

**POCKET  
FIRST AID AND  
WILDERNESS MEDICINE**

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**POCKET  
FIRST AID AND  
WILDERNESS MEDICINE**

**by**

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**and**

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*To the local people who make our journeys possible.*

### WARNING

This book is offered to people who find themselves managing accidents or illnesses in remote situations without immediate access to medical help. It contains advanced treatments and techniques as a reminder to people who have been trained to carry them out. Do nothing above your skill level. If you are not sure or don't know it, don't do it!

Comments, suggestions and criticism are always welcome: contact the authors at [info@treksafe.com.au](mailto:info@treksafe.com.au) ([www.treksafe.com.au](http://www.treksafe.com.au)).

*Front cover:* Camp 2 at midnight, Western Cwm, Mount Everest, SW face (1975)

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## ACRONYMS AND ABBREVIATIONS

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AMS	acute mountain sickness
BLS	basic life support
cap	capsule (of medication)
cm	centimetre(s)
CO	carbon monoxide
CPR	cardio pulmonary resuscitation
CSMS	circulation, sensation, movement, strength
DCI	decompression illness
DRSABCS	deadly bleeding, response, send for help, airway, breathing, circulation, specific situations
ETA	estimated time of arrival
EPIRB	emergency position indicating radio beacon
g	gram(s)
HACE	high altitude cerebral edema
HAPE	high altitude pulmonary edema
IM	intramuscular
IV	intravenous
L	litres
L/min	litre(s) per minute
LLS	Lake Louise Score
LZ	landing zone
m	metre(s)
mg	milligram(s)
min	minute(s)
MOI	mechanism of injury
NSAID	non-steroidal anti-inflammatory drug
ORS	oral rehydration solution
PIB	pressure immobilization bandage
PLB	personal locator beacon
psi	pounds per square inch
SAR	search and rescue (organization)
SC	subcutaneous (under the skin)
STI	sexually transmitted infection
tab	tablet
™	trademark (indicates a trademarked name)

## CONVERSION TABLES

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1 litre	1.75 pints (British), 2.1 pints (American)
2.5 cm	1 inch
1 metre	3.3 feet (39.4 inches)
1 km	0.6 mile
1 kg	2.2 pounds
1°C	1.8°F
37°C	98.6°F

### *Acknowledgements*

Thank you to all our friends and colleagues who contributed advice. Some of them are mentioned below but there are many others, including the trek leaders and guides we trained on our courses, who gave us valuable feedback.

Dr Peter Gormly, who passed away in 2012, wrote the Australian National Antarctic Research Expeditions (ANARE) First Aid Manual and we owe a debt of gratitude to him and all who contributed to that publication.

Réjane's enduring skill and dedication brought the book into being in the first place and the inestimable staff at Cicerone have put it all together.

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## PREFACE

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Venturing into remote areas on land or water involves a degree of risk. Minimizing these risks, while feeling confident in your ability to deal with any potential injury or illness, is part of the challenge and satisfaction of wilderness travel. One definition of wilderness is 'more than four hours from medical help', so even travellers in remote areas of developed countries may find themselves put to the test.

**First aid** is the provision of an immediate response to an accident or illness until timely medical help is available. **Wilderness medicine** means providing first aid, THEN continuing to treat and care for injured or ill people for an extended period of time without external help and with limited resources. Wilderness medicine requires diagnostic skills and abilities well beyond the scope of first aid.

*Pocket First Aid and Wilderness Medicine* sets out to provide the information needed to avoid or manage commonly occurring problems.

**Part 1: The fundamentals** should be read thoroughly as it covers the essentials of preparation, prevention, general care for the sick and injured, the use of medications and pain management.

**Part 2: Accident and illness protocol** sets out the standard procedures to follow in any accident or illness situation, including how to deal with immediate life-threatening situations. Importantly it sets out how to work out what the problem is (the diagnosis).

**Part 3: Problems and their treatment** covers specific accidents and illnesses.

The **Appendices** are a rich source of information, especially the chart of medications and suggested first aid kits for different groups and skill levels.

## READ THIS ↓ READ THIS ↓ READ THIS ↓

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- Information in this book is highly condensed: get to know the general layout and contents before you need it. Subjects are cross-referenced and indexed.
- 'Victim' is used throughout the book instead of 'patient', 'casualty' etc.
- When a treatment is described, it is assumed that a primary survey (Chapters 6 and 7), shock prevention and stabilization (Chapter 8) and secondary survey (Chapter 9) have been carried out as necessary.
- For any accident or illness there may be several ways to manage the problem: for clarity and brevity, we have chosen those we believe to be simple and effective.
- Symptoms and signs are set down roughly in order of appearance or importance. Although listed, symptoms and signs may not all appear in a given situation.
- Treatments are presented in order of preference (including antibiotics) and in the order in which they are carried out.
- Trained first aiders have a 'duty of care'. Always obtain consent and record all steps of diagnosis and treatment. Certain treatments and techniques are described as a reminder to people who have been trained to carry them out. **Make sure that you do nothing inappropriate for your skill level.**
- Certain procedures described should not be used if medical help is available within the time indicated in the text.
- Generic names of medications are used throughout the text and some common trade names are given in the chart of medications (identified with a 'TM').
- When a medication is suggested, it is to be given by mouth unless otherwise stated.
- Antibiotics are important in remote situations and their use is suggested in the text while dose and notes are in Appendix 2. Suitable levels of training are required.
- Antibiotics for particular conditions may change as resistance develops. If this book is more than three years old, check out Appendix 2 with your doctor!
- The procedures, and medications in particular, mentioned in this book are for fit healthy adults only. If you have pre-existing medical problems, consult your doctor about any possible interactions or contra-indications. Check with your doctor for children's medications and dose.
- The term 'hyperbaric bag' is used instead of 'portable hyperbaric chamber', 'pressure bag', 'Gamow bag' or their trade names (PAC<sup>TM</sup>, Certec<sup>TM</sup>, Gamow<sup>TM</sup>).

## **PART 1: THE FUNDAMENTALS**

## 1. PREVENTION

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### Preparation (hope for the best, plan for the worst)

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#### In general

- Trips should be chosen to suit the level of fitness and expertise of the weakest member of your group.
- Check that your equipment is in good condition and suitable for the area and for the worst conditions you may meet.
- Allow three months for all major overseas pre-trip preparations. Arrange for your vaccinations plus a medical and dental examination. Pre-existing medical conditions should be thoroughly checked by a doctor who understands the environment you intend to visit.
- Those with pre-existing illnesses must bring enough of their regular medication for the whole trip, and pack a reserve supply separately. Check whether it is heat sensitive and whether it will work under the conditions expected; ask your doctor/pharmacist whether any of it will interact with the drugs in your first aid kit. Those with allergies to specific medications must bring alternatives.
- You will need travel insurance, making sure it covers emergency evacuation, by helicopter if necessary, and your specific activity (eg diving). In many countries, proof of your ability to pay (insurance cover, credit card number or cash) is needed for prompt emergency air evacuation. Leave a copy of your insurance with your travel agent, trek company and/or embassy along with a copy of your passport and details of next-of-kin.
- **Travelling with controlled drugs/medications** (opiates, ketamine, even codeine) may be illegal in some countries, even in transit, so you **MUST** carry appropriate customs forms and your doctor's letter/prescription. Check country requirements with your travel agent, pharmacist, doctor, consulate or embassy (see [Appendix 10](#) – 'Travel Medicine and General Information').
- There are many serious infectious diseases worldwide, most of them occurring in tropical or subtropical zones. Owing to global warming, the range of many diseases is spreading. Research and preparation before leaving home are essential and vaccination/prevention is much better than treatment: see '[Keeping healthy](#)', p. 14.
- For any trip, however short and easy, leave details of your intended route and estimated time of arrival (ETA) with a reliable person or the relevant organization (and remember to let them know once you're safe!).

- Carry maps, GPS, mobile/satellite phone and/or radio (VHF or HF) and a personal locator beacon (PLB) or EPIRB, as appropriate. See 'Good Communication', p. 79.

## Children

Children deteriorate more quickly than adults when ill or injured, and they are more susceptible than adults to hypothermia, heat exhaustion and dehydration. If a child has lost consciousness, however briefly, they should be evacuated (exception: an obvious case of simple faint). Between ages 4 to 7 years, children become increasingly able to tell you reasonably clearly what they are feeling. Below age 4, the only signs that a child is developing a serious illness may be increased fussiness, crying, loss of interest or appetite, or becoming quiet, drowsy or unresponsive.

## Risks in pregnancy

The *relatively* safer time to travel is during the middle three months of a pregnancy, but risks still include miscarriage, life-threatening bleeding, tubal (ectopic) pregnancy and premature labour. Infections that can damage the foetus (especially malaria, rubella, Zika, hepatitis A and E) are a possibility.

- As a general rule, do not ascend above 2500m during pregnancy and avoid high-risk malarial areas and scuba-diving. See 'Childbirth in a wilderness setting', p. 196, and 'Pregnancy', p. 38.

## Notes for group leaders/doctors

Your position brings with it a professional duty of care and you must understand the ramifications of this thoroughly.

- Research the area you are going to: note the locations and phone details of hospitals, clinics and rescue organizations, means of communication and evacuation.
- It is your responsibility to see that water, food, kitchens and toilets are appropriate and sanitary.
- Before departure speak to all participants and check their insurance cover, passport and next-of-kin details (keeping copies). Instruct them to get as fit as possible. Ask about their health. If they have a pre-existing medical problem, they should see a doctor about the intended trip: have them explain to you how to deal with possible emergencies (eg testing a diabetic's blood sugar level, dealing with an asthma attack).
- On the trip, give daily (or more frequent) briefings to your group and staff on what to expect on the next stage of the trip.

- Put the **buddy system** in place: pair everyone up with instructions to keep a careful eye on each other in order to detect early signs of illness or other problems as soon as possible (see box below). Buddies must tell the leader/doctor of their suspicions immediately (preferably without telling their sick partner, who will often minimize or deny problems). Leaders, doctors and first aiders must also have a buddy.
- As the doctor/leader, you should briefly check every member of the group morning, noon and night. Early detection of problems needs an appreciation of the terrain to be covered and of potential environmentally-induced problems. Have a high index of suspicion and a readiness to act promptly.
- If you are worried that someone is becoming unwell, stop as soon as it is safe to do so and carefully look into the problem.
- Hypothermia, dehydration, low blood sugar (due to lack of food), altitude illness and exhaustion are common in the wilderness setting. They share some similar symptoms and signs, and may occur together. If one condition is found, check for the others and check the whole group.

**EARLY NON-SPECIFIC SIGNS OF SOMEONE BECOMING UNWELL**  
(easily remembered as the 'umbles':  
grumble, mumble, bumble, fumble, stumble)

Changes are more significant when they are 'out of character'.

- Personality changes: anxiety, irritability, anger, excitability, complaining, depression, loss of concentration, making poor decisions
- Behavioural changes: tiredness, lethargy, coming to camp late and last, social withdrawal, going to bed early and being last to get out of bed, disturbed sleep, loss of appetite, missing meals
- Clumsiness, staggering, falling over, dropping things, inability to tie shoelaces or pack own bag etc

## Keeping healthy

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### Preventing diarrhoea and food poisoning

Attention to detail dramatically reduces the incidence of these common scourges.

- Disinfect all drinking water (see below).

## DISINFECTING WATER TO MAKE IT DRINKABLE

Disinfecting water means making it drinkable, ie free enough of the germs (viruses, bacteria, protozoa) that cause diarrhoea and other infectious diseases. Select the cleanest water from the best site (eg above village/campsite rather than below it, running rather than still). Cloudy, dirty water should be allowed to settle and/or be filtered through material (Millbank bag) or sand and/or charcoal before disinfection, and chemical disinfection times extended. Methods of disinfection include heat, filtration, charcoal absorption, chemicals, ultraviolet (SteriPEN™), distillation (solar stills). Combinations of these techniques increase reliability.

**Method 1: boil** water till bubbling commences. This is sufficient whatever the altitude. **Note:** boiling is the only way to disinfect water contaminated with cyclospora, but it does not kill Hep A (protection is only guaranteed by vaccination).

**Method 2: filtration.** Use a good quality filter, preferably combined with a chemical treatment eg Katadyn filter bag (in an emergency situation use layers of sand and charcoal in a waterproof bag with a hole in the bottom).

**Method 3: adding a chemical** to the water eg chlorine (as hypochlorite or NaDCC)

Chlorine tablets (NaDCC): follow the instructions carefully.

Emergency use of unscented household bleach (5% hypochlorite solution – check the concentration on the bottle): add 2 drops per litre (there are approximately 70 drops in a teaspoon) and shake well. Wait 30 minutes. The water should now smell faintly of chlorine. If it does not, add another 2 more drops per litre. **Note:** once a bottle is opened, the bleach loses its potency after six months.

Emergency use of iodine: the treatment time for povi-iodine (6 drops/litre) is one hour. To get rid of any chemical taste, add a small amount of vitamin C or other flavour after the treatment time is up.

**Note:** the longer you leave the chemical treatments, the more effective they are. At least double the treatment times for polluted, very cloudy or cold water.

See advice on 'Water disinfection' in Appendix 10.

- Avoid touching your mouth with your hands ('buddies' can remind each other).
- Wash hands frequently and thoroughly (45 seconds) with soap and water (alcohol wipes/sanitizer gels are an aid, not a substitute for soap and water). Then dry them thoroughly with a clean towel, or air dry (drying is as important as washing). This is especially important if working in the kitchen, and after each bowel motion/visit to a toilet (toilets must be fly proof).
- No one with diarrhoea (or other infectious diseases) should be allowed near food preparation, serving or washing up.
- All kitchen utensils must be kept scrupulously clean. Cooks must have two chopping boards and knives: one set for preparing meat and fish only (this set must be thoroughly washed and scalded after every use), and one for all other purposes. Keep flies, cockroaches and rats off prepared food and preparation surfaces.
- Vegetables should be well cooked, or washed and soaked in chemical solution for at least one hour (use double the recommended dose of chemical for method 3 of water disinfection, below). However carefully prepared, salads may still cause diarrhoea.
- Peel fruit, boil fresh milk. Avoid curd, lassi, milk shakes, ice cream, local honey and home brewed beer.
- All cooked food should be eaten immediately. Avoid reheated food (if this cannot be avoided, reheat thoroughly to *reduce* the risk).

### **Preventing spread of infection**

- Anyone suffering from an infectious/contagious disease (such as diarrhoea, hepatitis, eye/wound infection, meningitis, pneumonia, influenza, measles or chickenpox) should be 'quarantined'. Check your group, including staff, for any sign of the illness.
- Ideally, isolate the victim in a room or tent on their own, keeping their dishes, cutlery, soap and towel separate.
- Help the victim to keep good personal hygiene.
- Wear protective/rubber gloves when attending the victim, especially when cleaning up blood, vomit or stools.
- Carer and victim should wear face masks (improvised if necessary) in cases of meningitis, pneumonia, influenza etc. This is especially important if the victim is coughing or sneezing.
- Wear gloves and goggles (or sunglasses) when treating wounds (to protect from blood-borne viruses – eg hepatitis B and C, HIV), especially when jet washing them.



- Wash and carefully dry hands after contact with the victim, their clothes or belongings.

### Preventing animal and insect bites/stings

- Do not approach animals too closely. Do not surprise, feed or pet them.
- All animal (and human!) bites should be treated very thoroughly as they are likely to become infected.
- **Dogs, monkeys, bats and foxes** and many other animals may bite, causing injuries or infection (including tetanus and rabies). While most animals are likely to bite when they are surprised, injured or already fighting, rabid animals often attack without cause and they often bite more than once, or more than one person. Rabid dogs may appear aggressive, carry their tails between their legs, and salivate or foam at the mouth; their eyes may be red. They usually die within 10 days. However, there may be none of these signs. Pre-exposure rabies vaccination is available and is recommended for long-term travellers, residents or those at special risk (even vaccinated people will still need a post exposure course of treatment if bitten).
- **Bears:** polar bears are the most dangerous, closely followed by grizzly (brown) bears. Most bear attacks occur when bears are surprised, have young, have lost their natural fear of humans, or are old or injured. Food and all other smelly items including food waste should be stashed 100m away from campsites which should be in open country. The camp and yourself must be meticulously clean and odour free (this includes soap etc). Travel in groups of four or more, make noise, avoid dense foliage and walking at night. If confronted, freeze, no eye contact, talk in low reassuring tones and slowly back off. Do not run or climb trees. If attacked by a brown bear: play dead, face down, hands over neck. If attacked by a black bear: fight back.
- **Sharks and crocodiles:** attacks are rare worldwide but more common in certain areas. Sharks congregate around seal colonies and migrating whales, and they may travel long distances up rivers. They feed mainly in the early morning or late evening. If approached, face it and back slowly away. If charged, assume the cold water survival position. If bitten, attack the eyes, gills and snout. Divers may seek shelter on the bottom, swimmers against rocks, reef or jetty piles

Crocodiles inhabit warmer rivers and estuaries and saltwater crocodiles may travel hundreds of kilometres out to sea from their estuarine breeding grounds. They are territorial stealth hunters. Camping,

wading or swimming in areas where they live is not recommended. Ocean beaches well away from a river mouth are considered to be safer. Consult knowledgeable locals.

- **Snakes, spiders and scorpions:** do not reach into holes, avoid climbing on vegetated rock or swimming from dense foliage on the shore, be wary when moving rocks or collecting firewood. Use a torch at night. Check inside your kayak, raft, sleeping bag and tent (keep it zipped up) before getting in. Check clothes and boots before putting them on. Wear long trousers, gaiters, boots and gloves. Scorpions are attracted to condensation under groundsheets. Wear strong footwear when wading on coral or in murky water. **Note:** carry the equivalent of two 15cm elastic or crepe bandages which is the minimum necessary to put a pressure immobilization bandage (PIB) on a leg (see '**Pressure immobilization bandage (PIB)**', p. 125).
- **Jellyfish stings:** for prevention wear a full body Lycra™ stinger suit.

### **Preventing mosquito-borne diseases**

Mosquitoes may carry serious diseases such as malaria, dengue fever, Japanese encephalitis, Ross River fever, yellow fever, West Nile disease or Zika virus. Avoiding mosquito bites is a vital first-line defence against these fearsome diseases.

- Use personal repellent containing DEET (20–50%), applied over sunscreens. Use sprays, heated repellent tablets and/or mosquito coils in your rooms on arrival (including the bathroom) and at night.
- In the evening and night, wear long sleeves, trousers and socks sprayed with repellent and/or permethrin.
- Sleep under an undamaged mosquito net (coated with permethrin for extra effectiveness), tucked under your mattress.
- Preventative medications for **malaria:** seek travel medicine advice before setting off as drug-resistant strains of malaria are common. These drugs need to be started before entering the malarial zone and continued for some time afterwards. They do not guarantee full protection and may have side effects such as rashes, nausea, dizziness, diarrhoea, increased risk of sunburn, vivid dreams and severe mental disturbance (the latter especially with mefloquine). Side effects often appear or seem to get worse at altitude.
- Avoid scuba-diving while taking malaria medications.
- If you have had malaria before, or are going to a remote malarial area with no medical help, carry a supply of treatment medication (eg Riamet™) and a malaria self-test kit with instructions.

## Preventing other insect-borne diseases

- **Tick-borne diseases:** ticks are found in marshes, scrub, woodland, mountain meadows and deserts worldwide. Ticks carry a wide range of nasty diseases that can affect humans. To keep ticks off your skin wear long-sleeve shirts; tuck socks and gaiters into long trousers, and apply insect repellent to them. Inspect your skin (especially the hairy areas) and clothing carefully, at least 12-hourly. Shower and scrub down after possible exposure and buddy up for inspections.
- **Schistosomiasis** occurs in parts of China, South Philippines, South America and Africa (especially Lake Malawi) and is caused by a tiny skin-penetrating worm found in fresh water. Infection typically causes a brief rash followed later by a feverish illness and, later still, abdominal and bladder problems. Avoid swimming and wading in fresh water in endemic areas. Local advice on water safety may be incorrect.
- **Strongyloides** and **hookworm** are common in rural, tropical areas of Southeast Asia (including tropical Australia), Africa and South America. They are found in the soil and penetrate the skin of the feet. They can cause serious, chronic illness. Do not go barefoot on damp, bare earth in these regions, especially near villages with poor sanitation.
- **Chagas' disease** occurs in Central and South America and is caused by a beetle-like insect. Use a permethrin-soaked netting over your bed, well tucked under the mattress, when sleeping in mud, thatch or adobe houses.
- **River blindness** (tropical Central America and Africa) and **sleeping sickness** (tropical sub-Saharan Africa) are both transmitted by fly bites. Prevention is as for mosquitoes, but note that flies bite in the daytime as well.
- **Leishmaniasis** (Amazonia and Africa) is transmitted by sandfly bites. Avoid bites.

## Dental problems

The best way to avoid any problems is to brush twice a day with toothpaste (preferably with fluoride), floss and avoid sugary food/drinks before bed.

## Skin problems

- Protect your skin from sun, cold and wind, and do not wash with soap too frequently.
- Prevent and treat chafing, wear well-washed, well-rinsed soft underpants/singlets. Wash, dry and powder the skin with talcum powder, or apply Vaseline™ (petroleum jelly).

- Feet may suffer blisters, fungal infections and trench foot. At the first sign of **chafing** (hot spots) apply a protective dressing and keep feet and socks warm and dry.

### Deep vein thrombosis (DVT)

Prolonged lack of movement of the lower limbs (due to illness, being storm-bound, long-haul flights etc) predisposes to clots in the internal lower leg veins (DVT). Other predisposing factors include dehydration, tight clothes, bandages, splints, smoking, very high altitude and oral contraception (avoid for longer stays above 5000m and during climbs above 6000m).

- Keep your lower limbs moving on long journeys or while confined to bed/sleeping bag (point your toes at your nose then away, sets of 25 every 15 minutes). Consider compression stockings. See '**Deep vein thrombosis (DVT) and pulmonary embolus (PE)**', p. 202.

### Carbon monoxide (CO) poisoning

This silent killer is best prevented. In enclosed spaces with a naked flame or near an engine exhaust, assume any unexplained headache, lethargy or drowsiness is due to CO poisoning. If you can smell exhaust fumes, you are inhaling CO (but CO itself does not smell). Flames that change colour, start to flicker or go out suddenly mean that CO levels are rising dangerously.

- Ensure *good ventilation* in any shelter, snow hole, tent, boat or vehicle where there is a source of combustion (such as engines, fuel heaters, cookers, generators or lighting).
- Do not leave anything burning in confined sleeping areas.

## Safety in extreme climates

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### Campsites

Choose campsites carefully; position pit toilets with safe access at least 30m from watercourses. Mark out a safe area on glaciers, having first probed for crevasses. Be aware of avalanche dangers, animal and insect hazards. Is there potential for flash flooding (ie canyon floors, water channels)? Seek shade or sun, depending on climate, and be aware of local ownership/feelings. Remove all rubbish.

### Cold or bad weather

May cause hypothermia, frostbite or frostnip. The group or individuals may become lost or separated. Hypothermia is most likely to occur when *wind*

intensifies *cold* and *wet* conditions (wet clothes lose their insulating effect). The air temperature does not have to be below freezing for hypothermia to occur. Shivering and/or the ‘umbles’ (see ‘Notes for group leaders/doctors’, p. 13) are often early signs of hypothermia and a call to act! High altitude makes hypothermia (and frostbite) more likely and more severe.

**Note:** for every 300m of ascent, the temperature falls about 2°C.

- Remember that it is easier to stay warm than to re-warm.
- Check forecasts and keep a weather eye open; turn back or delay departure if severe weather threatens.
- Keep your group together and check everyone regularly, remind everyone to buddy up, including local staff/porters. Be prepared to stop and shelter.
- Porters, children and old, sick, unfit, hungry or exhausted people are more likely to develop a cold injury. If one person suffers from hypothermia or frostbite, check the whole group.
- Avoid sweating and/or change wet or damp clothes for dry ones (especially gloves, socks and hat); put on warm windproof clothes before getting cold (ie *before* shivering); wear a scarf or face mask.
- Make sure footwear is not too tight, use plastic bags inside leaky footwear to keep the feet dry (paper around the toes is a good emergency insulator), use mittens rather than fingered gloves in extreme conditions and tie them to each other with string looped around the neck.
- Stop regularly and make sure everyone drinks and eats (sweets, chocolate, energy bars).
- Stop immediately and re-warm any part that goes numb (buddies often notice their partner’s frostnip first).
- In sub-zero temperatures, skin may stick to metal and fuel becomes super-cooled (avoid spilling on skin).

## Snow

Risks include getting lost in whiteouts, avalanche, snow blindness and loss of a ski (use leg ropes).

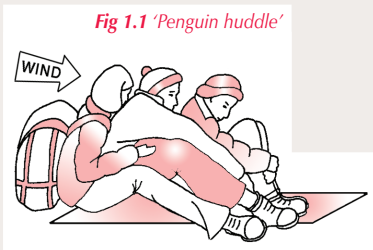
- The strongest people should break trail, leave someone responsible in the rear to prevent anyone getting left behind. Stop regularly to bunch up.
- Beware of avalanche slopes, especially after heavy snow falls or high winds after new snow. Heed avalanche warnings, stay on piste and open trails, spread out if you have to cross potential avalanche slopes, and wear transceivers (inside clothing). If searching for avalanche survivors, location methods include searching for visible persons or equipment (ski poles), calling out, probing and transceivers. See [Appendix 4](#).

- If you do have to leave a shelter in a whiteout, use a rope tied to your shelter to guide you back.
- To make crude snow gaiters and keep your socks dry, use plastic bags over your socks inside your footwear, then tape the bag over your trousers.
- Tie a strip of cloth or rope around your footwear if slipping is a problem.
- Prevent snow blindness by wearing sunglasses/goggles (wrap-around or side-shielded) at all times when at altitude and among snow and ice fields, even on cloudy days. Use a neck cord to prevent loss. If you have no sunglasses/goggles, cut slits or poke tiny holes in a piece of cardboard and tie or tape in place.

## EMERGENCY SHELTERS

If you have to stop in an exposed position, especially overnight, shelter is vital. Find a place out of the wind, keep everyone together, wear all spare clothes, arrange ground insulation, eat and drink. At all times try to stay as dry as possible. Emergency snow shelters need practice and take time to construct. In an enclosed space maintain ventilation, especially if carbon monoxide poisoning is possible.

- **Bivvy/bothy bags:** improvise using a large, strong plastic bag, cutting off a corner as a breathing hole, pull the bag over your head and tuck under your body, with feet and legs in your rucksack – you will get wet in this bag through condensation.
- **'Penguin huddle':** a very effective method of maintaining body heat when a group is forced to stop in exposed conditions. Hold a tarp over the huddle to increase its effectiveness.



- **'Tibetan tuck':** a dry land version of the survival position in water, used when alone. Kneel down on a pad of insulating material. Put your rucksack to windward and tuck your head and hands around your knees.

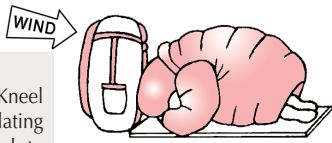


Fig 1.2 'Tibetan tuck'

- **Snow mound shelter** (snow depth <1m): pile up rucksacks, gear and branches and cover with a tarpaulin. Heap half a metre of snow onto your pile and pat down firmly. Now make an opening and extract the rucksacks, leaving an instant shelter (construction time: 2–3 hours).
- **Snow trench** (snow depth >1.5m): dig a trench and roof it with branches, tarp and snow. On a steep slope dig horizontally to form a sheltered ledge (construction time: 1–2 hours).
- **Snow hole/cave** (snow depth >2m): dig horizontally into a snow bank to make a small entrance/large cave (construction time: 2–3 hours).

### At high altitude

Above 2500m, altitude illness (AMS, HACE and HAPE) becomes a possibility. Once above this altitude, a rough guide to acceptable height gain between *sleeping* altitudes is 300m per day, OR 500m per day with a rest day after every 1500m of ascent. Even these ascent rates may be too fast for some slow acclimatizers.

- Use the buddy system to detect symptoms and signs of altitude illness and check your group regularly.
- Avoid over-exertion and breathlessness while acclimatizing, especially if experiencing symptoms of AMS.
- Dehydration does not cause altitude illness, but it is an unnecessary complication. Drink enough liquid to keep your urine pale and plentiful, passing at least one litre/day. An increased urine output after an ascent is a good sign, while a decrease in urine output indicates that altitude illness (or dehydration) is developing.

- Some medications can have adverse effects at altitude.
- If you must fly or drive rapidly to 3000m or higher, spend a minimum of two nights at your arrival altitude (or lower if possible) – or until symptoms disappear – before ascending further. Consider using acetazolamide (Diamox™), especially if you have to be very active on arrival (eg group leaders, rescue personnel).

**Note:** coca and ginkgo biloba are unreliable for prevention of altitude illness. See also ‘**At altitude**’, p. 38.

### Sun and wind

Sun and wind may cause burns and dehydration: extra care is needed in high, dry, cold or hot regions, and on snow or water. Apply protection (zinc oxide) to lips and nose and sunscreen to exposed areas, and wear a hat with a wide brim and maybe a scarf across your face and neck.

### Hot weather

Dehydration and hot weather problems are possibilities (*heat exhaustion* is common and *heat stroke* deadly). Acclimatization to a hot climate can take up to two weeks, although two weeks of pre-departure sweating exercise in warm clothes helps. Predisposing factors to hot weather problems include fever, diarrhoea, unfitness, being overweight, youth, old age, alcohol and caffeine, and some medications (eg diuretics, beta-blockers, antihistamines, prochlorperazine/Stemetil™).

- Wear light-coloured, loose-fitting cotton clothing (dark colours absorb more heat) and a broad brimmed hat/umbrella.
- Travel in the cool part of the day or at night.
- Keep your urine ‘pale and plentiful’, passing at least one litre/day (you may need to drink up to 1 litre/hour in very hot, dry desert conditions). As thirst is not a reliable indication of when and how much to drink, discipline yourself and your group to stop and drink regularly (at least every hour). Make drinks more attractive by adding flavour. If food and snacks are taken regularly, plain water is sufficient. If no food is being eaten, add a pinch of salt (a half teaspoon per litre) or use half strength ORS or a sports drink (see ‘**Dilutional (exertional) hyponatraemia (water intoxication)**’, p. 142).
- During heavy sweating in hot weather, especially if little food is being eaten, prevent heat cramps by adding a half teaspoon of salt to each litre of drinking water.



## Lightning strike

A lightning strike may cause death (by stopping the heart), unconsciousness, severe burns (which may be internal) or blunt trauma due to being tossed or from the shock wave. When a lightning storm approaches:

- shelter in a building or vehicle with windows closed
- try not to be the highest point in the landscape
- avoid wire fences, erected tent poles (if caught in a tent, insulate yourself from the ground and don't touch the poles or ground): lay walking poles, ice axes flat on the ground
- move 50m from lightning attractors such as ridges, summits, shallow caves or cracks in rock faces, tall trees, masts or pylons
- if you are on the water, head for the shore and move at least 50m away from the water
- if you are on a via ferrata, move to a safe place where you can detach yourself from the cable
- if you are caught in the open with no shelter, spread your group out (more than 10m apart), assume the Tibetan tuck position with insulation (closed cell sleeping mat, inflatable mattress) under you and avoid touching the ground with hands or arms.

## Particular situations

When taking part in any wilderness activity, the appropriate equipment (lifejackets, helmets, harnesses and technical equipment etc) should be worn/carried, and be thoroughly inspected before departure.

## In the mountains

**Crossing passes** and **summit days**: may pose problems due to altitude, tiredness, falls, separation, cold or hot weather problems.

- When planning, consider the abilities of the weakest/slowest members and local staff (including porters).
- Keep an eye on your buddy, companions and local staff.
- Start early, maintain communication between front and rear of the group, bunch up in bad weather.
- Do not climb higher in worsening weather.

**Glacier crossing**: may pose problems due to hidden crevasses, falls and snow blindness. 'Dry' glaciers with no snow cover often have glacial streams (drowning and hypothermia).

- Avoid glaciers unless you have mountain skills (eg ability to perform