CONSENSUS GUIDELINES ON MOUNTAIN EMERGENCY MEDICINE AND RISK REDUCTION

CONSENSUS GUIDELINES ON MOUNTAIN EMERGENCY MEDICINE AND RISK REDUCTION, First Edition. ISBN

Printed in Italy

Published by: *casa editrice stefanoni - lecco*

1st edition

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Editor:
Fidel Elsensohn, MD

Consensus Guidelines On Mountain Emergency Medicine And Risk Reduction

Attached CD-ROM with translations into the following languages:
English, French, German, Italian, Norwegian, Slovakian, Slovenian, Spanish, Swedish, Czech

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Cover illustrations: Rescue operation in the Dolomites, Italy. Mountain Rescue Service, provided by the Alpine Club of South Tyrol, archives Hermann Brugger

Acknowledgement

This publication has been generously funded by the Italian Mountain and Speleological Rescue Organisation CNSAS. We thank the President of the Italian Mountain Rescue Organisation, Armando Poli, for this support. The ICAR and UIAA Medical Commissions hope that this excellent help will set a good example to other institutions which will follow supporting similar initiatives in future. We thank Roberto Buccelli (Italy) as well for the help in formatting the papers, Dave Syme (Great Britain) and Ken Zafren (USA) for translations and language review.

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Icar Medical Commission

After a glance at the booklet printed now, my very first emotional reaction is: thanks for your friendship, dear members of the International Commission for Mountain Emergency Medicine of ICAR.

But friendship is not only emotion, it's a working style too. A true friendship allows big scientific fights among delegates of 24 countries without producing other casualties than some useless ideas and details left behind on the battlefield. All papers are true consensus statements which have been discussed and regularly many times updated before publication.

Initially, consensus papers about on–site medical procedures were published to establish international guidelines, which should protect ourselves regarding questions of liability. To me, this view still seems quite important because legal regulations and the style of medicalisation (physicians, paramedics) vary considerably from country to country.

There are many more procedures to discuss and many other consensus papers to produce – the commission won't lack of work. I'm very happy to see that the actual president is very well catalysing the collaboration among all members.

The guidelines will hit their target only if they are widely spread and known by as many mountain rescuers as possible. Thanks to the "Club Alpino Italiano" with his head Sig. Armando Poli the booklet was finally produced.

And thanks to our new president, Hermann Brugger and the Editor, Fidel Elsensohn, who made the publication of the booklet possible.

Urs Wiget
Past President
ICAR MEDCOM
www.ikar-cisa.org

UIAA Medical Commission

A medical service for health and mountaineering!
Mountain medicine – a subspecialty for the well-being of all mountaineers!

The UIAA (International Union of Alpinists Associations) - founded in 1932 - is the roof federation of over 80 Mountaineering and Climbing Clubs from all over the world and represents several millions of mountaineers. Through its Commissions, the UIAA studies and solves problems of relevance to the mountaineers at large. These commissions are: the Safety Commission, the Youth Commission, the Mountain Protection Commission, the Access and Conservation Commission, the Expeditions Commission, the Mountaineering Commission and the International Councils for Climbing and Ski mountaineering Competitions and the Medical Commission. The UIAA has been recognized by the International Olympic Committee.

Mountaineers from all over the world seek for reliable advice regarding health and safety in the mountains. Only trained and experienced physicians are able to advise these mountaineers correctly. For this reason, MedCom UIAA was initiated in 1980 and started to collect and distribute medical data regarding all mountaineering sports. In order to optimize the efforts of time and the expense of travelling, all the meetings of MedCom UIAA were regularly combined with scientific sessions since 1980. The results of these meetings are regularly published and made available to the mountaineering world.

In order to have a better international impact, MedCom UIAA has founded in 1986 the International Society of Mountain Medicine (ISMM). This society deals with all different aspects of mountain medicine, mainly on a scientific level. ISMM has for the time being over 450 members. For the training of mountaineers, a big pool of experienced doctors is needed. For this purpose, UIAA- and ICAR MedCom members have founded national societies in 10 different countries. In order to have an international consensus, MedCom UIAA and ICAR have established in 1997 the minimal curricula for the International Diploma of Mountain Medicine.

Together with Medcom ICAR, MedCom UIAA has been successfully working as a catalyst for linking together international organisations and for founding national societies of mountain medicine.

For all mountaineering doctors, mountain medicine is a fascinating field, - a unique field where we can combine our medical profession with our love and passion for the mountains in an ideal way. This keeps us all…

Bruno Durrer
President
UIAA MEDCOM
www.uiaa.ch

PREFACE

Does Mountain Emergency Medicine represent an exclusive subject in medicine? Is it useful to publish international guidelines which can hardly be applied everywhere in the world, due to different national circumstances? This booklet gives answers to these and other questions.

The International Commission for Mountain Emergency Medicine was founded in 1948 by the Alpine countries as a sub-commission of ICAR (International Commission for Alpine Rescue) with the aim to improve medical treatment of casualties in the mountains. So far ICAR MEDCOM has a membership of 24 countries in Europe and North America; meanwhile, a tight network of helicopter rescue services has been established in the Alps. With favourable weather conditions almost all emergencies can be reached within a few minutes.

While many European Emergency Medical Services are equipped with medical personnel, in other countries casualties are managed by well trained paramedics and first responders. Due to these professional differences and the great variations in logistic and economic resources medical recommendations can not be equally put into practice all over the world. Nevertheless, I suppose that it is legitimate to set standards for the patient's treatment in the field, knowing of course that all guidelines should be evaluated with accuracy before application and regional circumstances should be taken into consideration.

Hostile topographic and meteorological conditions require specific skills of rescue personnel during operations in mountainous areas. Casualties must be medically treated in extremely cold and windy environments and evacuated from vertical walls, crevasses, canyons or avalanches. Moreover, technical operations may run at a high altitude and times of transport rescue may last hours, evens days. All decisions have to be balanced against potential risks for the rescuers themselves since many rescuers have lost their lives during rescue operations. Thus, it seems justified to declare Mountain Emergency Medicine as an exclusive subject in Emergency Medicine.

This compendium results from 10 years of intensive work by the Medical Board and represents a collection of Consensus Guidelines intended for the training of paramedics and emergency doctors working in mountainous areas. All recommendations were established by experienced emergency physicians who proposed the different topics to the Board. Subsequently the arguments were discussed, eventually reviewed by external experts and finally approved by the

Board's members. I would like to mention, that, since controlled studies are extremely rare in mountain emergency medicine, most papers are not based on statistical evidence.

Urs Wiget was President of the Board from 1989 to 2001 and promoted these guidelines with great effort. He worked with the conviction and competence of an experienced and passionate mountain emergency doctor. I am confident that these guidelines may act as a transmitter of this competence and experience for outstanding rescuers, paramedics and physicians and may improve the quality and efficiency of the on-site treatment of casualties in the mountains.

Hermann Brugger
President
ICAR MEDCOM

Dedication

This book is dedicated to all casualties who lost their lives or have been disabled during rescue operations in the mountains.

CHAPTER I

ICAR MEDCOM RECOMMENDATIONS

Intended for Rescuers, Mountain Emergency Physicians and Training Organisiations

First Aid Training Guidelines for Mountain Rescue Service Members

Fidel Elsensohn
1996

Introduction

It is the goal of modern mountain medicine to provide optimal treatment for injured or ill persons on the site of the accident and to transport the patients with stabilized vital functions as gently as possible. The emergency physician cannot work alone.
This paper defines the aims of medical training for mountais rescuers. It suggests minimum times for training and refresher courses.
The mountain rescuer, as a member of a rescue organization, must be able to recognize the severity of an injury or illness, initiate and continue steps necessary to maintain vital functions, and call for the right kind of rescue in order to ensure that the sick or injured person is brought gently and quickly to the receiving hospital.
In addition, each mountain rescuer and specially trained rescuer should have training in mountain medicine.
Refresher courses should be required to such an extent, that the whole first aid basic training is repeated within about 3 years, so that continuity of knowledge is achieved and any new subject that may come up can be integrated.
The national rescue organization must establish quality control in order to maintain medical standards for rescuers.

Basic Training

General First Aid, Total 15 to 20 Hours minimum:
This training can either be organized by the mountain rescue group itself, or conducted by cooperating rescue organizations, such as the Red Cross.

Required Topics:
Basic anatomy
- Evaluating vital functions: consciousness, breathing, circulation
- CPR

- internal injuries and illness
- wounds: stopping bleeding and bandaging
- injuries to the extremities
- skull and brain trauma
- spinal injuries
- chest and abdominal injuries
- multiple trauma
- positioning of the victim
- pediatric emergencies
- basic knowledge of oxygen therapy
- reporting of emergencies

Specialized Training in Mountain Medicine

Required topics: (according to the needs of each group)
- cold injury: hypothermia, frostbite and non freezing cold injuries
- heat injury: heat exhaustion: heatstroke
- lightning accidents
- high altitude medicine (AMS, HAPE, HACE, other syndromes)
- exhaustion
- ultraviolet radiation: snowblindness, sunbrun
- special considerations for avalanche victims
- flight accidents: paragliders, hang-gliding
- cave medicine
- swift water accidents; canyoning accidents

Practical exercises are obligatory during basic training.

Including practice sessions, mountain rescuer basic first aid training will require at least 45 hours.

Further Training

Only continued repetition ensures that a mountain rescuer will always be ready for duty. For that reason increased attention must be paid to refresher courses. Yearly 15-hour courses would privide complete review of first aid training in three-year cycles. Continued training is mandatory for a member of a rescue organization.

In addition, specially trained rescuers with advanced medical education are needed, to assist the mountain emergency physician. These are in particular air emergency rescuers, dog handlers, etc, but there should be at least one of these specially trained, rescuers in every field team.
In areas, in which paramedics provide advanced life support, they may take the place of mountain emergency physicians.

Expanded Training for Mountain Emergency Medical Staff, Flight Rescuers, Dog Handlers, etc.

The mountain emergency physician needs help from a medical assistant in order to give effective advanced life support. This assistant needs additional training to assist the emergency physician and to provide medical care at the scene, before the emergncy physician arrives.

Required Topics:
- rescue techniques and basic medical training, as described above
- specific demand-oriented training: air ambulance, dog handlers,...
- expanded and in-depth medical training amounting to minimum 60 hours, including theoretical and practical training as an emergency medical assistant.
- intensive trainig in moutain medicine subjects
- practical training period (appr. 100 hours) within the rescue organzation
- continued training or refreshed courses.

Intended for Rescuers, Mountain Emergency Physicians and Training Organisiations

Canyoning Rescue for Professional Guides

Urs Wiget, Xavier Ledoux
2001

Minimal Requirements for Medical Training

Recommendation for topics to be covered by courses for professional guides.
Canyon guides need to be technically competent.
Medical instructors should be suitably qualified and experienced in both theoretical and practical aspects of in canyon rescue, which includes technical climbing aspects as well as specific problems associated with rescue in water.
Instruction should last at least two days and should be 80% practical work

Water is the most important danger in canyoning rescue

It is essential that each guide know the principals of canyon rescue, including helicopter rescue. They should know how rescues are organised in the area where they are working.

The Following Topics Should be Trained

Assessment of the situation. Check of the rescuers own safety
Ensure casualty is in a safe situation where initial assessment can be performed
Primary survey: Check ABC DE
Basic Life Support: Cardio- pulmonary resuscitation
Secondary survey (full body examination of the patient without removing the neoprene suit, if possible)
Planning of the rescue action: Can the injuries be treated on site and the casualty evacuated by the canyoning group or should the guide call for help?
Near drowning situation: Airways free? Breathing ok? Consciousness of the patient?
Hypothermia: Heat loss can be very rapid, especially in running water. Even in a neoprene suit, hypothermia can result

within half an hour. How can the casualty be held outside running water during the preparation of the rescue action? (e.g. hammock)
Assessment and emergency treatment of fractures and dislocations
Assessment and emergency treatment of wounds
How call for help? (professional rescue)
Management of the situation of the other members of the group
Specific rescue situation at night

Intended for Mountain Emergency Physicians

Qualifications for Emergency Doctors in Mountain Rescue Operations

Georg Rammlmair, Ken Zafren, Fidel Elsensohn
2001

Introduction

Medical treatment in the mountain environment is different to that in other rescue operations. Geographic conditions, terrain, tactical considerations, medical equipment, weather conditions, and the limitations of daylight may all make mountain rescue operations a great challenge for the entire team.

These circumstances can limit medical treatment. It is essential that rescue equipment and tactics are appropriate for the terrain and that suitable rescue equipment and trained personnel (mountain rescuers and mountain rescue doctors) are available day and night.

Because only a small percentage of rescue operations in the area covered by an air rescue unit may take place in mountains, some may question the need for special training programmes and treatment strategies adapted to mountainous terrain.

In countries with mountains a small proportion of operations takes place on hiking trails, in avalanches, glaciers, steep rock and in canyons. Emergency medical treatment requires co-operation with the local ground rescue team, although in some cases the patient must be immediately evacuated. The doctor should reach the site of accident (the patient) as soon as possible , either first or as a member of the first rescue team. There he has to make the decision to perform therapy etc. or to start emergency evacuation .

This means that the doctor must be comfortable in exposed situations, must be conscious of his own safety and that of the patient and be able to work under extreme conditions. Because in many operations he and one rescuer might be by themselves, he must be able to perform winch or long-line operations. He must be able to accept that medical treatment may be limited. In case of bad weather, the doctor must be able to move safely and when necessary to descend alone. The doctor must be physically fit and technically skilled in order to carry out these activities.

Many doctors who are active in air rescue deny the need for these skills on the grounds that the number of mountain rescues is relatively small.

Recommendations

The International Commission for Mountain Emergency Medicine makes the following recommendations:
For operations in mountainous terrain, the emergency doctor must have technical mountain knowledge and experience. In all countries where a certain percentage of air rescue operations takes place in mountainous terrain, training must include theoretical and practical skills for moving (climbing) in steep terrain in summer and winter conditions, self-belay and other rescue manoeuvres, patient transport, management of avalanche victims and other specific emergencies. The training programme must be co-ordinated between the mountain rescue service and the medical directors. The doctors should have to pass the same medical checks as other members of the air crew.

Intended for Physicians and Pharmacists According to National Regulations

Contents of a mountain refuge´s pharmacy

Christian Vogt, Alfred Thomas, Herbert Forster, Urs Wiget
1996

Unfortunate circumstances can hinder quick professional mountain help in case of accident or illness. In such a case, ill and injured persons have to be attended, sometimes for many hours, by people who just happen to be there. The refuge pharmacy should provide physicians and alpinists with whatever is essential to face such situations.
A well equipped and well maintained refuge's pharmacy is a sign of quality for the refuge.
The pharmacy must be kept in a cool dry place, and protected from abuse. It should be divided in two compartments: a general compartment and a second compartment intented to be used by the physician. On the latter the following indication must be clearly written: "To be used exclusively by a physician or after telephone agreement with a physician".
The pharmacy must contain a precise list of the medicaments with information on doses and other indications. This list should, if possible, be written in several languages, and should include international names of medicaments (DCI - INN). The following indication should also figure on the list: "Use under personal responsability. Please read the directions for use". Manufacturer's leaflets must be left in the original boxes.
Regular control by a physician or a pharmacist must be guaranteed.

GENERAL COMPARTMENT

PAIN, FEVER	paracetamol 500 mg tabs
SPASMOLYTICS	butylscopolamine or other spasmolytic tabs
SEVERE PAIN	tramadol or tilidine drops
COUGH	dihydrocodeine 25 mg retard tabs
COLD	decongestant nose drops
THROAT	tablets to suck
DIARRHOEA	loperamide tabs or activated carbon
VOMITING	metoclopramide 10 mg tabs
TO SLEEP	short action benzodiazepine *
ANGINA PECTORIS	nitroglycerine caps
ANTACID	H2 - blocker or Al - Mg buffer tabs
EYES	disinfectant + astringent eye salve
FROSTBITE	aspirine 250 or 500 mg

MISCELLANEOUS
Elastic bandages, sterile gauze, adhesive dressings, plasters, skin closure strips, disinfectant agent, scissors, gloves, SAM splints, tweezer.
Desirable: ventilation mask and bag, 2 l oxygene bottle

* attention! narcotics may induce HAPE in susceptible persons!

PHYSICIAN'S COMPARTMENT

ATROPINE 0,5 MG	5 ampoules	
ADRENALINE 1 mg	5 ampoules	syringes 5 and 10 ml
ANTIEMETICA	3 ampoules	injection needles
SPASMOLYTICA	3 ampoules	i.v. cannulas
DIAZEPAM	5 ampoules	2 x 500 HAES infusion
FUROSEMIDE	5 ampoules	2 x 500 Ringer's lactate infusion
NIFEDIPINE	10 mg caps	infusion sets
PREDNISOLONE 250 mg	3 ampoules	garrot
beta 2 mimetic drug	3 ampoules	alcool prep pads
ANTIBIOTIC	CIPROFLOXACINE 500 mg tabs or CO-TRIMOXAZOLE (according to local situations and resistance)	
ANALGESIC (according to national law's)	e.g. TRAMADOLE 100 mg	5 ampoules

FOR REFUGES OVER 3000 m

ACETAZOLAMIDE	250 or 500 retard tabs
DEXAMETHASONE	4 mg tabs
NIFEDIPINE	retard tabs

Desirable: 2 l oxygene bottle and / or portable hyperbaric chamber

Intended for physicians and pharmacists according to national regulations.

A Modular First Aid Kit for Alpinists, Mountain Guides and Alpinist Physicians

Urs Wiget
1998

The content of a backpack modular first aid kit depends on the medical knowledge of the user: "only use what you know how to use".
Therefore we propose a modular first aid kit that takes into consideration the instruction level of the user. The alpinist with only basic medical information will be satisfied with the basic module. From the professional guide we can expect greater knowledge and experience. He or she should take courses of a higher level and can then use the extension module for guides in addition to the basic module.
Physicians who do mountaineering often have difficulties to compose a small but nevertheless useful first aid kit. We propose that they take, in the same box, the three proposed modules.
The content of the three modules is complementary. It will have to be adapted, by the respective physicians, to the legal requirements of the various countries and to the availability of drugs.

The criteria for the composition of the pharmacy are:

- as small and light as possible
- no easily improvisable material (e.g. scissors...)

Medicaments:
- really useful and effective
- with a wide therapeutic security
- of a stable galenic form
- no narcotics

Clear and detailed directions for use are included

We propose to include one injectable drug in the guide's module for the following reasons:

- in case of a mountain accident there are often physicians or medial staff on the site with no equipment.
- the proposed drug is absorbed completely by mouth (beneath the tongue) and its effect is rapid and non toxic. We teach our guides to apply the content of the bulbs directly in the mouth if they can't inject it.

1	**BASIC MODULE**	(for alpinists)
PAIN, FEVER	paracetamol –tabs	10
SPASMOLYTICS	current spasmolytic drug	5
COUGH	dihydrocodeine 25 mg retard caps	5
COLD	decongestant nose drops in a plastic bottle	1
THROAT	small tablets to suck	10
DIARRHOEA	loperamide caps	5
VOMITING, TRAVEL	metoclopramide 10 mg tabs	5
ANTACID	H2 - blocker eg ranitidine 300 mg tabs, or:	5
	Aluminium - Magnesium - oxide buffer	10
EYES	disinfectant + astringeant + and/or antiinflammatory eye salve	1
LIPS	lip protector salve	1
DISINFECTANT	povidone iodine 10 ml (eg Betadine)	1

MISCELLANEOUS and DRESSINGS
2 compressed gauze bandages 5 cm x 10 m; adhesive plaster; some disposable adhesive dressings, skin closure strips, alcohol prep pads, 3 lancet blades, 1 small tweezer, 1 paire of gloves

DETAILED INSTRUCTIONS FOR USE Alu box 9 x 17 x 3 cm 300 grams

2	EXTENSION MODULE	(for mountain guides)
ANGINA PECTORIS	nitro caps	10
ALTITUDE	acetazolamide 500 mg caps	5
	nifedipine 20 mg retard tabs	10
	dexamethasone 4 mg tabs	10
EXHAUSTION	small vitamin - glucose tabs	10
TO SLEEP	zolpidem or midazolam tabs *	5
AMPOULES	tramadol 100 mg (for sublingual use)	3
1 disposable syringe 2 ml, 3 injection needles,		
DETAILED INSTRUCTIONS FOR USE	Alu box 9.5 x 18 x 4 cm	350 grams

* attention! hypnotics may induce HAPE in susceptible persons! Let the physician decide whether sleeping drugs shall be included.

3	EXTENSION MODULE	(for alpinists physicians)
ALTITUDE	nifedipine 10 mg caps	5
ANTIBIOTICS	ciprofloxacin 500 mg tab or Co-trimoxazole 160/800 mg	5
AMPOULE	adrenaline 1 mg, 1 ml syringe, 1 intravenous catheter - over needle set (e.g. Venflon)	
WOUNDS	atraumatic thread + needle for sutures without needle holder	
consider:	injectable antiemetic drug (e.g. metoclopramide or droperidol) injectable strong analgetic drug (e.g. Ketamine or opiates) midazolam ampoule (1 ml, 5 mg/ml)	
	Alu box 9.5 x 18 x 4 cm 1+2+3 = 380 grams	

Intended for Emergency Physicians

Equipment for Canyoning Rescue Doctors

Xavier Ledoux, Urs Wiget
2001

Preamble

Canyoning rescue takes place in a very hostile environment. Any doctor who undertakes canyoning rescue requires very good physical fitness, a good knowledge of canyoning, especially rope techniques, and the ability to work in difficult conditions in the water. The doctor may have to spend a long time swimming or static in water and can become cold very quickly.
A canyoning accident can rapidly become very serious because of the combination of water and cold. The doctor may commonly be faced with a patient who will die during the rescue, no matter what is done.

Equipment

Equipment kept in specific canyoning bags with positive buoyancy. Equipment must be kept dry in special containers. Sterile equipment must be kept in sealed individual plastic bags and changed regularly.

Waterproof torch with spare batteries
Intubation and ventilation materials. (See IKAR recommendation on Intubation and Ventilation in the field, 1999)
Ventilation bag connected by wide tube 1.5m long with interposed bacterial filter
Manual suction apparatus with stiff tube aspirator (e.g. Res-q-vac or Vitalograph)
Gastric catheter, to empty stomach in near drowning
Nasopharyngeal airway
Equipment for neck stabilisation (Formal collar or improvised)
Splinting and immobilisation equipment - 4 SAM™ splints, consider Scotchcast™
Bandages - Elastic bandages are best. Adhesive tape does not work

Temperature measurement: Tympanic thermometer is best available
(Electronic thermometers are not reliable at low temperatures and infra – red – type measurements of the tympan are not accurate)

Drugs:
Antibiotics iv: (e.g. Metronidazole, Rocephine) (risk of contamination of wounds by river water)
Adrenaline
Steroids (Treatment of spinal injury)
Analgesics - Local anaesthesia (nerve blocks) may be useful
Fluid replacement 1 litre of "Amidone"

Scissors or scalpel blades
Syringes I-V cannulas and I-V giving sets.
Chemical warm packs – to be placed inside the wetsuit
Floating stretcher and Kendrick Extrication Device™ should be brought by team. A hammock which can be lifted out of the water with the casualty horizontal has been found useful.

Prevention of Hypothermia

Use of neoprene hood or cap for the patient.
Expose the patient as little as possible. (Slits in neoprene suit can provide access and be reclosed with bandages)
High calorie food and warm sweet fluids. (for patients and rescuers)

Fractures and Wounds

Be aware of contamination of water. Prophylactic antibiotics.
Most common are lower limb fractures, then spinal injury, then upper limb, finally facial injuries.
Shoulder dislocations can result from use of flotation bags or in jumping. They should be reduced immediately. (See IKAR recommendation on treatment of shoulder dislocation)

Intended for Mountain Rescuers and Mountain Emergency Physicians

Immobilization and Use of the Vacuum Mattress in Organized Mountain Rescue

Georg Rammlmair, Ken Zafren
2001

Introduction

Immobilization of the injured patient or of parts of the body is one of the main aspects in the treatment of victims of mountain accidents. The aim of immobilization is to reduce pain to a minimum and to avoid further damage during transport. Since the beginning of organized mountain rescue, various different materials and methods have been used to immobilize injured victims in various member countries.

The vacuum mattress as a total body immobilization device

The increasing use of vacuum mattresses in the case of accidents is due to the following advantages:

- fixation of the whole axial spine like a plaster cast
- various possibilities of positioning the patient
- reduced transmission of movements
- quick application
- leveling out of underlying surfaces
- insulation from cold
- transparent to x-rays
- hygiene
- no negative influence on circulation
- application easy to learn
- easy to transport

It has the following disadvantages:

- a relatively large packing volume
- outer cover can be damaged easily; may be made of flammable material
- transport of rescue bag necessary in mountain areas
- (relatively) high costs of acquisition
- the cervical spine and upper extremities cannot be optimally protected.
- The lower extremities cannot be placed in traction.

The commission feels that the advantages of this piece of equipment outweigh the disadvantages, especially when compared to all the other types of devices, which all have a narrow range of applicability.

Considerations for Use

1. The mattress itself is not sufficient for longitudinal immobilization of the spine. It should be used in conjunction with a stretcher/litter
2. For optimal immobilization, the cervical spine should be separately protected. A device such as the Kendrick Extrication Device™ (KED) can be used in conjunction with the vacuum mattress.
3. In case of injury of the extremities, they should be immobilized using appropriate splinting. These devices can be kept in the same kit as the vacuum mattress and will not increase the weight appreciably.

A spine board is acceptable for transport in certain circumstances if its use will be limited to a short duration – no longer than 30 minutes - to avoid compression injuries.

Material

A vacuum mattress should by constructed with nonflammable material. Between the mattress and the patient a linen should be employed. Only a vacuum mattress allows sufficient fixation and positioning. Furthermore , it can be put into the transport rescue bag, on a sled, into the helicopter and on the stretcher. The pump and the tube have to be functional at low temperatures, according to the region where it is employed.

Recommendation

For these reasons, the commission for mountain emergency medicine of IKAR/CISA makes the following recommendation regarding the immobilization of the injured patients:

- **In general, injured patients in the mountains should be immobilized with a vacuum mattress and not be removed from the mattress until admitted to emergency area of the hospital. The mattress itself is not sufficient for longitudinal immobilization of the spine. It should be used in conjunction with a stretcher/litter**
- **For optimal immobilization, the cervical spine should be separately protected.**
- **In case of injury of the extremities, they should be immobilized using appropriate splinting. These devices can be kept in the same kit as the vacuum mattress and will not increase the weight appreciably.**
- **Smaller splints without the vacuum mattress should be used in cases of isolated injuries**
- **A device such as the Kendrick Extrication Device™ (KED) can be used in conjunction with the vacuum mattress.**
- **A spine board is acceptable for transport in certain circumstances but duration should be short.**

Intended for All Rescue First Responders According to National Regulations.

Treatment of Dislocations and Fractures

Herbert Forster, Ken Zafren
1996

Most mountain rescue operations are due to joint injuries and fractures. Treatment of these injuries must follow some basic principles.
The injury affects not only the bone or the joint, but also a complex functional unit that consists of skin, muscles, nerves, blood vessels, ligaments, tendons and bones. Each part of this unit has an important function. In most cases treatment is determined not so much by the injury to the bone itself, but by the injury to another part of this functional unit. Therefore, treatment is directed at the entire functional complexe.
Because mountain rescue operations are often time-consuming, failure to reduce dislocations of joints or displaced fractures may result in serious skin, circulatory or neurological injury.
There is often no way in distinguishing fractures in the field. In doubtful cases, injuries should be treated as fractures to prevent further harm to the patient.
The main complication of open fractures is the danger of infection. A bandage should be applied to prevent further bacterial entry into the wound and should be not removed until hospital treatment. It is very important to report the possibility of an open fracture under the bandage when handing over the patient to another care giver.
In most cases it is better to bandage before splinting a limb. Foreign objects in the wound should not be removed. Improper removal can lead to major bleedings or to injuries to surrounding soft structures (e.g. nerves). Protruding foreign objects may to be shortened or bent very carefully, taking caution not to lose the remaining part in the wound.

Step-by-Step Fracture Treatment

1. Careful and complete examination of the patient
2. Promptly administer analgesia, as needed
3. Prepare splinting materials
4. Bandage open fractures
5. Reposite the limb by applying traction

6. Splint
7. Transport in a controlled fashion
8. Complete required documentation

In most cases, obvious or even spectacular injuries make a strong impression when approaching an injured patient. Nevertheless, the first step has to be a complete and systematic examination. It is crucial to recognize all life-threatening injuries well as to obtain an over view of all injuries. Once this has been done and life-threatening injuries addressed, then treatment of the injured extremities can be begun. If analgesics are given, there will be a delay before the onset of pain relief. The plan of treatment should be logical and explained to the patient in order to gain his or her confidence and cooperation.
Repositioning of the upper extremity is generally unnecessary and often impossible, except for shoulder dislocations. The upper extremity should be splinted in the position in which it is found, if not easily and without causing more pain an approxiate anatomic position can be achieved for splinting. The same applies to the lower extremity except for injuries of the ankle and lower leg.
Fractures of the femur are almost always unstable. By applying traction, they can be reduced to anatomical position while placed on the vacuum mattress. If vacuum immobilization is unavailible, a traction decive should be used. Injuries of the knee or hip should be splinted in position, which is most comfortable and least painful for the patient. For suspected hip dislocation, reduction should not be attempted at the scene of accident, unless arrival at hospital will be delayed for several hours or more.
Fractures of the lower leg are unstable in most cases, so that by applying traction along the axis of the lower leg during splinting, the limb can be restored to the normal postion. This is especially important as the mantle of soft structure around the bone in this area is very thin, and an abnormal position of the tibia and fibula could cause harm to the skin, nerves and vessels very quickly.
Serious problems are caused by dislocations and displaced fractures of the ankle joint. The abnormal position damages the skin, nerves, ligaments and blood vessels. The goal is to restore the joint to anatomical positon as rapidly as possible and to splint in this position.
Inform the patient about the planned course of action and prepare to splint. Vacuum splints and vacuum mattresses are preferred to blowup splints. When analgesics are given, wait until pain relief starts. In order to secure cooperation during the process of repositioning and splinting, it is important to maintain contact with the patient and to explain each step of the procedere.

Reduction

One rescuer holds the lower leg at the knee. The second rescuer holds the heel with one hand and the back of the foot with the other hand. The second rescuer tries to correct the abnormal position by applying strong traction along

the axis of the lower leg. If the first attempt is unsuccessful, the limb should be splinted in the position in which it is found.

Open fractures should be reduced as well. The reduction of a penetrating bony fragment is no longer regarded as unfavorable. Secondary damage by pressure on surrounding soft tisssue is much worse than possible introduction of foreign matter into the wound. After reduction, apply traction at the heel until the prepared splint has been secured. Prior to transport, neurovascular status should be stabilized. Further stabilization of the splint, protection of neurovascular status and documention af the injury may be required during transport.

Intended for Mountain Rescue First Responders and Rescue Physicians According to National Regulations.

Treatment of Shoulder Dislocations

Herbert Forster, Ken Zafren
1998

Shoulder dislocations are very painful and sometimes associated with neurologic and vascular injuries. If transport will be prolonged or difficult it is desirable to reduce the dislocation at the scene of the accident. This procedure is well accepted. If transport will be rapid (the normal case in European rescue conditions), the patient should be transported prior to reduction of the shoulder. The decision of whether to reduce a dislocated shoulder in the field requires balancing the desirability of early reduction against the risks involved.

Diagnosis and Accompanying Injuries

Anterior dislocation is the most frequent type and has a characteristic clinical picture. The shoulder is very painful. The patient holds the arm slightly abducted and externally rotated. In most cases, the patient supports the affected arm with the other one. Typically, the shoulder joint is locked and the arm cannot be adducted to the body. The empty glenoid fossa can often be palpated.
Accompanying bone injuries are quite frequent. Fractures of the head of the humerus can also be clinically similar to shoulder dislocation. Dislocation of the humeral head can lead to traction or pressure on the nerves. Brachial plexus injuries are present in 12% of shoulder dislocations, while axillary nerve injuries are found in 9%. Vascular injury is rare.

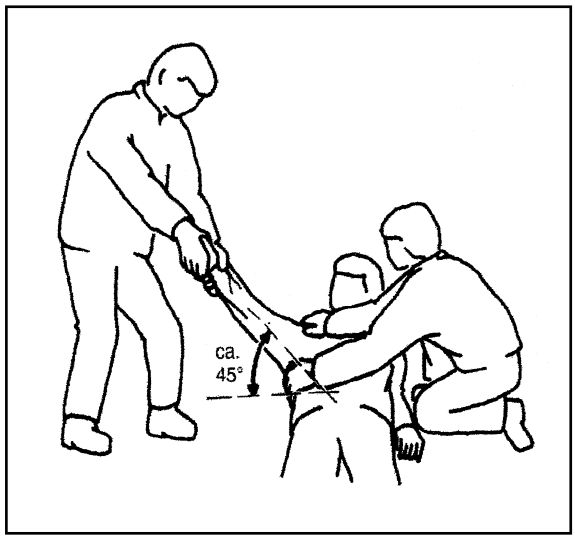
Treatment

If the diagnosis is not absolutely clear, reduction must not be attempted. In such cases, the arm should be splinted in the position that is most comfortable for the patient. Analgesic medicines may be given before splinting. A vacuum splint is ideal.
If reduction is to be attempted, discuss the proposed plan of action with the patient. Document neurovascular deficits which are present prior to reduction. Offer the patient analgesics and wait until the onset of pain relief. If two attempts are unsuccessful, the arm should be splinted. Overzealous efforts can do more harm than good.

Reduction should be primarily a responsibility of the physician, but can also be accomplished by rescuers with appropriate training. We recommend, without reservation, the use of the „Campell“ method in mountain rescue.
The patient will normally be found sitting or standing up. Explain the plan to the patient. The first rescuer grasps the injured arm at the inside of the elbow and applies traction along the axis of the arm. As if to shake hands, the rescuer gives the patient his or her hand (the right hand if the right side is dislocated, the left hand if the left side is dislocated). In this way, the traction that has been applied to the upper arm is transferred to the forearm. The hand that held the upper arm before, now grasps the wrist. The success of this reduction method depends on applying traction continuously, without interruption, to overcome the tension of the muscles.

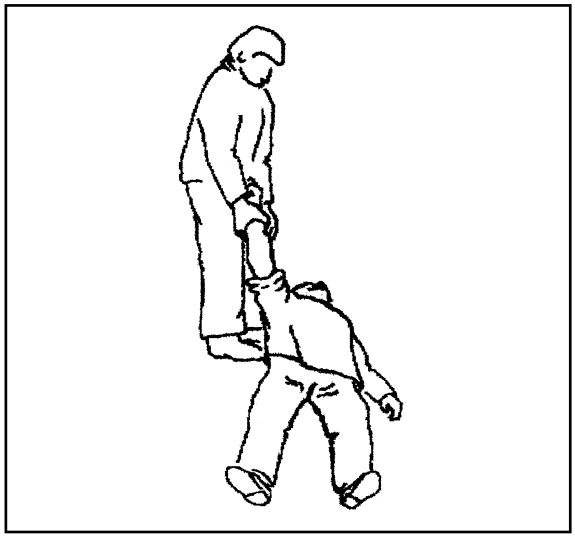
Two Rescuer

At this point, ask the patient to lie down flat (supine) on the ground, with the support of a second rescuer. Continue to apply traction with the arm abducted to 90 degrees and at a 45 degree angle to the ground. It is important for the second rescuer to provide countertraction. The position of this rescuer will be adapted to the terrain (see drawing).



One Rescuer

Position the patient as for the two-rescuer technique with the arm at a 90 degree angle to the ground. Apply traction continuously The shoulder should be lifted slightly from the ground. If the reduction is successful a pop may be heard or felt and the pain resolves almost instantly. After reduction, splint the arm and refer the patient to a physician for follow-up care.



Intended for Mountain Emergency Physicians

Treatment of Pain in the Field

A. Thomas, U. Wiget, G. Rammlmair
1999

Preamble

The treatment of pain is an unequivocal duty of the medical profession to relieve human suffering. Analgesic therapy is always important in the management of patients who have sustained injuries, because intense pain can cause clinical deterioration. Drugs given to relieve pain may occasionally provoke dangerous drops in blood pressure and other side effects, therefore all drugs should be titrated against effect. This means that the doctor must be familiar with the actions, desired and undesired effects and potential complications of the drugs he employs and must understand the management of these complications, so that any necessary measures can be started immediately. Proper management of pain in the acutely injured patient hence calls for knowledge of the pathophysiology of shock, acquaintance with pharmacology and an understanding of the principles of intensive care.

Significance of Severe Pain in Trauma Patients

Individual Perception of Pain	Wide range from feeling discomfort to real suffering
Pulmonary Disfunction	Resulting in Hypoxemia, e.g. shallow tachypnea by serial rib fractures
Deterioration of Shock	Vasovagal reflexes causing Hypotension
Neurohumeral Stimulation	High Cortisol level resulting in immuno-suppression, excessive sympathoadrenergic stimulation causing circulatory dysfunction, promoting ARDS and Multi Organ Failure

In severe to extreme pain Opioids and Ketamine are the only drugs which provide sufficient analgesia.

1. NALBUPHINE	Moderate Opioid
2. MORPHINE	Strong Opioid
3. FENTANYL	Very strong Opioid
4. KETAMINE	Non Opioid, potent Analgesic and Narcotic

Footnote: Continuous monitoring is mandatory with all these drugs.
Normally, in emergency situations opioids should be administered by IV-line. Under special circumstances in the mountains, opiods may be administered sublingual, transdermal, and Ketamine also intramuscular.

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	Dose, relative potency	Action	Advantages	Disadvantages
NALBUPHINE (Nubain)	Iv/sublingual: 0,15 – 0,3 mg/kg Rel. Potency : 0,5 – 0,8	Onset: 2 min Maximum: 10 min Duration: 2 – 3 H	- limited respiratory depression (ceiling effect) - cardiovascular stability - no dysphoria - not subject to the Misuse of Drugs Regulation	- moderate analgesic potency - sedation, nausea and emesis - vertigo - continuous monitoring manda- tory
MORPHINE	Iv/sublingual : 0,05 – 0,2 mg/kg Rel. Potency : 1,0	Onset: 5 min Maximum: 20 min Duration: 2 – 4 H	- highly potent analgesic - sedative, hypnotic and euphoric effects - cardioprotective action, e.g reduction of heightened sympathetic activity - antitussive and antiemetic (late) effect	- respiratory depression - histamine liberation - nausea and emesis (early effect) - muscle spasm in gastrointestinal tractus - drop of blood pressure - continuous monitoring mandatory
FENTANYL	Iv : 1 – 1,5 micrograms/kg Rel. Potency : 100	Onset: 1 min Maximum: 5 min Duration: 25 – 35 min	- very high analgesic potency	- respiratory depression - continuous monitoring mandatory
KETAMINE	Subanesthetic single dose: iv 0,25 – 0,5 mg/kg im 0,50 – 2,0 mg/kg repetitive administration: iv 0,25 mg/kg Combination with benzo-diazepine (midazolam) and antisialogogue (atropine) recommended	Onset: iv: 1 – 3 min im: 5 min Maximum : iv: 5 min Duration: iv: 15 min im: 30 min	- high analgesic potency - no significant respiratory depression - bronchodilation, no vasodilation - preserved protection reflexes - no alteration of seizure threshold - no release of histamine, rare allergic reaction - no cumulation, no organ toxicity - not subject to the Misuse of Drugs Regulations	- central sympathetic stimulation - increase of systemic and pulmonary arterial blood pressure, heart rate and myocardial oxygen consumption - increase of intracranial pressure under spontaneous breathing - induction of salivary secretion - low hypnotic potency - emergence delirium, bad dreams - continuous monitoring mandatory - contraindicated in coronary heart disease and hypertension

Note: S – Ketamine (l – enantiomer) will replace Ketamine (racemic) in the near future. S – Ketamine is in Germany already admitted for use. S – Ketamine has twice the potency of Ketamine, the dosage is therefore half of Ketamine. S – Ketamine is said to have fewer side effects.

Intended for Mountain Emergency Physicians

Emergency Intubation and Ventilation in the Field

A. Thomas, G. Rammlmair, U. Wiget
1998

Preamble

Controlled ventilation with 100% oxygen after intubation improves oxygen delivery in shock patients and offers the basis for sufficient analgesia and sedation. Thus, the incidence of secondary organ failure in shock patients can be minimized and survival rate increased. Therefore, rescue doctors with anaesthetic practice prefer early endotracheal intubation in a wide range of critically traumatized or ill patients. However, intubation attempts can lead to disastrous events, especially when unexpected serious problems arise during the procedure. Concerning emergency endotracheal intubation on the field, the rescue doctor must decide the indication by weighing up his own experience and skill with the clinical condition and possible risk factors of the patient rendering intubation more difficult. The classification into three levels of difficulty facilitates the individual decision.

The main aim is oxygenation of the patient not intubation at any price.

Three Levels of Difficulty in Emergency Intubation on the Field

Level 1:

Intubation of a deeply comatose patient without induction of anaesthesia or muscle relaxation, e.g. in the course of CPR. Mountain rescue doctors and qualified rescue personnel, like paramedics, must be familiar with this procedure.

Level 2:

Induction of anaesthesia, intubation and ventilation of a spontaneous breathing patient with the aim to improve impaired respiratory and/or circulatory functions. However, this procedure bears the risk of hypoxia and aspiration so that it should be performed only by doctors / paramedics with anaesthetic experience. If sufficient anaesthetic practice is lacking it is better to rely on airway management by means of oro-/ naso-pharnygeal tubes, and oxygen delivery via face mask or assistant bag-valve-mask ventilation.
Pulse oximetry monitoring is especially valuable in this situation.

Level 3:
The unavoidable difficult intubation with induction of anaesthesia in desperate situations, e.g an entrapped casualty with severe pain and imminent loss of consciousness. In those situations even the most experienced emergency specialist may face his limits.

Indications for Emergency Intubation and Ventilation

1. **Unconsciousness without protective reflexes:** e.g. CPR, intoxications
2. **Respiratory failure:**
   In trauma patients: e.g. severe head injury, -thorax trauma, polytrauma, shock
   Of other cause, without improvement after delivery of oxygen via face mask: e.g. cardiogenic shock, status asthmaticus

Essential Equipment for Emergency Tracheal Intubation

Suction apparatus, oxygen source, ventilation bag, anesthesia masks, oro- and nasopharyngeal airways, endotracheal tubes, stylet, 10-ml syringe, clamp, intravenous anesthetics, muscle relaxants, syringes, needles, catheters, laryngoscope, adhesive and umbilical tape, stethoscope

Procedure (Level 2)

1. **Clearing of the airway**
2. **Preoxygenation**, e.g. bag-valve-mask ventilation with O_2-reservoir and high F_iO_2
3. **Peripheral intravenous access** (large-bore catheter)
4. **Intravenous anesthetic:**
   Diazepam 0,1-0,5 mg / kg, or **Midazolam** 0,03-0,1 mg / kg
   and/or **Etomidate** 0,15-0,3 mg / kg, or **Ketamine**, 0,5-1,5 mg / kg
5. **Avoid muscle relaxation for emergency intubation !!**
   Only administer **Succinylcholine**, 1 - 1,5 mg / kg i.v., if absolutely necessary,
   and the vocal cords are visualized by direct laryngoskopy!
6. **Laryngoscopy and insertion of a styletted endotracheal tube**
   Assistant performs Sellik maneuver and cuff inflation
7. **Determination of endotracheal tube location and securement**
   External markings 20-22 cm, 22-24 cm, auscultation, bandage fixation

8. Controlled ventilation with bag and O_2-reservoir or ventilator,
F_iO_2 near 1,0.

9. Intravenous analgesia and sedation:
Ketamine or Fentanyl or Morphine in combination with Midazolam or Diazepam

10. Muscle relaxation with non-depolarizing relaxant, e.g. **Vecuronium**
0,1 mg / kg i.v., if ventilation is insufficient without relaxation.

Miscellaneous

A lot of different details emerge in connection with emergency intubation, e.g.:
Consideration of neck injury: Minimize head and neck movement during intubation.
Before **intubation on snow** put a blanket over your head and let your eyes adapt to the darkness for a moment.
Expected and unexpected difficult intubation, difficult airway algorithm, use of **laryngeal mask, combitube, surgical airway,** etc.

Reference:
Adams HA, Schmitz CS (1996) Analgesie- und Anästhesieverfahren im Rettungsdienst. In: Deutsche Akademie für Anästhesiologische Fortbildung (ed) Aktuelles Wissen für Anästhesisten: Refresher Course. Springer, Berlin Heidelberg New York, p 83

Intended for Emergency Physicians

Thoracostomy at the Scene of an Accident in the Mountains

Herbert Forster, Ken Zafren
1996

Preamble

Intubation and ventilation of a seriously injured patient in the field is now an accepted and frequently used procedure. In case of a patient with chest trauma, this procedure can lead to a life-threatening tension pneumothorax.
In this case, thoracostomy of the injured side of the chest is mandatory to provide ventilation without causing a pneumothorax. It does not make any sense, however, to do without a vital measure only because the doctor on emergency call is not capable of performing a thoracostomy. Therefore we require that all mountain rescue doctors should be able to do this procedure.
The following are the only indications for a thoracostomy at the scene of an accident in the mountains:
• to ventilate a patient with serious chest trauma and decreased or absent breath sounds (hemo- or pneumothorax)
• tension pneumothorax
Often there is a long time between the accident and the arrival of the doctor, then we have to deal with advanced shock and respiratory failure. So in spite of difficult conditions (terrain, weather) there are more liberal indications for intubation and also for thoracostomy at the scene. A long transport also supports the decision to perform a thoracostomy.

Thoracostomy Site

There are two usual sites for thoracostomy.

1. Thoracostomy in the second intercostal space (ICS) in the mid-clavicular line is only feasible with a pneumothorax with clear clinical indications and when an x-ray can be used to confirm the position of the tube. In an emergency situation however, we have to expect a hémothorax. For anatomical reasons this site is aiso difficult due to the ease of slipping off the ribs in this area. It is also more dangerous, since the mammary artery might be injured, which can be fatal.

2. Thoracostomy in the fourth or fifth ICS in the mid-axillary line (at the level of the nipple) on the other hand, is ideal for our purpose. It is anatomically easier, less dangerous, suitable for a hemothorax as well and allows an easy posterior placing of the tube.

Technique

We do not recommend thoracostomy through a stab incision using a stiff trochar especially under field conditions there is great risk of injury to organs like the lung, the diaphragme the stomach, the liver, or the spleen. These injuries are caused by the sharp tip of the trochar or by rib fragments being pushed forward. With the trochar method, positioning of the tube cannot be controlled. Also catheter-through-needle devices should not be used .
Catheter-over-needle devices in which the needle is removed after placement (such as Venflon) can be used for short flight distances or dangerous scenes. Such devices must have a catheter diameter of 14 gauge or larger.

We Recommend the Following Procedure

1. Make a 5 centimeter incision parallel to the ribs in the 4th or 5th ICS in the mid-axillary line.
2. Spread the subcutaneous tissue with dissection scissors.
3. Open the pleural space on top of the rib with closed scissors.
4. Spread and palpate with a finger.
5. Insert and direct the tube using a finger.
6. Close the skin and secure the tube.

Only a few instruments are necessary for this procedure: a scalpel, scissors with a rounded, slim tip (Metzenbaum), toothed forceps and a needle holder. We use a large thoracostomy tube 20-28 French (Ch.) in order to prevent clogging. If there is no thoracostomy tube available, one can use an endotracheal tube without inflating the cuff.
A Heimlich valve can be added but is not absolutely necessary

Intended for Physicians and Paramedics

On Site Treatment of Avalanche Victims

H Brugger, B Durrer

An avalanche accident is a medical emergency. In all decisions the goal of rapid rescue of the victim(s) must be balanced against the risks to the rescue team. The possibility of a second avalanche, snow conditions, as well as topographic and meteorological factors must be evaluated. "Thinking ahead" should be the guiding principle of the rescue procedure. Try to bring emergency doctors and/or paramedics and dog handlers with dogs ("docs and dogs") as soon as possible to the site of the avalanche. The more persons buried the more doctors and/or paramedics you need.
In case of a short burial time (up to 35 minutes) a rapid extrication has absolute priority. If a buried person is in a critical condition, it will probably be attributable to acute asphyxia or to mechanical trauma. In case of respiratory arrest start artificial respiration as soon as possible during recovery. After a complete burial (head and trunk buried) hospitalise the patient in any case for 24 hours for observation (pulmonary complications: aspiration, pulmonary oedema).
After a prolonged burial time (as from 35 minutes) hypothermia is to be expected, therefore extrication should be not as speedy as possible but as gently as possible. An air pocket and free airway are essential for survival and that's why on uncovering the face it's absolutely necessary to look for them. So far a core temperature of 13° can be supposed as lower therapeutic limit for re-warming, but core temperature in that limit area has to be measured oesophageally since an epitympanic measurement can give falsely low values (see ICAR guidelines for hypothermia treatment). Many clinicians reject a lower temperature limit on principle so as not to wreck therapeutic outcomes in future. Nowadays a non-lethal injury is no longer a contra-indication for re-warming with cardiopulmonary bypass. If several buried persons must be attended to simultaneously, the maintenance of vital functions of surviving patients must have priority over reanimation of buried ones without vital functions.

Equipment

Complete winter equipment. Thermometer for core temperature measurement, hot packs (table 1) **and hot, sweet tea**. Consider **airway warming device** (to administer warm, moistened O2). If the outside temperature is low make sure batteries are fully charged. If there is enough time, install a **depot** with a tent for medical care beyond the avalanche. Have medicines and instruments (metallic laryngoscope) kept warm, e.g. put a hot pack in the emergency physician's bag, carry medicines on the body.

Localisation and extrication of the patient

Get the emergency physician and/or paramedic to the scene after position finding, not just on rescuing.
Look out for an air pocket (= any cavity in front of the mouth and nose, no matter how small, provided the airway is clear).
Avoid any destruction of an existing air pocket during extrication! Don't dig vertically from above but diagonally from the side in direction of the buried victim.
Absolutely avoid unnecessary movements of trunk and of main joints (shoulder, hip and knee). If movements cannot be avoided, carry them out as slowly as possible.

Monitoring

ECG-monitoring during all the time of rescuing.
Look for provoked arrhythmia and ventricular fibrillation during extrication and removal.
Core temperature monitoring. For measuring with an epitympanic thermometer the auditory canal must be dry. Consider oesophageal measurement in the lower third part of the oesophagus (preferable in hypothermia stages III-IV).
Pulse oximetry can be disregarded since it results in wrong values due to centralisation.

Staging of hypothermia

Swiss staging (table 1) has the advantage that it can be established by non-medical rescuers, since it is not based on measurement of the core temperature.

Hypothermia I: patient alert, shivering (core temperature about 35-32°C [95-89,6°F])
Hypothermia II: patient drowsy, non-shivering (core temperature about 32-28°C [89,6-82,4°F])
Hypothermia III: patient unconscious (core temperature about 28-24°C [82,4-75,2°F])
Hypothermia IV: patient not breathing (core temperature about < 24°C [< 75,2°F])

Assessment of the Patient and On-site Treatment

Single steps are shown in figure 1. In all cases: core temperature and ECG monitoring, oxygen inhalation, insulation in supine position (table 1). Consider airway warming. 0.9% NaCl and/or 5% glucose only if an intravenous line can be established within a few minutes.
The administration of ACLS drugs, including epinephrine and vasopressin, is not recommended so far in hypothermia

stages III – IV, since cardioactive drugs may have arrhythmogenic effects and can accumulate to toxic levels. In stages I – II, ACLS drugs may be administered, but with longer intervals between doses than in normothermic patients. Trauma treatment if indicated.

Patient alert or drowsy

Change wet clothing without unnecessary movements (cutting).
Hot sweet drinks as long as swallow reflex preserved.
Nearest hospital with intensive-care unit.

Patient unconscious

Intubation: whether a hypothermia stage III patient has to be intubated at the site of the accident or not, is still a matter of discussion. For the intubation of a patient with protective reflexes an intravenous line is needed for the administration of medicine. The risk of further heat loss during the time of treatment and transport has to be evaluated in relation to the advantages of the intubation. Danger of provoked ventricular fibrillation is negligible.
Be ready for resuscitation.·
Hospital with intensive care unit and hypothermia experience or preferably unit with cardiopulmonary bypass.

Patient not breathing

Exclude obvious fatal injuries.
Start cardiopulmonary resuscitation, intubate the patient.
Check burial time and/or core temperature.
Asystole: triage only by the emergency physician aiming to differentiate hypothermia stage IV from asphyxia and to bring patients with hypothermia stage IV for re-warming to a hospital with cardiopulmonary bypass. Criteria: burial time, core temperature, air pocket and airway. The information about the air pocket and airway must be given by the emergency physician or by the rescuer. Core temperature must be measured immediately after the rescue, later measures are not reliable. Following situations are possible:

Burial time ≤ 35 minutes and/or core temperature ≥ 32°C: continue resuscitation, follow standard ACLS protocol. Successful: ➧ transport to the nearest hospital with intensive-care unit. In case of failure the emergency physician can establish death by "acute asphyxia".

Burial time > 35 minutes and/or core temperature < 32°C:

Air pocket present and airway free (or uncertain): suspect hypothermia stage IV. **Resuscitation must be continued** without break until re-warming. Therefore, start cardiopulmonary resuscitation only from the moment when an uninterrupted resuscitation is possible. Cardiopulmonary resuscitation as per normal guidelines. ◗ **Hospital with cardiopulmonary bypass** continuing cardiopulmonary resuscitation. Only if unit with cardiopulmonary bypass cannot be reached directly by road or aerial means: ◗ **nearest hospital** continuing resuscitation **for determination of serum potassium** (criterion of irreversibility). With values exceeding **12 mmol/l**, resuscitation can be stopped, with values of 12 mmol/l or less a further transport should follow – under constant resuscitation - for re-warming to a hospital with cardiopulmonary bypass (cave: haemolysis, rhabdomyolysis, see ICAR-guidelines for hypothermia treatment).·

No air pocket present and/or airway blocked: resuscitation can be interrupted by the emergency physician and death "by asphyxia with subsequent cooling down" established. ·

Ventricular fibrillation at core temperature < 28° C: electric defibrillation generally vain, up to 3 attempts with 200-300-360 J.

◗ hospital with cardiopulmonary bypass under constant resuscitation.

Prevention of heat loss in all stages: insulation, hot packs

2 to 3 chemical hot bags, 1 aluminium foil, 2 wool blankets, 1 cap are needed.

a) **2 to 3 chemical hot packs** near the heart on thorax and upper part of abdomen, not directly on the skin.

b) Before removing the patient prepare the stretcher with **2 wool blankets and 1 aluminium foil.**

c) On removing the patient **avoid big movements.**

d) Wrap up the patient closely packed in the blankets and in the aluminium foil.

e) **Cap** (30 - 50 % of body heat gets lost over the head).

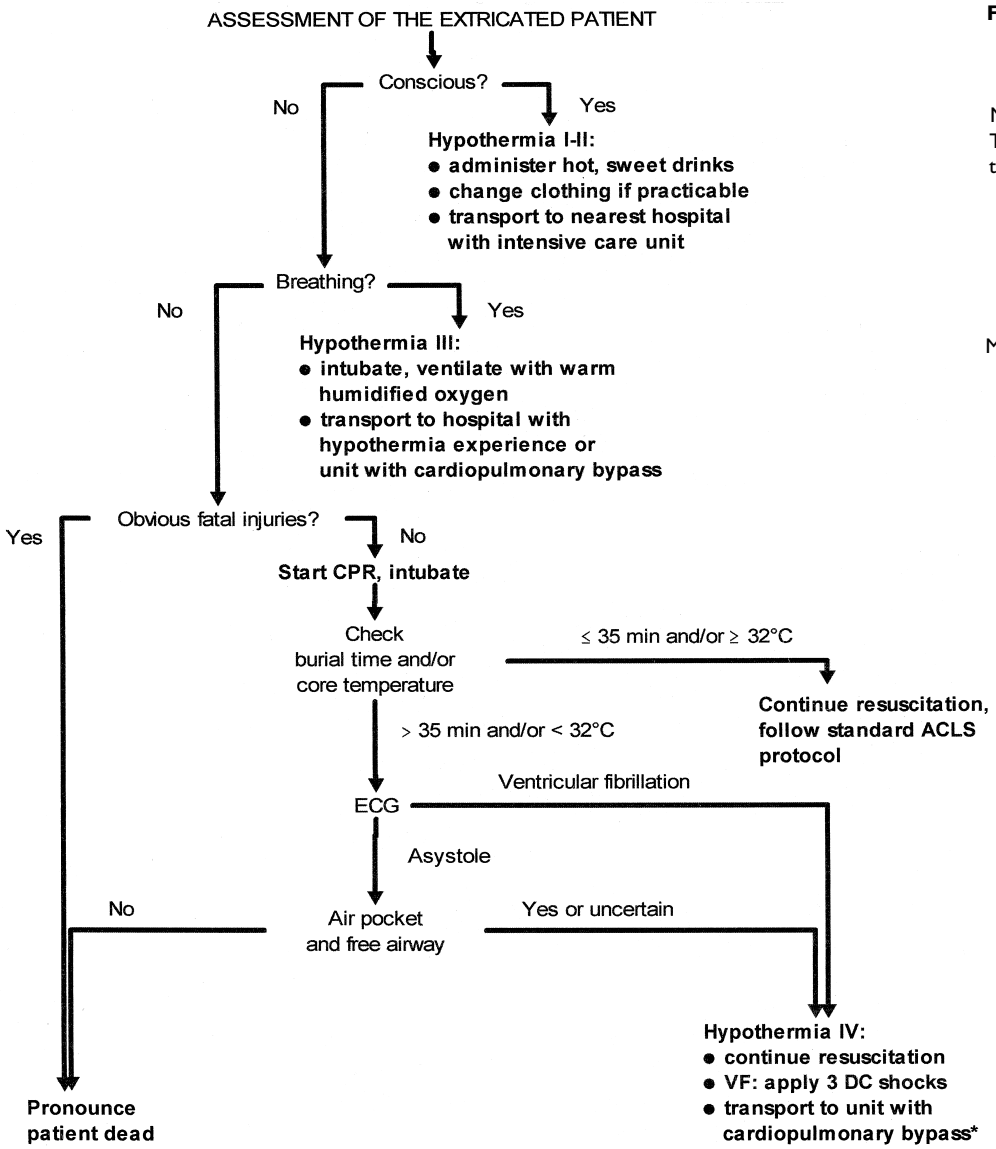

Figure 1: Algorithm for on-site management of avalanche victims. Staging of hypothermia according to Swiss Society of Mountain Medicine guidelines. * Transport to the nearest hospital for serum potassium measurement if hospitalisation in a specialist unit with cardiopulmonary bypass facilities is not logistically possible (see text). Reprint from: Brugger H, Durrer B, Adler-Kastner L, Falk M, Tschirky F: Field management of avalanche victims. Resuscitation 51:7-15 (2001).

Figure 1:

This paper has been discussed and accepted 1998 (Fanes Hut, Italy) and 1999 (Sonthofen, Germany) by the International Commission for Mountain Emergency Medicine by following members: Wiget U (President, Switzerland), Agazzi G (Italy), Aleraj B (Croatia), Beaufort J (Czech Republic), Bonthrone I (Great Britain), Brandt S (Italy), Elsensohn F (Austria), Escoda M (Andorra), Farstad G (Norway), Flora G (Austria), Forster H (Germany), Hora L (Rumania), Jakomet H (Switzerland), Krassen D (Bulgaria), Ledoux X (France), Marsigny B (France), Miko I (Slovakia), Morandeira JR (Spain), O´Gorman J (Ireland), Phleps W (Austria) Rammlmair G (Italy), Rheinberger P (Liechtenstein), Syme D (Great Britain), Swangard M (Canada), Tekavcic I (Slovenia), Thomas A (Germany), Zafren K (USA).

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Intended for First Responders and Emergency Physicians

The Medical On Site Treatment of Hypothermia

Bruno Durrer, Hermann Brugger, David Syme
1998

Preamble

Injured persons have an increased risk of cooling out. Due to altitude and wind exposure, hypothermia is a pathology commonly seen in the mountains.
The following recommendations apply for the European Alps with many rescue stations and generally short flight distances to hospitals. In other regions these recommendations have to be adapted to the local rescue systems and local medical facilities.
For practical rescue work and instruction of non medical rescue staff we distinguish between five stages of hypothermia. As criteria we use the degree of consciousness, the presence or absence of shivering, cardiac activity and core temperature. In mountaineering accidents the core temperature should be taken as often as possible. Should the core temperature drop abnormally fast, suspect a serious underlying injury.

HT I	***Clear consciousness with shivering***	***Coretemperature C°:***	***35 – 32***
HT II	***Impaired consciousness without shivering***		***32 – 28***
HT III	***Unconsciousness***		***28 – 24***
HT IV	***Apparent death***		***24 - 15 ?***
HT V	***Death due to irreversible Hypothermia***		***< 15 ? (< 9 ?)***

1. On Site Triage: who is dead?

Severe hypothermic victims with asystole can be resuscitated successfully even after a few hours of cardiac arrest. Therefore, prior to establishing death in the field, the mountain rescue doctor always has to exclude a HT IV. An ECG

and a field thermometer (in HT I-III: tympanic; in HT IV/V: oesophageal temperature recommended) are needed as aids A wrongly indicated resuscitation can put the the rescue team under unnecessary risks.
After having excluded lethal injuries, the rigidity of thorax and abdominal muscles, core temperature and the ECG are decisive.

ON-SITE TRIAGE:	Exclude lethal injuries!	
	HT IV	HT V:
Clinical findings	No vital signs Chest:compressible Abdominal muscles: Kneadable	No vital signs Not compressible Not kneadable
ECG	Ventricular fibrillation Asystole	Asystole
Coretemperature:	Above 15° Celsius (?)	Below 15°Celsius (?)
Potassium: **(in the nearest hospital)**	Below 12 mmol/l	Above 12 mmol/l

Serum potassium can be used as a criterion for triage only, if hypothermia is combined with asphyxia e.g. avalanche, immersion (cave: hemolysis, rhabdomyolisis). The on-site determination of the serum potassium is in evaluation at present.
Recently some clinical centres have begun to offer rewarming by cardiopulmonary bypass (CPB) without full heparinization of the patient. Consequently, rescue doctors have to decide whether there is a HT IV with additional injuries or a dead patient with lethal injuries and subsequent cooling down.

Medical On-site Treatment of Hypothermia

HT IV:

As soon as the diagnosis of HT IV is confirmed, resuscitation is started (including intubation and ventilation, preferably with humidified warm oxygen) as soon as its continued maintenance can be guaranteed. The frequency of heart massage is the same as in normothermic patients. Whether or not a HT IV should be prevented from further cooling out, is a matter of discussion (metabolic icebox vs. low irreversible limits of the the core temperature). During the evacuation there is always the risk of the core temperature decreasing beyond reversible limits. For this reason most rescue doctors consider a proper protection against further cooling out in HT IV as necessary.. This is usually done by insulation and heat packs on the trunk. I.V. medication and perfusions are considered not to be necessary in HT IV. Defibrillation below a core temperature of 28 degrees is supposed to be ineffective. Therefore only one attempt with 360 J should be tried in case of ventricular fibrillation. The air-transport of the victim to a hospital with CPB facilities is recommended.

HT III:

Very careful handling helps to avoid life-threatening arrhythmias. In HT III peripheral vessels are difficult to locate and it takes usually some time to do an IV. If an IV-line can be established without delay (within about 5 minutes). Only NaCl 0,9% should be perfused. Whether a HT III patient has to be intubated at the site of accident or not, is still a matter of discussion. For the intubation of a patient with protective reflexes an IV line is needed for the application of medicaments. The risk of a further heat loss during the time of treatment and transport has to be evaluated in relation to the advantages of the intubation. There is an increased risk for further cooling out in HT III and a proper protection against further heat loss is of utmost importance. ECG monitoring has to be started as soon as possible. We recommend to transport the victim to a hospital with active rewarming- / CPB facilities.

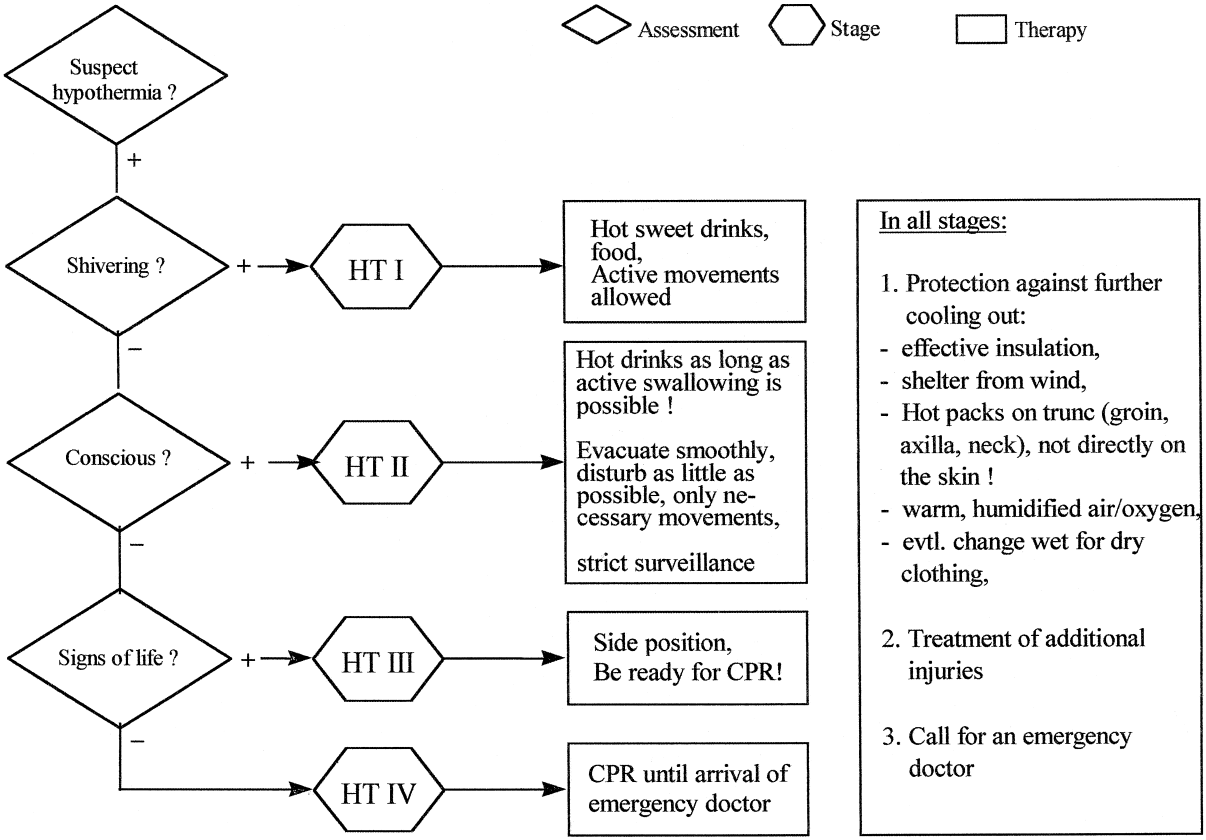
HT II:

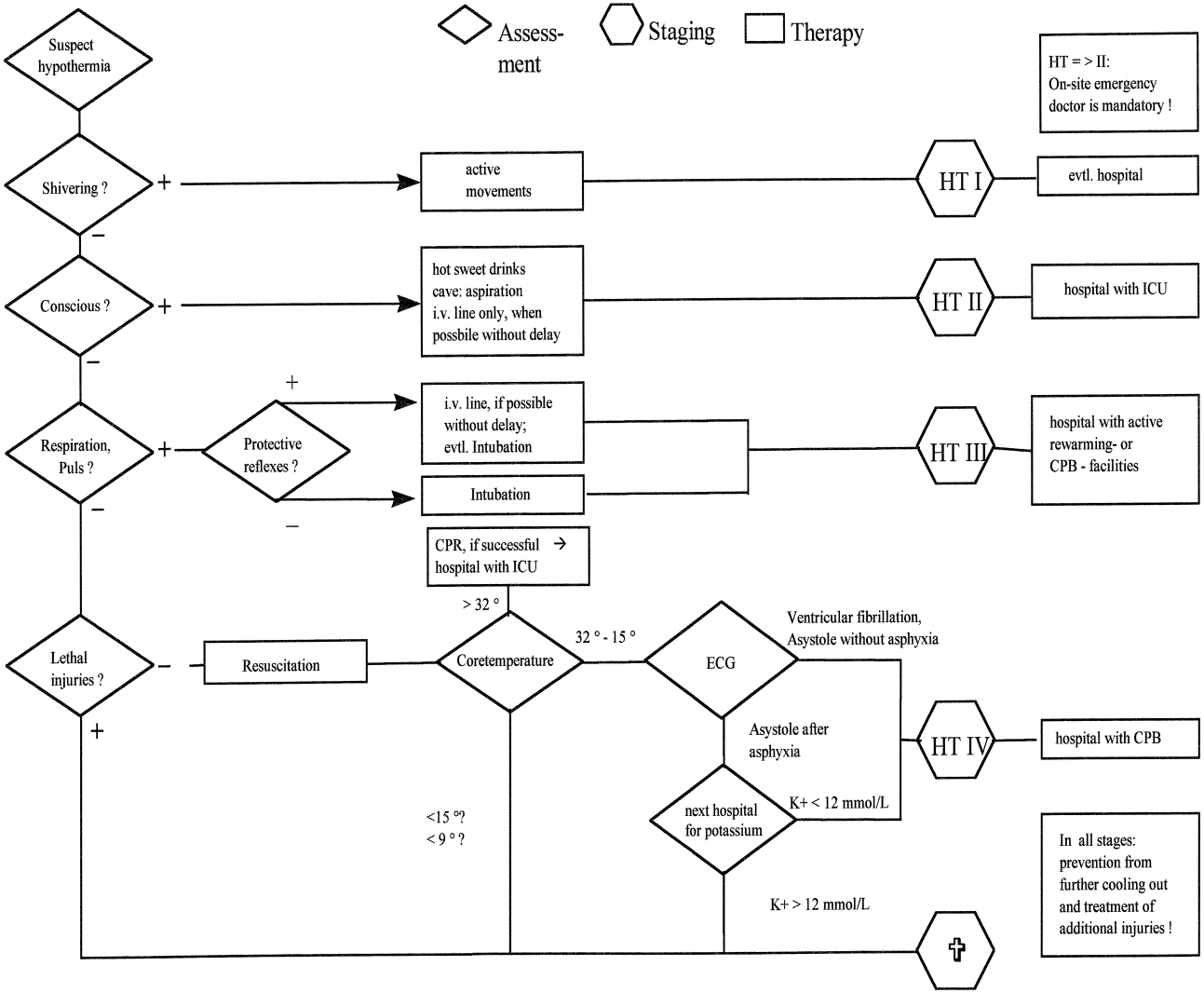
In case of a victim having an impaired consciousness very careful handling is necessary to avoid life-threatening arrhythmias. If swallowing is possible, fluid intake, preferably hot and sweet drinks are recommended. Strict supervision is necessary. We recommend to transport the victim to a hospital with Intensive care unit.

HT I:

Injuries in the mountains are often combined with mild hypothermia. Shivering should not be used as the only clinical indicator of HT I. Changing wet for dry clothes, hot drinks and insulation help to prevent a further cooling out of the patient. Non- injured victims do not have to be transported to a hospital in all cases. On-site treatment of hypothermia victims is the „art of the possible„. With increasing data about on-site core temperatures, we will gather more information about the optimal preclinical treatment and the limits of the reversible core temperature.

Algorythm Hypothermia for First Responders




Assess-
ment
Staging
Therapy
Suspect hypothermia
Shivering ?
Conscious ?
Respiration, Puls ?
Protective reflexes ?
Lethal injuries ?
Resuscitation
active movements
hot sweet drinks
cave: aspiration
i.v. line only, when possbile without delay
i.v. line, if possible without delay; evtl. Intubation
Intubation
CPR, if successful → hospital with ICU
> 32 °
32 ° - 15 °
Coretemperature
ECG
Ventricular fibrillation, Asystole without asphyxia
Asystole after asphyxia
next hospital for potassium
K+ < 12 mmol/L
K+ > 12 mmol/L
<15 °?
< 9 °?
HT I
HT II
HT III
HT IV
HT = > II:
On-site emergency doctor is mandatory !
evtl. hospital
hospital with ICU
hospital with active rewarming- or CPB - facilities
hospital with CPB
In all stages: prevention from further cooling out and treatment of additional injuries !

Intended for Mountaineers

On Site Treatment of Frostbite for Mountaineers

David Syme
2000

Definition

Frostbite is a localised cold injury. It may be superficial or deep. It may lead to amputation of the frozen part.

Predisposing factors	Dehydration/Exhaustion/Lack of Fitness Poor Insulation/humidity/windchill Immobilisation Injuries e.g. Fractures High altitude Previous Frostbite Restriction of Circulation by Equipment e.g.Harness, tight boots, watch, rings. Pre-existing illness e.g.diabetes, Raynaud's syndrome Alcohol/ Nicotine/ Drugs
Prevention:	Frostbite is preventable, by avoiding the predisposing factors. In particular, boots and gloves should be good, windproof and not too tight

Recovery of sensation after 10 mins rewarming may indicate superficial frostbite, with a good prognosis but indicates that prevention has failed. Recurrence is likely unless prevention is improved

Symptoms/Signs:
- White pale tissue with numbness
- Increasing loss of sensation without pain

Emergency Treatment

1. In the Open with possible onset of frostbite

- Move out of the wind/consider turning back/drink fluids (Warm if possible)
- Remove boots - but consider may be problems with replacement if swelling occurs
- Remove socks/gloves if wet. Change for dry
- Warm by placing foot/hand in companion's armpit/groin for 10 minutes only
- Replace boots
- Give one aspirin or ibuprofen to improve circulation (if available and not contra-indicated)
- Don't rub affected part - may cause tissue damage.
- Don't apply direct heat

If sensation returns	-can continue to walk
If no return of sensation	- go to nearest warm shelter (hut/base camp) - seek medical treatment.
At High Altitude:	Give Oxygen, if available

2. Base Camp, Mountain Hut or other Stable Sheltered Situation

- Remove boots / change wet clothing for dry / remove rings from fingers
- Warm fluids to drink (+/- alcohol)
- Aspirin 500 - 1000mg or ibuprofen 400 - 800mg for pain relief and to improve circulation

Rapid Rewarming:

- Never use dry Heat / never rub
- Immerse part in warm water (with disinfecting agent if available) at 37°C. (="baby bath" temperature, check with elbow)
- Add further hot water to maintain temperature
- Warm the affected part to the same temperature as the rest of the body, or till colour returns (Approx. 1 hr for foot)
- Dry, then carefully apply loose bandaging, sterile if possible. Elevate

Casualty cannot walk after rewarming of feet, transport is mandatory
The procedure causes large blisters. Do not burst them.

Remember:

Do not: **rub with snow or other material**

Do not: **revarm one part if the casuality has hypothermia**

Do not: **start rewarming if there is a possibility of refreezing**

Do: **get medical help as soon as possible-**
if circulation of the frozen part is not restored within 48 hours, loss of the frozen part is possible

For Mountain Emergency Physicians

Small Volume Therapy in Mountain Rescue

Alfred Thomas
2002

Introduction

Volume therapy in trauma patients in the mountain environment entails several problems that have to be taken into account properly to be of benefit for the patient. Hypothermia is present in nearly every trauma patient in the mountains irrespective of the season. Large amounts of could iv-solutions precipitate a drop of core temperature. Due to cold ambient temperature, restricted and time consuming access to IV sites, and difficult rescue maneuvers/ transportation in rough terrain, the application and management of iv-lines in a rescue situation must be handled differently than in the normal setting.

Therefore, small volume resuscitation (SVR) with hypertonic solutions might be especially favorable for volume therapy in the mountain setting because of:

1. Low volume and weight
2. Can be kept warm more easily
3. Very short time of administration (3-5 minutes)
4. Highly effective within minutes

Indications

Traumatic/hemorrhagic/hypovolemic shock, especially in combination with severe brain injury
No contraindications in the prehospital emergency setting

Procedure

1. Introduce and secure one large bore iv catheter
2. Administer body warm hypertonic solution as rapid bolus in 3-5 minutes
3. Evaluate effect on blood pressure, heart rate and peripheral microcirculation
4. Maximum dosage of hypertonic solutions for adults: 4 mL/kg body weight
5. Continue with standard isotonic cristalloid or colloid solutions.

Do not:

1. Administer large amounts of cold solutions (hypothermia!)
2. Continue infusion during transportation through rough terrain (Uncontrolled, disconnection of line, venous air embolism)
3. Waste time with overaction (e.g. more than two iv-lines)
4. Overload with volume in case of uncontrolled bleeding

Small volume resuscitation in haemorrhagic shock, the essentials

A small volume of a hypertonic/hyperoncotic solution restores hemodynamic stability and improves microcirculation due to a rapid mobilisation of fluid from erythrocytes, vascular endothelium, and the interstitial space.

1. Transient osmotic translocation of extracellular and intracellular water into the vascular compartment
2. Prolonged increase in venous return
3. Peripheral vasodilation
4. Decrease of ischemia induced adhesion of leucocytes on vascular endothelium
5. Reduction of endothelial cell edema, optimizing of flow properties of blood with improvement of capillary perfusion
6. Redistribution of regional blood flow
7. Improvement in myocardial contractility

SVR is highly effective when administered rapidly within 3-5 minutes. Despite the high osmolarity of ~2400 mosmol/l peripheral iv administration is well tolerated. Because of the temporary effect (30 min) of the hypertonic solution volume therapy should be continued with isotonic cristalloid and colloid solutions when necessary.

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Official Statement of the International Commission for Mountain Emergency Medicine

Activation and Rational Use of Rescue Helicopters

Iztok Tomazin
2001

The aim of Emergency Rescue and Emergency Medical Service is to attend the patient rapidly, provide quality on scene care, and take the patient to an appropriate hospital.
The use of a helicopter for these purposes is necessary when it has clear advantages for victims in comparison with ground rescue and transport. Primary rescue helicopters must all be staffed by an emergency doctor, or doctor specially trained in emergency medicine, a rescue assistant and appropriate rescue and medical equipment. .The main goals for using a rescue helicopter are:

1. To provide, as fast as possible, access by a rescue team with medical personnel, including a doctor.
2. To provide necessary medical diagnosis and treatment on site.
3. To provide fast and gentle transport of victims to the proper medical institution (hospital).

The activation of a rescue helicopter is ruled by national rules. One of the main rules should be that, whenever the doctor in the field or through data from the site of accident, judges that it is necessary for the rescue helicopter to be used, it must be activated immediately, without any mediators and delays. Medical doctors must have the competence to activate a rescue helicopter independently according to their judgement of medical and other indications for the intervention. Many times it is of vital importance that a helicopter rescue team, including a qualified doctor, reach the site of accident as soon as possible to perform diagnosis, treatment and evacuation of the patient. So, the helicopter team which is nearest to the site of accident and well equipped with appropriate material should be sent out, regardless of service (army, police, private etc), district or state.

Chapter 2

UIAA MEDCOM Recommendations

Recent Developments in Mountain Medicine Education

Patrick Peters, M.D.

Introduction

While in earlier days mountaineering and climbing in their different forms were „exotic" disciplines practised by only small groups of people, they have evolved lately into „trendy" sports attracting larger numbers of sometimes unprepared adepts. This increase was achieved as well by adding a number of subspecialties (e.g. sport- and icefall climbing, mountain biking, river rafting) as by opening up new remote parts of the world for trekking and expeditions. Unfortunately, this rapid growth lead to a similar rise in accidents and high-altitude problems.
The medical community was thus faced with the problem of dealing with these incidents and providing adequate counselling for their patients preparing to enter one of those sports. As the various mountain sports induce very specific problems not dealt with e.g. in normal sports medicine programs, there was the need for specialised education teaching the different medical aspects of these mountain sports.

Development of Guidelines for Mountain Medicine Education

The above described situation was dealt with by the parallel organisation, in different countries, of courses offering part of the specialised education needed to face medical incidents in the alpine or in the remote-country setting. As the content of these courses varied and a compatibility between courses was not given, the ICAR MEDCOM (International Commission for Alpine Rescue Medical Commission), in co-operation with the UIAA MEDCOM (Union Internationale des Associations Alpinistes Medical Commission), developed a first set of proposals for the contents, length, circumstances and international impact of a mountain medicine educational program, by this way establishing minimal requirements.
These proposals were followed in 1995 by a very detailed working paper of the UIAA MEDCOM redefining structure, contents and aims of the courses and presenting the courses themselves as a system of linked theoretical and practical elements. Exact specifications were given for course cycles, time requirements, presentation of topics. At the end of

the course cycle, a diploma would be issued to the candidates who passed a final examination. This diploma would be accepted by the university awarding it; as well as by the international bodies and commissions dealing with mountain medicine (ICAR MEDCOM, UIAA MEDCOM, and the International Society for Mountain Medicine [ISMM]).
As it was nearly impossible for the well-established and running national courses to integrate these detailed proposals into the organisation of their courses, Thus ICAR and UIAA MEDCOM decided to issue a set of minimal requirements approved by both commissions and the ISMM. These recommendations could be integrated into the programs respecting national and regional needs and standards while maintaining minimal requirements for content, duration and length of the courses.

The International Diploma of Mountain Medicine

National courses fulfilling the minimal requirements defined by the work of the commissions and enumerated below receive an approval and are issued a UIAA-ICAR-ISMM label. They are allowed to confer the International Diploma of Mountain Medicine to their successful candidates.
The course cycle is divided into a common course and two specialised courses (rescue and expedition medicine respectively) which can be integrated into the common course. The common course and one specialised course adding up to at least 100 hours are necessary to obtain a diploma. No definite recommendations are given for examinations. Contents of the common course include altitude, hypothermia, avalanche rescue, survival, practical trauma, alpine techniques, first aid kit and legal aspects. Most contents are repeated in the specialised course with more detailed and up-to-date knowledge of e.g. in the expedition medicine course altitude, cold, medical kit, improvised rescue techniques, and practical expedition medicine (how to avoid pitfalls).
Approved courses for mountain medicine include the course organised in co-operation with the Austrian and the German societies for mountain medicine, both courses organised in Spain (University of Zaragoza, University of Barcelona) [year of approval 1997] as well as the courses given by the Nordbadischer Sportbund, Germany and the Swiss Society for mountain medicine in co-operation with the MedCom of the Swiss Alpine Club [year of approval 1998].

Synopsis of Mountain Medicine Courses

At the moment there are 13 different mountain medicine courses held in the following European countries (in alphabetical order): Austria/Germany (1), France (3), Germany (1), Italy (2), The Netherlands (1), Spain (2), Switzerland (1) and United Kingdom (2). Following is specific information about the different courses, for full details please refer to "Mountain medicine education in Europe", Wilderness and Environmental Medicine, 9, 19-27 (1998). The addresses of

all course organisers are listed in the appendix.

Austria/Germany

The approved combined course in Austria/Germany offers a complete cycle with 3 courses covering most topics of mountain medicine. Candidates having completed the 3 courses can take a final examination (multiple choice questions) leading to the diploma. The first 69 candidates with final exam graduated end 1998. Furthermore a separate, non approved trekking/expedition medicine course is organised.

France

ARPE (Association pour la recherche en Physiologie de l' Environnement), together with Université Paris XIII, developed the first course in mountain medicine in 1984. Since then each year 30 doctors can enrol in this course with theoretical lectures in Paris and practical exercises and workshops in Chamonix in co-operation with the ENSA (Ecole Nationale de Ski et d' Alpinisme). The major topics are high-altitude medicine and practice of medicine in isolated remote regions.

The University of Grenoble is offering a mountain and rescue medicine course divided into theoretical and practical parts. A final written examination is taken.

The University of Toulouse is offering a mountain rescue course divided into 3 modules of 5 days each adding up to 160 hours. Special topics include the therapy of snakebites and special analgesia techniques in the mountains (e.g. nerve blocks).

Germany

A course cycle with 2 modules, one each in winter and summer, is offered by the Nordbadischer Sportbund. The course is approved as well for the diploma in mountain medicine as for the German curriculum in sports medicine. All topics are covered and special focus is put on the practical aspects of mountain medicine.

Italy

The University of Modena organises a three part course for doctors with mountaineering skills and a special interest in mountain and emergency medicine. 20 doctors are educated each year. An oral final exam has to be passed.

The University of Padova also offers a course divided into theory and practice. Admission is based on applications and an admission examination.

The Netherlands

The Dutch Alpine Organisation is regularly organising information weekends about mountain medicine. The last weekend course in 1998 was conjointly organised with the UIAA MEDCOM Assembly 1998, thus allowing different national delegates to give talks and help teaching during this very well organised meeting.

Spain
The University of Zaragoza has embedded their course divided into 5 modules into postgraduate study programs. After 2 modules, the graduate obtains the University Diploma in Emergency Mountain Medicine (UDEMM), after 4 modules the University title of Specialist. After module 5, which is a practical year in a professional rescue team, a master's degree is awarded.
At the University of Barcelona, the mountain medicine course is part of the master's degree in "Tropical Medicine and Medical Geography", and is organised and managed by the iemm, Institut d'Estudis de medicina de Muntnya. The complete course cycle now consists of 4 modules adding up to 150 hours and dealing with high altitude medicine, mountain sports medicine, alpine techniques and emergency mountain medicine.

Switzerland
Each year, a full course (alternating between winter and summer respectively) and a shorter intensive refresher course are offered. A cycle combines a full winter and summer course and leads to the diploma. All topics are covered and the seasonal mountain sports practised.

United Kingdom
A long weekend is regularly organised at Plas-y-Brenin, a national mountain education centre in North-Wales. Theoretical aspects are covered in lectures and are completed by hands-on-workshops in Snowdonia.
A basic short course is offered in Scotland dealing specifically with the medical problems arising from the practice of mountain sports in the Scottish Highlands.

Summary

By the end of 1998, 3215 doctors had a first contact with mountain medicine by either completing a weekend, a module or a complete course cycle. Out of these 3215 doctors, about 2300 doctors did at least 1 full week of mountain medicine education and a minimum of 1400 doctors did a full course cycle.

Appendix
Address list of course organisers

Austria
Sekretariat der Internationalen Lehrgänge für Alpinmedizin
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The Transfer of Blood-to-Blood Infection in Climbing Competitions

1993

Hygienic Measures

Principally speaking, in blood lies a high-risk medium for infection. In an epidemiological sense, the danger of HIV (AIDS-virus) is relatively low as compared to that of Hepatitis-B or even perhaps Hepatitis-C. The exact infection mechanisms are not fully known.

Direct contact (skin contact) with blood or other body fluids is to be avoided under all circumstances, especially in the case of injuries or skin deseases, where a reduced barrier effect is encountered.

The best possible protection is ensured through the disinfection and subsequent cleaning of all parts (as well as hands contaminated with blood or other like contaminating substances) with a bacterial, viral and fungal disinfectant, with a particular working on Hepatitis-B, Hepatitis-C and HI-viruses (disinfectants which contain aldehydes or active chlorine for surface disinfection, preparations containing 70-85 % alcohol for skin disinfection). The medical personnel in charge must wear disposable gloves according to WHO specifications, whereas latex gloves have proven more dependable than equivalent vinyl variety.

Preventive measures against viral cross-infections are, in this way, satisfactorily fulfilled.

HIV and Hepatitis Positive Climbers

Excessively-demanding sports, such as climbing, are not recommended for HIV-positive sportspersons. In addition to the high risk of contagion, the bodily exertions strain the immune system with the known typical consequences.

But in our opinion HIV-positive climbers should not be banned for many reasons, and if hygienic measures are carried

out a ban is not necessary.

Apart from this, each climber must bear the responsibility for themselves in terms of the risks involved in sporting injuries, as well as the dangers of passing on infections. Relevant preventive measures are the responsibility of the individual themselves.

In our opinion no specifically qualified personnel is necessary to prevent virus-contaminations during climbing competitions. However, the rescue team personnel should be generally informed about the risks from viral deseases, blood contagiousness, and should therefore be acquainted with the appropriate measures.

Among the most important precautions are hand-washing, safety clothing and handwear, sterilization, disinfecting and cleansing, inoculations and appropriate support information. The utmost importance should be focused on the experience and handling of cannulae, sharp and/or pointed instruments, and appropriate disposal containers. Mouth-to-mouth respiration masks, which avoid direct mouth-to-mouth contact, are also of great importance. Mouth protection, safety glasses, and such similar wear should be worn during intubation or siphoning operations.

People with Preexisting Conditions Going to the Mountains

S. Milledge

Introduction

This paper is intended for Doctors and interested non-medical persons. As more and more people are taking holidays at altitude, many of them are elderly, there are going to be a number suffering from chronic medical conditions. How should they be advised?

Effect of Altitude and the Mountain Environment

At altitude the low barometric pressure means that the oxygen inhaled is at a lower pressure than at sea level. This in turn means that the oxygen transport system of the body is operating under difficulties and any chronic condition which effects this system will make matters worse. Thus diseases of the cardio-respiratory system are especially likely to interfere with performance at altitude.

Apart from the effect of altitude itself, the mountain environment poses other hazards. The great ranges are situated mostly in under-developed countries and in wilderness areas where gastro-intestinal problems are common and medical help uncertain. Altitude holidays usually involve quite strenuous exercise and put a strain on the joints, especially knees, hips and backs. Finally the different culture and life style of such a holiday may impose psychological stresses which may be too much for some people unused to the difficulties and privations of such a trip.

There is also the consideration that on an expedition or trek the aphorism, "No man is an island" applies with greater force than in normal urban life. One member's illness affects the whole team and may even imperil the safety of other members. Therefore it is ethically imperative that if a person knows he/she has some pre-existing condition which might affect his performance, he should make it known, at least to the leader or medical officer if there is one.

Specific Conditions

A few of the commonest conditions are discussed here. Further reading is suggested at the end of the paper.

Respiratory

Conditions such as **chronic bronchitis, emphysema (COPD)** and other lung conditions which cause breathlessness at sea level are obviously going to cause even more shortness of breath at altitude. However **asthma** sufferers usually find they have less trouble at altitude. Although they may be breathing cold dry air, which can be a cause of bronchospasm, because of the absence of the allergens in the air at altitude, in the majority of cases, they have less wheeze. The increased sympathetic drive and adrenal steroid output may also help. They should, of course, take a good supply of their usual medication.

Cardiac Conditions

Clearly patients with symptomatic heart conditions (e.g. **unstable angina, heart failure** etc.) should not go to high altitude, but patients with **systemic hypertension** controlled by medication seem not to be at increased risk nor do patients following successful **coronary bypass surgery** or **angioplasty** who have good performance at sea level. Patients with **angina** controlled by drugs should certainly consult their cardiologist before considering an altitude trip. The question of whether altitude is a risk factor in the aetiology of **coronary occlusion** in previously asymptomatic people, is unknown but the best evidence is that it is not a significant factor.

Blood Disorders

Patients with **anaemia** will be more short of breath at altitude and some women may have low iron stores so would benefit from taking iron tablets when going to altitude. But for the majority of people these vitamins are unnecessary. Patients with **bleeding** or **clotting problems** should not go to altitude. Although the effect of altitude on the clotting system is debated the remoteness from medical help is reason enough to advise caution. Similarly patients on **anticoagulation therapy** for any reason should probably be advised to choose a holiday where medical help is readily available. Patients with **sickle cell disease** also should not go to altitude. Even with sickle cell trait there is a 20-30% chance that altitudes above 2000 m may trigger a crisis. **Aspirin** is taken by a number of people going to high altitude with the idea of reducing any risk of thrombotic problems due to the high haematocrit of altitude. We have no evidence either way for this practice but the usual precautions in taking aspirin (or any NSAIDs) must be stressed.

Endocrine Disorders

Diabetes mellitus
Altitude itself probably does not have any effect on diabetes and many diabetics have enjoyed holidays in the mountains. However the increased exercise is likely to reduce the insulin requirements and, if this is not allowed for, hypoglycemia is a risk. Both the patient and companions need to be aware of the risks of hypo- and hyperglycemia and know how to recognize and treat these problems in the absence of medical help.

Steroid therapy.
Patients who have been on steroid replacement therapy for adrenal failure, should increase their steroids on going to altitude to cover the increased requirement due to the stress of altitude.

Gastro-Intestinal Disorders
The commonest medical problems amongst trekkers are usually diarrhoeal disorders and anyone with a chronic pre-existing condition of this sort, e.g. **Crohn's or ulcerative colitis** should probably not plan this sort of holiday. Peptic ulcer should be treated before going into the high mountains. Similarly conditions such as **hemorrhoids, fissure in ano** etc. considered trivial at sea level can cause real problems in the mountains and need to be dealt with before the trip.

Neurological Conditions

Migraine.
Many migraine sufferers find that ascent to altitude triggers an attack, often a severe one with neurological symptoms. It can be difficult to distinguish this from AMS or even HAPE although the headache of AMS is not usually unilateral, as it is typically in migraine. Migraineurs should take a supply of the drugs that usually help them and use the drugs at the first sign of an attack. If in doubt about the diagnosis, especially if symptoms persist after using drugs which normally relieve symptoms, the patient should be treated as for AMS or HACE.

Cerebro-vascular disorders.
Patients with known or suspected cerebro-vascular problems such as TIAs, previous strokes or carotid artery stenosis should probably be advised against altitude travel because of the risk of thrombosis with the high haematocrit.

Epilepsy.

Contrary to what might be expected, there is no evidence that altitude increases the risk of an epileptic seizure, so patients who's epilepsy is well controlled can enjoy holidays at altitude with the same confidence as would apply to hill walking at low altitude.

Joints and Ligaments

A trek, particularly long down-hill sections, will reveal even slight weaknesses in weight bearing joints. Again this is not due to altitude itself and would-be trekkers can test themselves out at low altitude. Non-steroidal anti-inflammatory agents are valuable in this area and a good supply of various drugs should be taken. They should be started early (taken on a full stomach) and in adequate dosage rather than being heroic about the pain.

ENT and Dental Problems

Nasal polyps which interfere with breathing should be dealt with prior to the trip as should any outstanding dental problems. Dental abscesses seem to be very common at altitude, possibly as a reflection of reduced immune function. They can usually be kept under control by antibiotics until return home.

Mental Outlook

For the majority of people venturing into the high mountains is a wonderful experience even if, at times, the conditions are harsh and uncomfortable. Most have graduated via family trips into the hills, short camping trips near home, hill walking etc. But some suddenly get the idea that they want to make some big trip with no previous experience and have quite unrealistic ideas of their own performance. Sometimes all works out well and they adapt to what is a very different life style, with no problem, but others are clearly psychologically quite unsuited to it and become psychiatric casualties, to the distress of themselves and their companions.

Summary

An account of this sort inevitably focuses on the gloomy side. Many people with chronic conditions can nevertheless enjoy holidays in the mountains. The important thing is to assess the situation realistically, take advice, be honest with oneself and one's companions and tailor the trip to one's abilities.

Further reading:-

1. Ward, MP, Milledge, JS and West, JW. (1995) High Altitude Medicine and Physiology 2nd Ed. Chapman & Hall, London p543-53.
2. Hultgren, H. (1997) High Altitude Medicine. Hultgren Publications, Stanford. p424-70.
3. Pollard, AJ and Murdoch, D. (1998) The High Altitude Handbook. 2nd Ed. Radcliffe Press. Abingdon. P67-73.

Nutrition in Moutaineering

1994

Mountaineering in its numerous variations is, from the physical point of view, a high-performance sport. There is hardly any other sport which is as physically demanding as mountaineering.

What is "fitness"?

Physical fitness is only one component for the mountaineer`s performance, however, a very decisive one. Safety in the mountains requires appropriate fitness. Fitness can only be achieved by goal-orientated training.

Note: A mountaineer who does sufficient and appropriate exercise, who eats and drinks regularly, who chooses the correct tactical approach so that his "engine" does not "overheat", can walk or climb for hours on end without premature fatigue or even exhaustion.

Many mountaineers mistakenly believe that they can make up their insufficient fitness by taking so-called sports nutrition, energy drinks or even medication. This never works, because nutrition only tops up energy reserves, it can under no circumstances increase the individual level of performance attained by fitness.

Note: Insufficient physical fitness cannot be compensated for by specifically designed sports nutrition. Nutrition does not create performance.

"Hunger" and "thirst" are unreliable indicators - especially for overtired and unfit persons. At high and extreme altitudes a dangerous lack of appetite is usual.

Note: When mountaineering, do not eat and drink to relieve hunger and thirst, but to maintain performance!

The energy equivalent of mountaineering and climbing, estimated on average for an adult is from 6 Kcal/kg/h without rucksack, up to 9 Kcal/kg/h with a 20 kg rucksack.

Which Nutrients are Important?

Carbohydrates

(flour products, potatoes, fruit, vegetables, sugar products, egg pasta, biscuits, chocolate, jello, etc.) constitute the most important soures of energy supply for mountaineering. Energy from these foods can be released up to three times faster and with less need of oxygen as opposed to energy from fats. About half of the food supplies should consist of carbohydrates and be taken every two hours to stabilise performance.

Fats

constitute important nutritional components, but they are, however, less effective as energy suppliers. Percentage calorie intake from fat: not more than 30 to 35 %.

Proteins

(meat, egg, milk, cheese, some vegetables, some fruit, etc.) are also important for performance in the mountains. Animal and vegetable proteins should be balanced equally. Percentage calorie intake from proteins: 10 to 12 %.

Vitamins

constitute essential regulative and protective substances and should be taken together with fresh food. Therefore, a regular vitamin supply with multivitamin tablets is only necessary when eating unbalanced, vitamin-deficient food over a period of several weeks (e.g. on expeditions).

Water

fulfils many important functions for the sport organism: it serves as a constituent, solvent, means of transport and heat regulator.

Note: Perspiration and heavy breathing in cold and high altitudes can cause the loss of 2 litres of water per hour; this loss must be replaced, or else the blood thickens.

Water is lost through urine, stool, transpiration and respiration, but also through diarrhoea (up to 8 litres per day), and through vomiting in cases of severe altitude sickness.
Every loss of liquid leads to blood thickening and must therefore be avoided as much as possible. If not, the mountaineer takes great risks: early fatigue, early exhaustion, frostbite, thrombosis, thrombembolia, kidney stones.

Mineral Salts

are particularly important as building material for the bones, teeth, hormones, enzymes, haemoglobin and cells, and, dissolved in the body water (here known as "electrolytes"), they provide performance important biochemical means of transport. Water and electrolytes always belong together.

Note: Regular intake of mineral salts is of utmost importance for mountaineers. However it is not necessary to eat or drink additional mineral supplements (e.g. salttablets, mineral drinks) normal, well-balanced food contains sufficient minerals

Roughade and Taste Intensifiers:

Roughage is of great importance for a sufficient and proper digestion. Taste intensifiers encourage the appetite, which is often too small in proportion to the requirements. at high altitudes, food-taste can change or even become distorted.

Note: After an exhausting day with abundant perspiration, complete rehydration as well as reconstruction of carbohydrate stores may require more than 24 to 36 hours !

The Right Eating and Drinking Tactics in Mountaineering

- Compose your tour diet as varied and imaginatively as possible.
- Do not eat food concentrates or extremely one-sided food (e.g.exclusively vegetarian food). Eat your normal diet concentrating mainly on complex carbohydrates.
- Before the tour: have a quiet and relaxing light breakfast with plenty of liquid.
- During the tour have a short rest at least after every two hours and eat and drink while you are resting. No alcohol.
- Immediately after the tour have a light snack, drink a lot.
- The most important meal of the day is one hour after the tour: have a substantial and relaxed meal, drink a lot.

The Medical Commission of UIAA does not recognize any unique ergogenic value of products such as vitamins, L-carnitine, trace lements, glucose-tablets, wheat germ, honey, bee pollen, sunflower seeds, or electrolyte enriched beverages, and does not advocate the use of alcohol as a source of calories, muscle relaxant, body heater or ergogenic aid

The Ten health rules for Mountaineers

1994

These general suggestions are designed to guide those who are unfamiliar with mountain terrain and who wish to hike or climb (in mountains).

1

Adapt your goals and your level of activities to your actual fitnes degree. During or immediately after a fever of any form of mountaineering might be harmful.

2

Consume a diet rich in complex carbohydrates (biscuits, chocolate, jello etc.)

3

Drink as often as possible - but drink no alcohol during a tour. Alcohol reduces performance and vigilance and should therefore be avoided when walking or climbing.

4

Go slowly for the first 30 minutes of the tour in order to let the body warm up slowly.

5

Rest and eat and drink if possible every hour. You should eat a little and drink plenty, even if you are not hungry or thirsty (then it is even more important.)

6

If signs of fatigue or exhaustion arise take a long rest or consider accompanied descent. When resting eat not only glucose but also complex carbohydrates. If there are symptoms of severe exhaustion consider also the possibility of hypothermia and/or acute mountain sickness.

7

Children and seniors as well as people suffering from some chronic illness, with the necessary precautions find mountaineering quite suitable. If in doubt please consult a physician.

8

Above 2500-3000 metres increase your sleeping altitude by not more than 300 altitude metres in 24 hours. If possible do not sleep at the highest point reached on this day.

9

Even the smallest rucksack has enough room for basic equipment: Never forget sunglasses, gloves, a suncap, a bivouac bag, some spare clothes, candles and matches, a torch, a first-aid-box.

10

Seek local advice about routes, climate and weather conditions. Register your climb if appropriate.

Hiking Sticks in Moutaineering

1994

Many hikers, mountaineers and climbers use telescopic sticks, because these aid walking up/downhill and also ease the strain on the spine and the lower extremity joints, particularly the knee.
Telescopic sticks must be used with the **correct technique:**
two sticks must always be used, which are height-adjustable and which have **handles** that are constructed in a way that the user's hands - when pressing down - gain firm support. **It is of utmost importance to use two sticks as close as possible to the body's line of fall.**

Advantages

When the sticks are used with the correct technique - especially while walking downhill - the hiking stick can absorbe several tons of weight of the lower body per walking hour (NEUREUTHER, Münch, med, Wschr. 123/1981). This leads to a considerable spine and joint relief, especially in the following situations:

1. ADVANCED AGE, EXCESS BODY-WEIGHT
2. WHEN THERE ARE PREEXISTENT JOINT AND SPINAL DISEASES (i.e. arthritis, spondylitis)
3. WHEN CARRYING HEAVY BACKPACKS (i.e. on expedition)
4. WHEN HIKING ON SNOW SLOPES, AND IN THE WET, WHEN CROSSING RIVERS AND WHEN HIKING WITH LIMITED VISIBILLITY (fog, at night)

Disvantages

1. INCORRECT STICK TECHNIQUE:
   If the distance between the body and the stick is too large, not only is the strain relief greatly reduced, but a strong turning moment can result. This can threaten the hiker's balance.

2. DECREASE SENSE OF BALANCE:
   Continuous use of hiking sticks can decrease the hiker's coordination ability and through this his steadiness, although, in his own mind, he may feel safer.
   This disadvantage is becoming more and more evident and can lead to certain balancing problems, especially in difficult mountain areas, where the stick-user cannot use his hiking sticks (i.e. narrow ridges or climbing terrain). In fact, the most common type of hiking accident, a fall by tripping or stumbling, can actually be made a greater risk as a result. For these reasons such accidents occur even during the use of sticks.
3. REDUCED PHYSIOLOGICAL PROTECTION MECHANISMS:
   Strong pressure and strain stimuli are very important for the nutrition of the joint cartilage and also for training and maintaining the elasticity of the"breaking musculature". Continuous use of hiking sticks decrease these physiologically important strain stimuli.

Correct Walking Techniques to Avoid Over-strain

In general it is easier - for motion-physiological reasons (proprio-receptor system) - for healthy hikers to learn and maintain an elastic, safe and joint-relieving walking technique without the aid of sticks than by regular stick use.

The following factors are important with regards the degree of strain put on the leg joints:

• BODY WEIGHT (excess weight)
• WEIGHT OF BACKPACK
• CORRECT DOWNHILL WALKING TECHNIQUE:
The hiker should spread the strain evenly by using elastic and shock-absorbing steps over as long as possible. This means walking downhill with small, elastic steps as slowly as possible, certainly avoiding big steps or running down. Paths should be usec taking the bends, no short-cuts when walking downhill. Also, one should only undertake mountain tours in proportion to one's own physical ability.
Following this advice, healthy hikers and climbers will develop no joint problems, even after decades of intensive mountaineering.

SUMMARY

Use of adjustable sticks as a hiking aid, especially for downhill walking, is advantageous and recommendable for the following situations:

- advanced age, excess body-weight
- when suffering from diseases of the joints or the spine
- when carrying heavy backpacks

Hiking sticks are not required for any other hiking situation and should not - mainly for reason of safety - be used all the time, as a rule, particularly not by children and youths. The adavantages and disadvantages must be weighed up in each individual case.

Intended for Doctors and Interested Non-medical Persons.

Portable Hyperbaric Chambers

P.Baertsch, F.Berghold, JP.Herry, O.Oelz
2000

Portable hyperbaric chambers have been developed for emergency treatment of severe acute mountain sickness (AMS), high altitude pulmonary edema (HAPE) and high altitude cerebral edema (HACE). They are constructed from light weight fabrics and inflated using a hand or foot pump thus providing rapid pressurization of patients simulating a descent of 1500 to 2500 altitude metres.

Principles

- Prevention of AMS by adequate acclimatization is always safer than treatment including the portable hyperbaric chamber.
- The hyperbaric chamber is not suitable for prevention or treatment of mild AMS because it prevents or at least slows down acclimatization.
- It has been shown that the use of the hyperbaric chamber does relieve the signs and symptoms of severe AMS, HAPE or HACE for a while.
- The priority sequence of emergency measures with cases of severe AMS / HAPE / HACE should always be:
  1. Descent / evacuation,
  2. Oxygen / drugs,
  3. Hyperbaric chamber.
- Hyperbaric treatment should only be used as an emergency measure and does no substitute for descent or evacuation. It improves the condition of the patient for a time and it is essential to use the window of opportunity for descent or evacuation. In order to avoid rebound in severe cases of HAPE, the patient should be as exertion-free as possible after successful treatment in a hyperbaric chamber; even walking short distances should be avoided unless it is essential for descent.
- Hyperbaric treatment should always be performed in combination with special drugs (dexamethasone for severe AMS/HACE, nifedipine for HAPE) Hyperbaric treatment normally results in a significant improvement within 60 to 90 minutes.

- If there is no improvement within 120 minutes, complications of AMS or additional conditions must be considered e.g. thrombembolism, hypothermia, severe dehydration, infection etc.
- The treatment with oxygen plus drugs is generally favoured in all cases of extreme HAPE / HACE (in particular with loss of consciousness), but the amount of bottled oxygen is limited whereas the use of the hyperbaric chamber has no time limit apart from the man power needed.
- In severe cases, oxygen breathing during the treatment with the portable hyperbaric chamber is recommendable. Additional oxygen within the chamber at a flow-rate of 4 - 6 l/min from a bottle inside the bag may further improve the situation of the patient. In a portable hyperbaric chamber there is no danger of fire or explosion.
- It is a common belief that a portable hyperbaric chamber must be carried at least on every commercial altitude trip on legal grounds (liability of the organizer) although to date neither particular legal rules have been published nor has litigation been instituted.
- A portable hyperbaric chamber should especially be considered when visiting an area where there is no possibility of quick and easy descent to lower altitudes.
- Only trained persons should treat a patient with the portable hyperbaric chamber. It is very important that the user know exactly how to handle the chamber before going to high altitude. A videotape by CERTEC is available. A demonstration and exercises should be done systematically and by all group-members before ascent.
- Because the handling of a hyperbaric chamber at extreme altitudes is very strenuous, the upper limit for its use might be approximately 7000m. Above this altitude emergency oxygen plus drugs appear to be preferable.
- In case of doubt, apart from cardiac arrest, there is no contraindication to the hyperbaric treatment. Patients with loss of consciousness can also be treated in a hyperbaric chamber if their body position is appropriate.

Models of Chambers

GAMOW BAG:

This first portable hyperbaric chamber is cylindrical,
2.5 x 0.6 m and inflated by a foot pump. 12 pump strokes/min are required to maintain an internal pressure of 104 mmHg (139 mbar) and to prevent build up of CO2. Weight: 6.5 kg.

CERTEC BAG:

Conical, 2.2 x 0.65 m. For maintenance of an internal pressure of 165 mmHg (220 mbar) and prevention of CO2 build up eight strokes/min by a hand pump are required. Weight: 4.8 kg.

PAC (PORTABLE ALTITUDE CHAMBER):

Mummy shape, otherwise comparable to GAMOW BAG. Radial zipper at the head end makes access easier. No pressure gauge. Pumping procedure and pressure comparable to GAMOW BAG.
In Europe, the CERTEC BAG is more popular than the GAMOW BAG because the maximum pressure is higher. The

Certec operates at 165 versus 104 Torr for the Gamow. This is equivalent to about 800m greater simulated altitude descent. There is also a weight advantage (6.5 to 4.8 kg), easier entry into the bag and, last but not least, a lower price for customers within the EU.

Procedure of Use

The chamber has to be isolated from ground by clothes or rucksack. The patient should urinate and defecate before going inside the bag. He should be instructed to breathe normally and to "pop" his ears by swallowing as the bag is inflated. If the bag should suddenly deflate, the subject should exhale. During recompression in the chamber, the patient must be isolated from the cold by sleeping bags and covers. On the other hand, when sun is shining and the bag is not covered by shadow, heat inside the bag can be quite uncomfortable.
Typical treatment protocols are to put the patient into the bag, pump it until the pop-off valves hisses and then keep the patient at pressure for about one hour. One needs to continue pumping 8 to 12 times per minute to flush fresh air through the system and to prevent CO2 building up. Talking and reassurance to the patient while in the bag is psychologically very useful. At the end of the one-hour-treatment the patient is removed from the bag and reassessed. Additional cycles of descent and reassessment have to be done until the patient is cinically improved and is able to descend.
Patients with HAPE may not tolerate lying flat. Putting the bag on a slope or on a rigid surface and propping one end up an angle of 30° could solve this problem.

Results of Treatment

A number of uncontrolled studies reported rapid and long lasting relief of symptoms. Under controlled circumstances treatment of subjects with moderate to severe AMS for one hour at 4.559 m caused an immediate relief of symptoms. However, while remaining at the same altitude the subjects experienced the return of symptoms within 12 hrs. In another study, prolonged treatment for 3 hrs was also effacious in relieving symptoms of AMS which, however, returned after 12 hrs. There are no systematic studies of hyperbaric treatment of HAPE patients.

Problems with Hyperbaric Chambers

- Build up of CO2 if airflow is less than 40 l/min eventually may lead to CO2-intoxication.
- Anxiety and claustrophobia.
- Vomiting inside the bag.
- HAPE-subjects may not tolerate the recumbent position.
- Pumping requires a considerable effort at altitude to maintain the pressure and airflow.
- The risk of leakage of air from the zipper and valve areas if the bag is not carried and handled properly.

Paper modified by Jim Milledge, March 20 2000

I think this paragraph (below, lifted from the section on Principles) is better left out. The problem of where to keep oxygen and the bag is not a simple one. I very much doubt if the topmost camp is either practical or desirable for the one bag. Oxygen should be distributed through various camps but that is not a debate for this paper.

[The logistic problems of oxygen bottles as well as of the portable hyperbaric chamber are quite common: They are hardly ever available where they are urgently needed. Both oxygen bottles and hyperbaric chamber should therefore be stored in the highest camp.]

Emergency Treatment of Acute Mountain Sickness and High Altitude Pulmonary Edema

Oswald Ölz
1996

Mild AMS

(moderate headache, lassitude, loss of appetite, nausea, insomnia etc.):
1. Rest day, relaxation
2. Acetazolamid 2 x 250 mg
3. Aspirin, Ibuprofen

Severe AMS/HACE

(high altitude cerebral edema) (severe headache not responsive to aspirin, vomiting, dizziness, ataxia):
1. Descent, evacuation
2. Oxygen
3. Dexamethason 8 mg, followed 4 mg every 6 hours
4. Acetazolamid 2 x 250 mg
5. Pressure bag

HAPE

(shortness of breath, gurgling breezing sounds, cyanosis, tachypnea etc.):
1. Descent, evacuation
2. Oxygen
3. Nifedipin 10 mg, followed by Nifedipin SL 20 mg every 6 hours
4. Pressure bag
5. PEEP-Ventil, VPPB, PLB

Emergency Situation

with both signs of severe AMS and HAPE:
1. Descent, evacuation, oxygen
2. Dexamethasone as above plus Nifedipine as above plus Acetazolamide 500 mg
3. Pressure bag

Model Contract for Health Care on Trekking and Expeditions

Franz Berghold

A CONTRACT AGREEMENT COVERING THE HEALTH OBLIGATIONSAND RESPONSIBILITIES BETWEEN THE DOCTOR OF AN EXPEDITION OR TREKKING, AND THE ORGANISER, LEADER AND PARTICIPANTS

PREAMBLE

This is a model text, formulated by the Medical Commission of the UIAA, to specify the rights and obligations of the two parties in a trekking or other mountaineering expedition, hereafter referred to as "the expedition", the two parties being a) the expedition-doctor, and b) the organiser(s), the expedition leader and the other participants.

1. Doctor ..... is authorised in the practice of medicine, in accordance with the regulations of the medical code, and is prepared to undertake the medical care and supervision of the expedition, as organised by ..... between ..... and ..... with the objective of ..... (insert dates).

He/she has a sound knowledge of general medicine, sport medicine,high-altitude medicine and tropical medicine and can provide the medical equipment accordingly.

2. The expedition doctor is charged with overseeing the medical and general health requirements, sport and altitude care, of all expedition`s participants before and during the expedition. He carries the full medical responsibility for all concerned, with reason, under the terms and conditions here laid out.

The expedition doctor`s advice is to be sought and taken into account, in all matters of medical or major significance to the group, by the expedition leader and all its participants, and in such cases that may arise where there exists a difference of opinion, his is to be taken as final and deciding.

The group leader is to lend his immediate, unrestricted support to the doctor in all cases, without exception, where the doctor considers certain measures necessary. The doctor has top priority in any health affair.

Each participant of the expedition undertakes, in his own interests, and in those of the group, to maintain the strictest and highest standards in his personal hygiene, health and physical fitness at all times during the expedition. The doctor is himself under particular responsibility to avoid every type of health risk.

All participants undertake to respect that all health matters are the full responsibility of the expedition doctor. His instructions, being measures intended for the prevention of health risks, and for the treatment of occuring sickness and injury, in their own interests will followed by all concerned.

3. Every participant undertakes to inform the expedition doctor of problemes in their medical history, and to furnish all or any previous medical documentation as required from other doctors, such as G.P.s, specialists, doctors during treatments, and previous expedition medical officers. He is also under obligation not to attempt to hide from the doctor any health problems he may have experienced on similar previous activities. All information shared with the doctor is, under medical regulation, strictly confidential.

Every participant recognises that in many mountain areas, due to differently and often poorly-run local health systems, the medical care standards they are accustomed to in their home countries cannot be guaranteed. This is particularly true in the case of emergency transport and hospital services. The expedition doctor has little influence on this situation.

It is the responsibility of each participant to provide a medical kit for his own personal use, including a sufficient supply of necessary medicines for his particular requirements, such as

blood pressure, digestion, asthma, travel sickness and so on, as recommended and prescribed by his own doctor at home.

Every participant is to hold current comprehensive travel and medical health cover insurance, including return to origin travel, sufficient for the maximum incurrable rescue costs. Ideally, all participants should hold policies with the same insurance company. The expedition doctor is to receive a copy of the policy from every participant before departure, so in the case of an emergency, the relevant authorities can be contacted as quickly as possible.

4. In the trekking and mountaineering expedition the doctor is in particularly concerned with the following areas of responsibility:

4.1 In the Preparation Phase:

to assess the route and climbing objectives of the group, the local medical and search and rescue facilities, and to be up to date with the tropical medicine situation in the area concerned.

to make an assessment of the current physical fitness and state of health of each participant, including conducting, or arranging for, at least one sports ergometric diagnosis, and deciding on relevant prophylactic measures as necessary.

conducting any proper vaccination programme for all participants, as well as implementing tropical hygiene preventive guidelines.

to plan and oversee individual training programmes.

to create individual acclimatisation programmes, as befits his advisory role in high-altitude medicine.

to put together an appropriate medical kit for the expedition (medicines, bandages, instruments, laboratory equipment, emergency oxygen, and so on).
This medical equipment is unrelated to the personal medical kits of the participants, which remain the responsibility of the individuals themselves.

to be responsible for establishing the required number, volume and type of emergency oxygen bottles, which should be equipment compatible and cold-resistance tested, as well as other emergency equipment (e.g. hyperbaric chamber, rescue bag, etc.), the provision of which is the responsibility of the expedition organiser.

4.2 During the Expedition:

to oversee the tropical hygiene requirements, the health and physical condition, of each participant including their altitude aptitude. The conclusions as reached in this respect by the doctor are to be adhered to by all of the participants concerned, even should this entail, on medical grounds, the withdrawal of individuals or all participants from the expedition objective, a modification to the programme, or even the abandonment of the expedition altogether.

the manner in which the medical care of the participants, porters, and possibly the local population, is to be conducted, is the sole responisibility of the expedition doctor, with the support of the leader and participants.
In the case of large expedition groups, the doctor is to see the construction and equipping of an ambulance tent in the base camp, the provision of a dedicated two-way radio, the regular high-altitude control examinations of the participant at the base camp (daily body-weight, urine and pulse rate checks, and possibly altitude-related blood and eye examinations), the selection of the higher camp emergency medical equipment (medicines, oxygen bottles etc.) and, at the doctor`s instructions, their conveyance to the respective camps within the earliest possible time.

The care of the sick or injured must hold priority over all alpine activities.

Every participant is to report immediately to the doctor any health disorder they may experience.

In the case where a serious illness or injury necessitates immediate evacuation, the expedition leader and all participants are to assist in every way possible, recognising the doctor`s legal authority throughout as rescue operation commander, whose decisions and consequent orders are to be complied with, even should they undermine the objectives of the group, causing the cessation of the expedition.

During the expedition, the doctor may only participate in an ascent should either the entire group participate, or the entire party, including porters, be well and healthy. In all cases, any injury or illness takes absolute priority over the doctor`s personal climbing ambitions, and in principle he should stay close to the injured or sick at all times.

Should there be different injured or sick in more than one location, the doctor decides himself where his presence is most required.

The expedition participants recognise the possibility of the temporary absence of the doctor, should he deem it necessary to accomany a seriously ill or injured group member to the nearest suitable hospital (by surface or helicopter transport). The dotor cannot be held responsible for the consequences of illnesses or injuries during his absence. The doctor is to return to the expedition, if possible by helicopter, as soon as circumstances allow.

Intended for Rescuers, Mountain Emergency Physicians and Training Organisiations

Children Going to the Mountains

1995

General Suggestions

Healthy children can go to the mountains depending on their age and the parental knowledge of mountain environment and risks. Walking, climbing or skiing in the mountains must be a pleasure for the child and it is important to adapt the length of the activities to age and fitness of the child and to respect rest times.

Specific Altitude Risks

Children are not under more restrictions to acute exposure to altitude than adults. But they may not be able to express the symptoms of altitude sickness and so parents should therefore be aware to recognize headache, nausea, vomiting or difficulty in breathing. These symptoms should not be attributed to a childhood illness but maybe the result of altitude illness and must be evaluated by a medical professional. If medical attention is not immediately available, every effort should be made to descent. Infants with a higher risk (premature, hypotrophic, anemic, siblings SIDS antecedents) should not be taken into altitude.
The relative risk for children compared to adults is not exactly known by now but does not seem to be different at moderate altitude (below 3000 m). Above 3000 m, data are lacking and only caution can be recommended. At these altitudes the following questions are important:

DOES THE CHILD REALLY LIKE IT ?

IS PUBLICITY THE MOTIVATION FOR THE TRIP ?

AKUTE MOUNTAIN SICKNESS (AMS)

A diagnosis of AMS is based on a recent gain in altitude, at least several hours at the new altitude, and the presence of headache and at least one of the following symptoms: gastrointestinal upset (anorexia, nausea or vomiting), fatigue or

weakness, dizziness or lightheadedness and difficulty of sleeping (definition of the Lake Louise consensus).

PREVENTION OF AMS

Above 2500 m prevention must be the same as for adults:
• Progressive ascent (300 m vertical distance of sleeping altitudes)
• Moderate activity on arrival
• Descent if symptoms of AMS
There are no studies about medications preventing AMS in children (e.g. acetazolamide or dexamethasone). So, they are not recommended and it is imperative to respect acclimatisation rules.

SUDDEN INFANT DEATH SYNDROME (SIDS)

Definition: SIDS is the sudden death of any infant in the first year of life, which is unexepected by history, and in which a thorough post-mortem examination fails to demonstrate an adequate couse for death. SIDS represents a controversial problem. There are theoretical reasons to think that the risk is higher at altitude because of hypoxia, but studies are few and contradictory.
Infants are at risk until one year of life, with the maximum risk being between 2-4 months. Theoretically, the higher the altitude, the higher the risk. The risk must be considered in high altitude resorts, especially in winter, when respiratory tract infections are an added risk factor. According to current recommendations, it is important to avoid the prone sleeping position.

EAR, NOSE AND THROAT RISKS

Risk of otalgia or otitis is higher with rapid changes in altitude and barometric pressure. During ascent and descent by car with babies, let them suck every 300-500 m of altitude change. **If the infant has a cold** it is better to cancel the travel; if impossible clean the nose as well as possible with saline solution to avoid blockage of the nose and, with babies, stop more frequently for sucking. Do not take cable cars with sick children - the pressure changes are too rapid. **Dry, sore throat** is frequent in winter ski resorts because of dry air and overheated rooms. It can be prevented by humidification of the air.

COLD

The risk of **frostbites and hypothermia** is higher for children because of less subcutaneous fat for isolation, low energetic reserves and higher body surface / weight ratio leading to higher heat losses. Clothes and huts must be adapted and should be modulated during the day by responsible adults. Since children loose a great deal of heat through their head it is important to keep their head covered to protect them from the cold.
Backpack baby-carrier in cold weather can be dangerous: The baby can cool down very fast, the compression of femoral arteries slows down the blood-circulation in the legs with a risk of severe frostbites.

SUN

More than for adults, **protection from UV-rays** is essential. Use shady places to walk and rest. Protect the skin with adapted colthes and the naked skin with a high protective sunscreen. Protect the eyes with sunglasses of good quality. The child is recommended to wear a sun-hat.

NUTRITION

Drink plenty to reduce the higher risk of dehydration, which can lead to: frostbites in winter, heat stroke in summer and tendon and cartilage lesions. **Eat regularly** to prevent low energetic reserves. Do not skip a meal.

Body Mass Index and Age Limits

Dr. med. Christian Schlegel, Chairman Working group Climbing competition
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2000

1. Position Regarding Age Limits at International Competitions

Based on current studies (Schlegel/Kriemler, Hochholzer et al (both unpublished) as well as practical experience and observations, no change the age limit is required.
The member associations have to inform the athletes about training methods and routes prone to cause injuries. In addition athletes should be instructed about injuries and the treatments thereof particularly in the area of finger joints.

2. Position with Regard to Body Mass Index (BMI)

Summary of the replies from the member associations:
(Germany, Austria, Switzerland) as well as from experts (sports-pediatricians, trainers, psychologists)

2.1 Dr. Thomas Hochholzer, Innsbruck and Dr. Volker Schöffl
(German Youth team/selection)
Basically no recommendation for weight limits.
Examination of the German youth team in 11/99 did not show any anorexia nervosa, however frequently signs of iron deficiency, possibly caused by unbalanced diet.

2.2 Dr. Patrick Peters, Paderborn (Medcom Member UIAA)
Basically no recommendation for weight limits.
Recommendation: Educational campaign, information about eating disorders, early detection.

2.3 Dr. Martin Burtscher, Innsbruck
(Austrian national sports climbing team)
Basically advocates prevention, early detection etc. However, there was need for action, therefore introduction of the BMI-limits.

These BMI limits prove to be a useful tool up to the age of 16. In younger age-groups (particularly with boys) this does not appear to be the case. Eating disorders are rather on the decline since the introduction of recommended limits.

2.4 Mrs Gabi Sigrist-Madlener Bern (Swiss National sports climbing team)
Due to BMI unnecessary pressure is being put on the athletes. One punishes the constitutionally ideally built sports climber (ideal body size – weight relation, good range, no extensive hyperthrophy of muscles). Endorsement of preventive and sensitising measures. Information also of parents and trainer (responsibility). Concrete examples of youth not suffering from eating disorders with a BMI that is too low: 15 year old boy with BMI 15.97; 16.6; 16.43

2.5 Dr. Susi Kriemler, Zürich Switzerland (OA Sports Pediatrics„Triemli" Hospital, Zürich)
Preference for preventive and informative measures. Establishment of trust.

Summary of the Opinions Expressed

Most doctors and trainers involved prefer preventive and informative measures. The introduction of BMI is problematic, as obviously athletes that are not suffering from eating disorders would also have to be excluded from competing. On the other hand there are athletes with extreme eating disorders with a normal BMI, which "simply don't succeed in getting thin".
Therefore the UIAA Medical Commission proposes the following measures to be taken:

Measures for Avoiding Eating Disorders in Competition Climbing

1. Information events for athletes, trainers and parents of athletes about eating disorders, their consequence and their therapy.
2. Twice a year registration of size, weight, (evolution in percentage), percentage of fatty tissue, BMI and stage of puberty. It is important regarding percentage of fatty tissue (if bioimpedancy is being applied) that the apparatus has an integrated "youth" formula, as the one for adults would not be correct.
   If one measures skinfolds, it is recommended to apply the youth formula e.g. established by Slaughter et al. (88).
3. Use of a questionnaire about eating disorders such as EAT or "female athlete questionnaire" with questions about eating disorders and, for female athletes, questions about menstrual cycles.
4. If eating disorder is suspected, make a careful assessment and possibly start therapy, which may be multi-disciplinary.

Acknowledgement

We thank the President of the Italian Mountain Rescue Organisation, Armando Poli for funding the booklet and Roberto Buccelli for the help in translations and formatting of the papers.

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