a time-critical injury or unsafe environment takes priority, should spinal immobilization not be performed prior to evacuation.
Are treatment recommendations practicable in adverse environment?
YES, they are …

BUT not always applicable!
Conclusion

YES, Treatment recommendations are practicable, when they consider the special conditions in mountain rescue

Recommendations present expert opinions and consensus, supported by some literature, but rarely RCTs. (low level of evidence)

BUT, in certain cases strong limitations
- bad weather
- danger
- difficult and long rescue procedures
Thank you for your attention!