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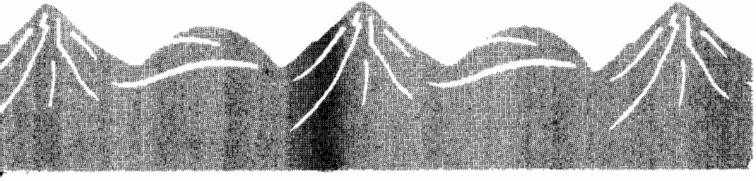
First Aid

Quick Information For Backcountry Use



INTRODUCTION

When a serious accident occurs in the mountains, first aid involves more than simply securing a "Bandaid" on a cut finger. A complex sequence of almost simultaneous actions must be taken CORRECTLY and COMPLETELY if the victim is to survive. The party must concern itself not only with initial life support, the splints and bandages that must be applied, but, in the broader definition of first aid, with the total care of the injured, including an attempt to alleviate his anxiety as well as his pain. The party must concern itself with protecting the injured from climatic hazards, providing him with shelter, food, and drink. Decision must be made as to whether the injuries require immediate attention, whether to send for help, and whether evacuation should be attempted. The party, too, must be aware of its own physical and mental condition, its needs for shelter, warmth, food and safety. In summary, a party must take positive and immediate actions to initiate proper accident response and must follow through on those actions to insure that the unfortunate situation is not compounded into a tragedy by carelessness or neglect.

An accident situation is one instance in which a leader, no matter how well qualified, cannot do everything himself. Each party member must contribute his share rather than being a hindrance to others. Proper accident response

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requires that the party members work closely together as a TEAM, *probably relying more on one another than at any other time in mountaineering.* The life of the victim, and perhaps the lives of the entire party, depend on the team's ability to think and act clearly and correctly. They cannot phone a doctor or summon an ambulance. They cannot count on outside help of any kind for many hours. That is why IT IS THE RESPONSIBILITY OF ALL WHO VENTURE INTO THE MOUNTAINS TO POSSESS A WORKING KNOWLEDGE OF HOW TO PROPERLY RESPOND TO AN ACCIDENT SITUATION.

How can one learn proper response to an accident? Just as with climbing, skiing, driving a car, or any other skill, one must learn the basics from someone qualified to teach and then PRACTICE under qualified supervision. Going into the mountains without knowing what to do is just as suicidal for the individual, and perhaps for the people around him, as driving a car without knowing how.

Throughout the United States there are a number of courses of recognized merit that teach first aid and emergency care. In some communities the American Red Cross offers a mountaineering-oriented first aid and accident response course which provides the student ACTUAL PRACTICAL EXPERIENCE at solving a number of simulated mountaineering accident problems. This course provides the student with the instruction and experience necessary to immediately and correctly respond to nearly any mountaineering, or community, accident situation.

This booklet is limited in an important respect: it provides only the basics of what should and should not be done, serving as a reminder to those who have previous practical training. IT DOES NOT ATTEMPT TO COVER EVERY POSSIBILITY, BUT ONLY SUMMARIZES THE MORE COMMON PROBLEMS, WITH EMPHASIS ON LIFE-THREATENING EMERGENCIES AND MAJOR INJURIES WHICH REQUIRE IMMEDIATE ATTENTION AND CARE.

GENERAL PROCEDURES FOR ACCIDENT RESPONSE

Turbulent emotions after an accident frequently confuse those involved. Therefore, knowing exactly what to do and when to do it are extremely important. It is well to memorize an optimum sequence of actions, and to carry an action checklist in the first aid kit. Then, when accident occurs, a dependable formula is available.

1. *Take charge of the situation.* Keep cool. Don't panic. Hasty actions, though well meant, may be fatal.
2. *Approach the victim safely.* Do not approach from directly above if there is a possibility of rock or snow slide.
3. *Perform urgently needed first aid and emergency rescue.* Immediate pulmonary resuscitation, cardiopulmonary resuscitation, and control of hemorrhage can be vital since time is of the utmost importance in avoiding certain death. If the victim is injured in an area of high potential snow or rock avalanche or extreme lightning danger, evacuate quickly to a safe location, but do not cause further injury.
4. *Treat for shock.* Always suspect and treat for shock after an accident. Do not move the victim until the extent of his injuries has been ascertained. Keep the victim as comfortable as possible. Reassure him (Tender Loving Care).
5. *Check for other injuries.* Examine gently and observe for shock, wounds, fractures, dislocations, contusions (bruises), or other irregularities.
6. *Plan what to do.* Preferably the most experienced person should direct the first aid. While this person makes a careful examination of the victim, assistants should gather first aid kits and assemble necessary supplies. After the immediate treatment, decide if the victim can be evacuated under his own power. If there is any doubt, assume he cannot. Then decide if the party has sufficient manpower for evacuation or if further aid should be summoned.
7. *Carry out the indicated plan.* If unable to evacuate the victim, make preparations for bivouacking in the area. If possible, transport the victim to timberline or a sheltered area such as a crevasse. Above all, however, ALWAYS THINK AND ACT IN TERMS OF THE VICTIM. When sending for help, be sure at least two of the stronger members are sent with all the information necessary to effect a rescue. This includes not only information on the victim's condition but the condition of the remainder of the party as well. If possible, complete an accident report of the type shown on Page 33 at the scene before leaving. If the party has sufficient strength, manpower, and expertise to evacuate, the procedures on Pages 24-31 should be followed.

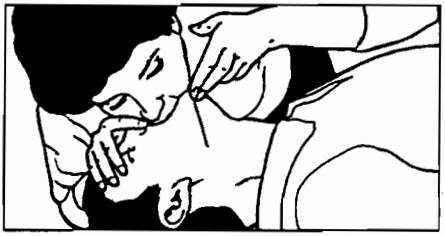
Procedures for dealing with life-threatening emergencies are presented in the order of their importance: pulmonary resuscitation, cardiopulmonary resuscitation, and control of hemorrhage and shock.

PULMONARY RESUSCITATION

In mountaineering, the stoppage of breathing from causes other than death results most frequently from crushing chest injuries, electrocution by lightning, drowning, or drug abuse.

Mouth-to-mouth resuscitation is best. To determine if it is necessary, gently shake the victim and shout, "Are you okay?" If there is no response, call for help. Then roll the victim to a face-up position by carefully pulling on hip and shoulder. Tilt the victim's head backward by lifting the bony part of the chin. THE VICTIM'S HEAD MUST REMAIN IN THIS POSITION THROUGHOUT RESUSCITATION. Look, listen, and feel for signs of breathing for 3 to 5 seconds. Next, pinch the victim's nostrils closed, open the mouth and place your own over it to form a seal. Give 2 full breaths lasting 1½ to 2 seconds each, then feel for the carotid pulse for 5 to 10 seconds. If a pulse is present but breathing has not begun, continue resuscitation. Every 5 seconds, give a single breath then check for breathing. Every minute, recheck the carotid pulse for 5 to 10 seconds.

Mouth-to-mouth resuscitation.
a. Tilt head back by gently lifting bony part of chin.
b. Pinch nostrils and place mouth over victim's to form a seal.



Note that a child's lungs are smaller than an adult's, and therefore shallower breaths or even very light puffs are required, depending on the size of the child.

In cases of drug abuse or electrocution by lightning, artificial respiration may have to be performed for a long period of time, perhaps an hour or more, before the victim can resume independent respiration.

CARDIOPULMONARY RESUSCITATION (CPR)

Artificial respiration is of value only if breathing alone will revive the victim; it is of no use if the victim's heart has stopped, since without circulation, oxygen cannot be carried to the vital organs. In this case, heart action must be replaced by external chest compression, which combined with artificial respiration, is called cardiopulmonary resuscitation or CPR. Its use, however, can be quite hazardous. Whereas a victim's weak breathing may be assisted by mouth-to-mouth artificial respiration, if his heart is pumping, even weakly, he will NOT benefit from attempts to assist his heart by compression.

To be successful, closed-chest cardiopulmonary resuscitation depends on thorough and careful training. It is doubtful that one will be able to achieve artificial circulation of oxygenated blood by this method if his only training is from reading written instructions. Further, injury is much more likely when CPR is performed by an untrained individual. Fractures of the ribs and sternum caused by improper cardiac massage can cause injury to the heart, spleen, liver, and lungs. The American Red Cross and American Heart Association strongly encourage individuals to obtain training that will qualify them to use this technique.

CONTROL OF HEMORRHAGE

Hemorrhages are of two kinds, arterial and venous. *Arterial bleeding* occurs in pulses or spurts and the blood is usually bright red. Since massive arterial bleeding can be fatal in a few minutes, quick and correct action is mandatory. *Venous bleeding* is usually dark and flows smoothly, without spurting. Bleeding injuries should always be examined carefully to determine if they are as severe as they may appear. Many bleeding wounds that at first appear serious may, in fact, be quite minor.

The following steps are taken to control any *major hemorrhage*:

1. Immediately apply direct pressure to the bleeding area! Do not allow severe bleeding to continue while rummaging through packs for sterile dressings; use your bare hand if necessary. When a sterile compress is available, place it directly over the wound. If bleeding continues place additional sterile compresses on top of the old one and continue to

apply direct pressure. This stops the bleeding in a majority of instances.

2. If the injury is on a limb, elevate the bleeding extremity. Use pressure points if known.
3. Apply cold packs, if available.
4. If these measures fail, and the wound is on a limb, and *only if the bleeding is severe and life-threatening,* apply a wide (3- to 4-inch) tourniquet. Apply it tightly enough to completely stop the bleeding, and once the tourniquet is in place, leave it on; do not loosen it. Tag or otherwise mark the victim to alert medical personnel that a tourniquet has been placed, the time of placement, and by whom. *Remember that a decision to apply a tourniquet is essentially a decision to sacrifice that limb to save the life.*

If the wound has bled severely and transportation is planned, it is advisable to pass a tourniquet beneath the extremity without tightening it. It can then be tightened and fastened promptly if bleeding should re-start and cannot be controlled by any other method. This is particularly necessary if the extremity must also be splinted—it would be difficult if not impossible to apply a tourniquet around or under a splinted extremity.

For small lacerations with *minor bleeding* the area should be thoroughly washed and the edges closed with steri-strips, butterfly bandaids, or butterflies improvised from ½-inch strips of adhesive tape. Puncture wounds are not pulled together but are left open and covered with sterile pads. (Sucking chest wounds require special handling and bandaging.) Avulsions (tearing of tissue) and abrasions are simply washed with soap and water and covered with a sterile dressing.

SHOCK

Shock is a profound depression of all body processes caused by the failure of the cardiovascular system to provide sufficient blood circulation. It may follow *any* injury, even a relatively minor one, but bleeding, pain, cold, and rough handling are intensifying factors. The victim feels weak and clammy, the pulse is weak and rapid. Shock actually may be more serious than the initial injury; it must be assumed to exist and treated in every casualty.

The following measures are used both to prevent and to control shock:

1. Place the victim in a supine position (flat on his back) to make the blood which is circulating available to the brain, heart, lungs, and kidneys. If the victim has head or chest injuries, it is desirable to raise him about 15 degrees toward sitting position.
2. Keep the victim warm with extra clothing. If he is badly chilled from exposure to cold, apply heat, but not above body temperatures; other-

wise merely prevent heat loss, using material to insulate him from the ground.

3. Minimize shock by controlling hemorrhage, relieving pain and handling gently.
4. Allow victim to drink a weak salt solution (six salt tablets or ½ teaspoon salt per quart of warm water).
5. If the victim has no injuries to the head, neck, back, or legs, it is desirable to raise the legs 8 to 12 inches to deliver an increased supply of blood to the body core.

COMPLETE VICTIM EXAMINATION

This examination is intended to find the additional and sometimes inconspicuous injuries that often cause serious complications: the closed undetected fracture that can become an open fracture when the victim is moved, the spinal injury that causes major spinal cord damage when the victim is helped to his feet. This examination must be a "head-to-toe" evaluation with careful checks for specific injuries. A good 10-point examination starts with the head, as follows:

1. Check scalp for laceration and contusions, beginning at the back of the neck and working to top of head.
2. Check skull for depressions.
3. Check ears and nose for blood and fluid.
4. Check for neck fractures, feel for lumps and bony protrusions.
5. Check chest region for fractures and wounds, look for movement and feel for fractures.
6. Check abdomen for spasms, tenderness, and discoloration.
7. Check pelvic area for fractures.
8. Check all extremities for fractures.
9. Check for paralysis of lower extremities.
10. Check buttocks for fractures or wounds; be cautious if spinal damage is suspected.

FRACTURES

Fractures are classified in two general categories: closed (simple), with no break in the skin; and open (compound), in which a broken bone fragment has penetrated the skin. One or more of the following signs are usually present: pain and tenderness at fracture site, inability to move or bear weight on the affected part without pain, a grating sensation felt or a grating sound heard during motion of the affected part, and sometimes deformity of the limb or body part. The following are general rules for treatment:

1. When in doubt, treat the injury as a fracture.

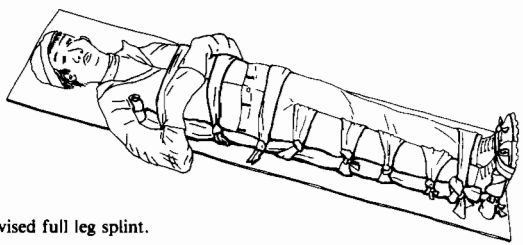
2. Splint both the joint above and the joint below the suspected fracture.
3. The extremity may usually be splinted in a position of some deformity. If it is apparent that splinting might result in penetration of the skin (in the case of some ankle fractures), or if splinting or subsequent transportation is not practical in that position, a gentle attempt at repositioning may be made by applying traction and then straightening the deformity.
4. Carefully pad all splints. Make sure the splint is the correct size and shape *before* application. Measure the unbroken extremity and use for a pattern.
5. Check splint ties frequently to be sure they do not interfere with circulation.
6. In the case of an open fracture, the bone end should not be left exposed. Before straightening the limb, thereby allowing the bone to slip back under the skin, examine the end carefully for dirt and debris. DO NOT HANDLE the bone end. If it is dirty, rinse with a saline solution of 1 teaspoon salt or 12 salt tablets in a quart of clean, or preferably sterile water. (To sterilize the water boil it for 15 minutes.) In all cases, NEVER allow the bone to dry out—keep it wet. DO NOT attempt to push the bone under the skin, but let it slip back of its own accord when the limb is straightened.
7. Above timberline, splint materials are scarce and a good deal of ingenuity is required to immobilize the fracture. Ice axes, piton hammers or uninjured portions of the patient's own body may be the only splints available.

Fractures of the jaw are held rigid with roller bandages. Place gauze pads or bits of clothing between the teeth before bandaging to allow for drinking or expulsion of vomitus. *Fractures of the collarbone* are held rigid by roller bandages, cravats or triangular bandages, and by immobilizing the affected arm over the chest. In *fractures of the upper arm or humerus*, the weight of the victim's arms helps to overcome the pull of the muscles and reduces pain. The victim's ribs are used as a splint, and the forearm supported in a sling. *Fractures and dislocations of the elbow* are best splinted and supported with a sling in the position of maximum comfort: a position acutely bending the elbow should be avoided, since circulation to the forearm may be cut off. However, fractures of a joint should not be straightened. *Forearm and wrist fractures* are best treated by securing to a splint applied to the inner side of the arm, and then supporting the limb with a sling. For *fractures of the hand or fingers*, the hand is folded around a fluffed gauze bandage and fastened with a cravat, webbing, or triangular bandage. *Fractured ribs* are best immobilized by encircling the chest with three to four cravats or pieces of

webbing. They should be tightened as the victim exhales. If pain is not relieved upon gentle compression, nothing should be applied, since there is some possibility that the ribs are fractured inward, and compression may puncture a lung.

Injuries to the pelvis are most frequently of a crushing sort. There is agonizing pain and possible swelling or bruising at the fracture site. Fractures most frequently occur in the front and a great hazard is perforation or rupture of the bladder. In such case it is essential to limit fluids to less than one pint per day. Pelvic fractures are immobilized by tying the legs together at the knees and ankles with a thick pad of clothing between the thighs.

A *fracture of the femur* is difficult to treat because of the powerful thigh muscles. The broken ends tend to be displaced inward and frequently slip over one another, causing great pain. A splint may be improvised, as illustrated, extending from under the arm on the outside of the leg to below the ankle. The splint must be well padded and held in place by strips of cloth or other material. Padding should be placed between the legs and the legs secured together. Under *no circumstances* should a traction splint be attempted; the possibility of causing further damage by impeding circulation is too great.



Improvised full leg splint.

Fractures of the leg, ankle, and foot may be treated by splints improvised from ice axes, trees, or by tying to the opposite leg, making sure to loosen the boot lest the swelling impair circulation. Pad all splinting material and between the legs.

INJURIES TO THE HEAD AND SPINE

Injuries to the head and spine give alpine first aiders their worst moments. These portions of the anatomy are so delicate that the slightest mistake may cause further injury or death, yet often symptoms are so confusing it is difficult to choose a course of action. Usually indecision

revolves around the question of whether or not the victim can safely be moved, or whether medical treatment on the spot is essential. Many climbers, particularly those who have once undergone the agonies of having to make this life-or-death decision, carry a detailed checklist of symptoms in their first aid kits. The sequence of examination and treatment is important, and must be accurate.

Head Injuries

It is first necessary to control any obvious bleeding. This may be done by direct pressure with sterile compresses. Ten minutes of pressure is usually sufficient to control most bleeding.

Next the first aider must thoroughly examine the victim.

1. *Unconsciousness* means there probably has been some bruising of the brain tissue by swelling or hemorrhaging, which can create excess pressures within the skull. The length of unconsciousness is roughly proportional to the seriousness of the injury.
2. *Bleeding or secretion of clear spinal fluid* from the ears, nose or eyes is symptomatic of skull fracture. If any is observed, elevate the head to lower blood pressure within the skull and thus lessen bleeding. Caution: ALWAYS suspect a neck injury. Approximately 15 per cent of all severe head injuries are associated with a broken neck (see Injuries to the Spine).
3. *Unequal pupil size or unequal pupilary response* to light indicates possible intra-cranial pressure on the side which is larger or does not react to light. To test for light reaction shade the eye with the hand, then suddenly remove the hand, exposing the eye to bright sun (or to a flashlight). Both pupils should react equally; unequal pupils are an important sign of brain damage.

Eyes with pupils of unequal size.

4. *A very slow pulse* or *noticeable respiratory fluctuation* means there may be hemorrhage within the brain and increased intra-cranial pressure.

5. *A headache generalized over the entire head* may be caused by internal hemorrhage.
6. *Disorientation* by the victim as to when, where, or how he got there may be an indication of serious injury.

If the victim has none of the above-listed symptoms and has no indications of spinal injuries, ask him to stand with his eyes closed. Swaying or falling may indicate damage to the brain or to the labyrinth (balancing organ). If he is stable, he may be evacuated by walking, but must be watched during the next six hours for evidence of drowsiness, nausea, vomiting, increased headache, bleeding, or unequal pupils. These may occur in injuries where there is an extradural hemorrhage between the skull and the membrane lining the skull.

If the victim has any of the above symptoms, he should be evacuated by stretcher. If his condition is serious, a helicopter evacuation should be considered and if his condition is progressively deteriorating, speed of evacuation becomes of primary importance.

Injuries to the Spine

Injuries to the spine may be caused by a blow on the head, a fall, or a blow by a falling rock. If there is any doubt as to a possible neck or back injury, examine for it and, if still in doubt, treat it as if it were a fracture. The victim may be able to assist in defining the area of pain. With a cervical (neck) fracture, there usually is a great deal of muscular spasm and the victim will not want to move his neck. The first aider should check for the loss of muscular and sensory functions in the arms and legs by asking the victim to move them, or by stroking them with a pointed object and asking if any sensation is felt. Always check both right and left sides.

If a fracture of the cervical spine is suspected, splint neck with one pad under the chin to prevent compression of the spinal cord, and others on both sides of the neck to prevent rotation. Alternatively, a cervical collar of rolled ensolite or clothing should be applied, with the center directly under the chin, the objective being to prevent hyperextension or flexion position of the cervical spine. The lateral movements of the neck must also be restricted. For evacuation, log-roll the patient onto his back, being sure his body and head are at all times held in perfect alignment. One person should hold the head and exert slight traction, rotating the head in line with the body as others carefully roll the trunk and legs. EVACUATION MUST BE BY RIGID STRETCHER—not by rope stretcher. If none is available, wait for assistance and proper equipment.

If a fracture of the back is suspected, slowly and gently roll the victim onto his back with one person keeping the victim's legs constantly in line with his body. Put a small pad under the small of the back to hyperextend

Cervical collar improvised from sweater.

it, as there is less likelihood of injury to the spinal cord if the back is returned to the natural arched position. If there is any doubt regarding the extent of injuries, EVACUATE BY RIGID STRETCHER.

INJURIES TO JOINTS AND MUSCLES

Sprains

A sprain is a stretching or tearing of ligaments in the region of a joint, followed by hemorrhage, swelling, and tenderness. The most common and distressing type from the standpoint of mountain evacuation is a sprained ankle. If there is pain in the region of the ankle bones or in the region of swelling, the possibility of a fracture is great. It is often impossible to tell without an x-ray if the ankle bones are broken. All severe "sprains" should therefore be treated as possible fractures until proven otherwise. If a sprain has just occurred, the ankle should be elevated and a cold pack applied for 30 minutes to control internal hemorrhage. After that time, if the pain is still excessive, splint as for a fracture.

Strains

A strain is a rupture of the lining covering a muscle, or a tear in the muscular fibers. It is differentiated from a sprain by its occurrence over a muscle rather than in the region of a joint. Localized tenderness is present. Treatment is by warm applications which increase circulation and promote healing.

Dislocations

A dislocation is a tearing of the ligaments around a joint, followed by

displacement of the bone from its socket. Most common in mountaineering is dislocation of the shoulder. The shoulder appears more angular, the arm cannot be moved, the muscules are in spasm, and there is considerable pain. A depression can be seen or felt below the tip of the injured shoulder, as compared with the normal side. REDUCTION OF A DISLOCATED SHOULDER SHOULD BE ATTEMPTED ONLY BY TRAINED PERSONNEL, SINCE PERMANENT DAMAGE CAN BE CAUSED BY IMPROPER PROCEDURE.

All dislocations should be treated in the same manner as fractures—by immobilization until medical assistance can be obtained.

HYPOTHERMIA

Many deaths not involving apparent injury have been caused by what the news media refer to as "exposure." Medically, this term is meaningless, for "exposure" is really a condition brought about by a number of factors, one of which, and perhaps the most important, is hypothermia —a lowering of the body's inner core temperature. There are three classes of hypothermia: (1) chronic, usually found in alcoholics, seniles, and others with medical problems; (2) acute, caused by immersion in cold water; and (3) subacute, occurring in healthy persons because of inadequate insulation or subjection to environmental stresses. Only subacute hypothermia and its treatment are discussed in this chapter.

To understand hypothermia it is useful to review some basic concepts of how the body can gain and lose heat.

Body Heat Gain

The body can gain or conserve heat in a number of ways, for example, through the digestion of food: the body produces heat by oxidation of food and tissue at a specific rate while resting (called the basal metabolic rate) or at an increased rate while exercising. The body can also gain heat externally from hot food and drink, the sun, fire, another body, and so on, or internally through muscular activity, either by deliberate exercise or by involuntary exercise like shivering. (Shivering produces as much heat as running at a slow pace or the approximate equivalent to the amount of heat generated from eating two medium-size chocolate bars per hour.) Heat is conserved through constriction of surface blood vessels, which reduces circulation at the skin layers and keeps blood nearer to the central core of the body.

Body Heat Loss

The body loses heat in five ways:

Respiration

A large amount of heat escapes when warm air is exhaled. This cannot be prevented entirely, but can be reduced by covering the mouth/nose area with wool or fur, thereby "pre-warming" the air as it passes through the material.

Evaporation

Evaporation of perspiration from the skin and moisture from the lungs contributes greatly to the amount of heat lost by the body. Although evaporation cannot be prevented, the amount of evaporation (and therefore cooling) can be controlled by wearing clothing that can be opened easily for ventilation or taken off readily, and wearing clothing that will not absorb water, but will breathe, that is, let the water vapor escape to reduce the cooling effect of evaporation.

Conduction

Sitting on the snow, touching cold equipment, and being rained upon are all examples of how heat can be lost as a result of conduction. If an individual becomes wet a tremendous amount of body heat is lost rapidly: deaths have occurred as a result of suspension or immersion in water below 40°F—body temperature could not be maintained. Although not as immediately serious in mountaineering situations, perspiration or rain should never be allowed to saturate articles of clothing, thus seriously reducing their insulating properties.

Radiation

Radiation causes the greatest amounts of heat loss from the body from uncovered surfaces, particularly the head, neck, and hands. Coverage of these areas, therefore, is extremely important in keeping warm.

Convection

The body continually warms (by conduction) a thin layer of air next to the skin. If warm air is retained close to the body, it remains warm. If removed by wind or air currents (convection), the body is cooled. The primary function of clothing is to retain this layer of warm air next to the skin, while allowing water vapor to pass outward, by enclosing air in cell walls or between numerous fibers. Heat is lost rapidly with the lightest breeze unless the proper type of clothing is worn to prevent the warm air from being convected away.

Deaths have been attributed to a loss of body heat at temperatures of 40°F, with 30 mph breeze. Under these conditions, the cooling effect on

Table 1. Effects of Hypothermia

SIGNS AND SYMPTOMS

Body Temperature	*Symptoms*	*Observable in Others*	*Felt by Yourself*
98.6 → 95.0°F	Intense and uncontrollable shivering; ability to perform complex tasks impaired.	Slowing of pace. Intense shivering. Poor coordination.	Fatigue. Uncontrollable fits of shivering. Immobile, fumbling hands.
95.0 → 91.4°F	Violent shivering persists, difficulty in speaking, sluggish thinking, amnesia begins to appear	Stumbling, lurching gait. Thickness of speech. Poor judgment.	Stumbling. Poor articulation. Feeling of deep cold or numbness.
91.4 → 87.8°F	Shivering decreases; replaced by muscular rigidity and erratic, jerky movements; thinking not clear but maintains posture.	Irrationality, incoherence. Amnesia, memory lapses. Hallucinations. Loss of contact with environment.	Disorientation. Decrease in shivering. Stiffening of muscles. Exhaustion, inability to get up after a rest.
87.8 → 85.2°F	Victim becomes irrational, loses contact with environment, drifts into stupor; muscular rigidity continues; pulse and respiration slowed.	Blueness of skin. Decreased heart and respiratory rate. Dilation of pupils. Weak or irregular pulse. Stupor.	Blueness of skin. Slow, irregular, or weak pulse. Drowsiness.
85.2 → 78.8°F	Unconsciousness; does not respond to spoken word; most reflexes cease to function; heartbeat becomes erratic.	Unconsciousness.	
78.8°F ↓	Failure of cardiac and respiratory control centers in brain; cardiac fibrillation; probable edema and hemorrhage in lungs; apparent death.		

the skin is equal to that of much lower temperatures due to increased evaporation and convection. At lower temperatures and strong winds, cooling occurs even more rapidly. This is why the victim of an accident situation must have wind protection and a great deal of insulation (dead air space) to ensure that his body heat is retained at a safe level.

Signs and Symptoms

If heat loss exceeds heat gain, and if the condition is allowed to continue, hypothermia results. Table 1 presents a summary of signs and symptoms keyed to the body's inner core (rectal) temperature. Although the temperatures shown are only approximate, the table provides an indication of how the bodily functions deteriorate with falling core temperatures. Learn to recognize these signs and symptoms and carefully watch yourself as well as others in your party during exposure to cold, wet, and wind.

Treatment

There are four lines of defense against hypothermia: avoidance of exposure, termination of exposure, early detection, and immediate treatment.

Avoidance of Exposure

In avoiding exposure one should dress for warmth, wind, and wet. When clothes become wet, they lose about 90 per cent of their insulating value. Wind drives cold air under and through clothing and refrigerates wet clothing by evaporating moisture from the surface. Put on rain gear before you are wet; put on wool clothes and wind gear before you start shivering. Do not be deceived by ambient temperatures well above freezing; most hypothermia cases develop in air temperatures between 30 and 50°F, and water at 50°F is unbearably cold—particularly when running down the neck and legs and flushing body heat from the surface of the clothes. Do not ask how cold is the air, but instead how cold is the water against the body.

Termination of Exposure

If you cannot stay dry and warm under the existing conditions, terminate exposure. Don't be afraid to give up your objective and turn back. Get out of the wind and rain. Bivouac early before energy is exhausted and before coordination and judgment are impaired. Eat sweets which are quickly and easily absorbed and keep continuously active to ensure adequate heat production.

Early Detection

Any time your party is exposed to wind, cold, or wet, carefully watch each other for the symptoms of hypothermia: uncontrollable fits of shivering; vague, slow, slurred speech; irrational actions; memory lapses, incoherence; immobile, fumbling hands; frequent stumbling, lurching gait; apparent exhaustion, inability to get up after a rest; drowsiness (to sleep is to die). Below the critical body temperature of 95°F the victim cannot produce enough body heat by himself to recover. At this point extreme measures must be taken to reverse the dropping core temperature.

Immediate Treatment

Although the victim may deny he is in trouble, believe the symptoms, not the victim. Even mild symptoms demand immediate, drastic treatment. First, prevent any further heat loss by getting the victim out of the wind and rain and into the best shelter available. Then remove his wet clothing and replace it with dry garments, insulate him from the ground, and warm him by the most expedient methods available. If the victim is only mildly impaired get him into a sleeping bag prewarmed by another member of the party who has stripped to underclothing in order to transfer a maximum amount of heat from his body to the bag. (Placing a hypothermia victim in a cold sleeping bag, no matter how much insulation it contains, is not sufficient because the victim's body cannot produce the heat needed to warm the bag and himself.) Well-wrapped, warm (not hot) rocks or canteens also help. Skin-to-skin, chest-to-chest contact is the most effective treatment, the stripped victim in a sleeping bag with another person (also stripped) or if a double bag is available, between two warmth donors. Build a fire, if possible, on each side of the victim. If he is able to eat he should be fed candy or sweetened foods; carbohydrates are the fuel most quickly transformed into heat and energy. If the victim is semiconscious or worse, try to keep him áwake. Do not give hot liquids by mouth to the severe hypothermic.

FROSTBITE

Frostbite, or freezing of the tissues, most commonly affects the toes, fingers, and face. It occurs when an extremity loses heat faster than it can be replaced by the circulating blood, or it may result from direct exposure to extreme cold or high wind, as happens with the nose, ears, and hands. Damp feet may freeze because moisture conducts heat rapidly away from the skin and destroys the insulating value of socks and boots. With continued cold or inactivity, the blood circulation to the extremities is

steadily reduced, accelerating the freezing process. With adequate equipment, properly maintained and used, frostbite is not likely to occur.

An area of superficial frostbite will look white or grayish, and the surface skin will feel hard, but the underlying tissue will be soft. With deeper involvement the affected area is hard, cold and insensitive. During rewarming large blisters may appear on the surface, as well as in the underlying tissue.

Superficially frostbitten areas are warmed by placing them against warm skin: feet, against a companion's abdomen or in his armpits; fingers, in a person's own armpits. Most emphatically the temperature of the frostbitten area should not be raised much above body temperature, such as by warming near a fire. Such misguided efforts to give speedy relief invariably increase the injury. Further, though the injured part may be snuggled closely, it must never be rubbed, especially with snow, for the additional cooling and the abrasive action of the snow can only cause more damage to already devitalized tissues. Areas of more extensive or deep frostbite, in which the affected area is white, has no feeling, and appears deeply frozen, should be immersed in 99°F to 104°F water until thawed.

If it is not possible to completely and uninterruptedly thaw the deeply frozen area, no attempt should be made to do so; it is better to await medical assistance than risk incomplete thawing and/or refreezing. In some circumstances, callous though it may sound, no attempt should be made to thaw frozen feet, since it is possible for a person to walk on frozen feet and suffer little or no additional tissue damage; once they are thawed he becomes a stretcher case, creating an obvious burden for the party and perhaps incurring considerable pain.

HIGH ALTITUDE PULMONARY EDEMA (HAPE)

Pulmonary edema is the leakage of blood plasma into the lungs, which renders the air sacs (alveoli) ineffective in exchanging oxygen and carbon dioxide in the blood. This condition rarely occurs in healthy people below 9000 feet; the average elevation at which it strikes in the United States is 12,000 feet (the level of onset varies for mountain ranges in other parts of the world).

The early symptoms of pulmonary edema are similar to those of pneumonia, although pulmonary edema is not precipitated by an infection and there is no fever. Within 12 to 36 hours after reaching high altitude the victim of pulmonary edema experiences extreme weakness, shortness of breath, nausea, vomiting, very rapid pulse (120-160), cyanosis (bluish color), "noisy" breathing which progresses to moist crackling breath sounds, and irritative coughing which produces a frothy white or pink sputum and later blood.

If untreated, the victim rapidly moves into the final phase characterized by unconsciousness and bubbles in the mouth or nose. If the unconscious victim is not immediately moved to lower elevation or given oxygen, he will die. All the early symptoms may be mistaken for "mountain sickness" or fatigue, or may pass unnoticed during the night, with the morning finding the victim unconscious in the final phase. The most effective first aid is rapid evacuation to lower altitude or constant administration of oxygen.

HEAT EXHAUSTION

Heat exhaustion may occur either when an individual is exposed to a hot environment or when he overheats (perhaps because of physical exertion). In heat exhaustion, the blood vessels in the skin become so dilated that the blood to the brain and other vital organs is reduced to inadequate levels. The result is an effect similar to fainting. Lack of acclimatization to heat or even minor degrees of dehydration or salt deficiency make an individual more susceptible to heat exhaustion. All or some of the following symptoms may be present: nausea, cold and clammy skin, faintness, weakness, and perhaps a rapid pulse. Treatment consists of rest, in the shade if possible, with plenty of liquid and salt.

HEAT STROKE (SUNSTROKE)

When exposed to excessive sun the body may become so overheated that it is provided too much blood through the cooling effort of the circulatory system. Symptoms are a flushed, hot face; rapid, full pulse; pain in the head; weakness; dizziness. If sunstroke occurs, it is EXTREMELY SERIOUS and requires IMMEDIATE treatment by cooling of the head and body with snow or water; administration of cold liquid should be continued until the body temperature drops to near normal.

THE PERSONAL FIRST AID KIT

Mountaineering first aid begins with the first aid kit, an essential which must be carried *by every person on every trip.* The kit should be small, compact, and sturdy. The contents must be waterproof whether the container is or not.

All mountaineers should have the items listed below in their personal first aid kits, plus any medications they need because of individual medical problems, such as allergies. Parties going on long trips or to regions remote from medical aid may make additions to their group first aid kit. The majority of these require a doctor's prescription and special instructions concerning their use and hazardous side effects.

THE MOUNTAINEERING FIRST AID KIT

Item	*Quantity and Size*	*Use*
Aspirin	12 tablets—5 grain	One to 2 every 4 hours, for pain.
Antacid	6 tablets	For indigestion or heartburn
Bandaids	12, 1"	For minor cuts
Butterfly bandaids (or know how to make)	6, various sizes	For closing cuts
Carlisle (Battle Dressing)	1, 4" (or sanitary napkin)	For large bleeding wounds
Moleskin	½ package	For padding blisters or "hot spots"
Needle	1 medium size	To remove splinters, etc.
Tincture of Benzoin	1-oz. bottle (plastic)	Painted on the skin to make tape adhere more firmly
Antibacterial soap	1 oz. bottle (plastic)	Mild antiseptic for abrasions, cuts
Razor blade, single edge	1	For cutting tape, mole foam, hair, loose bandage ends
Roller gauze	2 rolls, 2" x 5 yd.	For holding gauze flats in place
Steri-pad gauze	6, 4" x 4"	For larger wounds
Tape, non waterproof	2" roll	For securing dressings, etc.
Triangular bandage	1	For supporting arm, protecting dressing from contamination
Prescription medication	As prescribed by personal physician	If carried, each should be stored in a separate container, and clearly labelled as to dosage, expiration date, type of drug and expected reaction
Thermometer	1 (40°F to 120°F)	For measuring temperature
Wire mesh splint	1	For suspected fractures: forearm, wrist, ankle, cervical
Tweezers	1	For removing splinters

Miscellaneous items may include:
Coins for telephoning in emergencies
First aid/rescue information, including current telephone numbers
Pencil and paper, accident report form

COMMON MOUNTAIN MISERIES

Blisters

Blisters result from rubbing of the skin against the socks, either because the boots are too large or laced too loosely, or because the socks are lumpy or wrinkled. To prevent blisters, shoe and sock should be removed at the first sensation of discomfort and the foot examined for reddened skin areas which indicate undue friction. A wide band of adhesive tape, applied smoothly over—and well beyond—the margins of the "hot spot," relieves discomfort and prevents blistering. Application of tincture of benzoin prior to taping makes the tape adhere more firmly and toughens the skin. If preventive measures are not taken in time, a hole may be cut in a piece of moleskin, which is then placed over the blister to protect the area from further direct contact. The moleskin is secured with tape.

Blister protection. Circle is cut out of pad to keep pressure off blister.

Because of the risk of infection, blisters should not be opened unless absolutely necessary. If it must be done, the area is washed with soap and water and a needle sterilized with a match is inserted under the blister's edge. Fluid is gently pressed out and a sterile bandage applied. If the blister has already broken it should be washed and bandaged in the same manner and carefully watched for subsequent infection.

Headache

Headache in the mountains usually results from inadequate sunglasses, tension in neck muscles, constipation, acute mountain sickness, or some pre-existing physical condition. In any case of headache, the source of the trouble should be sought and eliminated by better protection of head or eyes, stretching and relaxing neck muscles, or taking a laxative. Aspirin may alleviate the immediate pain.

Acute Mountain Sickness (AMS)

Whenever a person ascends rapidly to an altitude greater than that to which he is accustomed, his system adjusts to new conditions: breathing becomes more rapid to extract the necessary oxygen from the thinner air; the blood increases its proportion of oxygen-carrying red corpuscles. In the extreme case, such as when an airplane pilot climbs thousands of feet in minutes, unconsciousness results. The mountaineer, moving upward slowly but steadily, suffers very uncomfortable but less drastic symptoms. First comes general malaise and loss of appetite, then headache, followed by increasing weakness and lessening of will. If forced by social pressure or inner resolution to continue the climb, the sufferer eventually becomes apathetic, nauseated, dizzy, and sleepy.

Symptoms of mountain sickness can occur even at relatively low altitude. Tourists driving in automobiles to 8000 feet sometimes feel lazy or dizzy, or experience palpitations. Climbers generally have more time to acclimatize, and except for shortness of breath usually feel only minor effects until elevations of 12,000 feet or more are reached. However, in regions such as the Pacific Northwest, where climbers live at sea level yet ascend to over 14,000 feet on a weekend, mountain sickness of greater or lesser severity is the rule rather than the exception.

Proper use of the rest step is the first remedy. Next come rest stops, with forced deep breathing ("overbreathing") to hyperventilate the lungs. Nourishment in the form of the simple sugars in candy, oranges, or fruit juice should be taken.

Muscular Cramps

Leg cramps caused by an accumulation of lactic acid in the muscles and loss of salt through perspiration sometimes make it impossible for a climber to continue. Such cramps appear suddenly, usually after strenuous exertion for several hours; the pain is excruciating. During ordinary activity the blood removes lactic acid as it is formed, but in extended exercise a surplus may build up. Resting, to allow the blood to carry away the lactic acid, is the first step in treatment. Deep breathing, and stretching of the cramped muscle as quickly and completely as possible – painful

as this may be—give further relief. Salt tablets should be administered immediately to remove the other cause; indeed, many climbers, after finding their cramps quickly dispelled by salt intake, wisely prevent them by using salt tablets at periodic intervals on any climb if they perspire heavily.

SNOWBLINDNESS

Snowblindness is caused by failure to use adequate eye protection during brilliant sunshine on snow or light-colored rock. The eyes are bloodshot, feel irritated and "full of sand." The treatment is application of cool, wet compresses to the eyes, and then having the patient wear two pairs of dark glasses. Aspirin controls the pain. Occasionally it may be necessary to cover the eyes and lead the casualty out by the hand. Recovery may take two or three days. Snowblindness is not a permanent condition.

SUNBURN

At high altitude and on snow nothing but coverage by clothing is completely effective as protection of the skin from the burning rays of the sun, and a degree of burning is inevitable. Lips are particularly vulnerable and some climbers develop severe lip sores unless they exercise special caution. Reflection from snow causes burns in areas not ordinarily affected, such as under the chin, around the eyes, inside the nostrils and ears, and on the roof of the mouth. Lack of a hat when hair is short, thin, or absent may result in scalp burns.

First degree burns with skin reddening and second degree burns with blisters are not uncommon. The climber often miscalculates the intensity of the sun or is simply too weary to take preventive action. As with any burn—from sun, rope, or fire—if the affected area is large, toxic substances absorbed by the body can cause generalized illness.

Sunburn usually is treated on first notice by further applications of sunburn preventive. Sun screens should be used rather than the more common cosmetic suntan preparations. In severe cases, and if there is much swelling, cold compresses should be applied. Aspirin may be taken for pain, and warm, salty liquids administered to replenish body fluids.

WHEN AN ACCIDENT HAPPENS

ANYONE WHO CLIMBS very often or for very long must expect sooner or later to be involved in misfortune, if not his own, then someone else's. The very nature of the sport rules out much chance of help from casual passers-by; climbers usually must be rescued by other climbers, often at great risk and sacrifice. So high a degree of mutual responsibility requires that every mountaineer be familiar with emergency procedures.

Competent leadership and strict discipline are requisite to success in alpine rescue. If there has been no recognized leader, then one must be selected to deal with the emergency. Once he accepts the task, companions abide by his decisions without argument, though he should remain flexible enough to consider suggestions.

Urgent first aid should be rendered at the first possible moment: bleeding stopped, breathing restarted, shock relieved, and fractures immobilized. Impending hazards may force the party to move the victim at once to a more sheltered location. However, choice between acceptance of the hazards of the accident site and the risks of moving the victim may be difficult. If he must be moved, methods must be used which do not compound his injuries.

Every aspect of the situation needs cool analysis: seriousness of the victim's injuries, measures necessary to sustain him during evacuation, terrain and distance to the road, and the strength and resources of the party. Then, and only then, should a course of action be selected.

Evacuation by the Party

There are occasions when a party can successfully perform the evacuation of an injured party member. If the injured person can walk and his injuries are relatively minor, lightening of his pack and moral support may be all that is needed to get him out. Minor but disabling injuries such as a sprained ankle or injured knee may possibly be evacuated by the party also.

It is generally true that a victim will benefit from a period of rest following an injury. The further trauma of immediate evacuation is seldom justified: therefore the inevitable move should be postponed until the victim's condition has stabilized. The victim himself is probably the best indicator of when to start. He should be consulted and his condition closely observed prior to and during transportation. His comfort must be kept foremost in the minds of the party.

Some conditions require immediate evacuation: pulmonary edema, unconsciousness for unknown cause, diabetic coma, and progressively deteriorating conditions such as appendicitis, or whenever circumstances of weather or terrain are life-threatening. Some conditions require that evacuation be delayed until trained rescue personnel arrive (unless such help will be more than 24 hours in arriving): head injuries, neck and spinal fractures, heart attack, apoplexy (stroke), and internal injuries. Evacuation is required but not urgent for all other serious injuries and illnesses.

When Outside Aid is Needed

There are occasions when a party cannot cope with its own emergency. In an area requiring long, difficult technical evacuation (involving long raises or lowers), if injuries are severe, or when the party size, relative condition, terrain and distance to the trailhead combine to make transport difficult, help will have to be obtained. As a general rule 30 or more rescuers are often needed to carry a disabled victim for distances greater than 2 to 3 miles on even the best of trails.

Once it is determined that outside aid will be needed, help should be summoned as soon as the victim is stabilized and it is certain that the persons going for help will no longer be needed at the accident site. In many areas, help by helicopter is usually no more than 3 hours away once word gets to the proper authorities. If a ground party is required, help is usually about 8 to 16 hours away. Therefore, if the party is in an area accessible by helicopter, if the party and victim are sheltered, and if the weather is good, there is little reason to move the victim unless the injuries require doing so.

When help must be requested—from climbers on nearby peaks, from people living or working in the region, or from local authorities—then there must be no hesitancy in making the request. At all times a party should know what help it can expect if its own efforts fail, where and how to get it, and how to co-operate with authorities and rescuers.

Going for Help

Whenever possible, two climbers should travel out together—partly for safety and partly because two people do a better job of obtaining help. Messengers should carry enough equipment to handle their own emergencies but not so much that they cannot move swiftly. Wherever possible marking the trail out will facilitate travel back to the accident site by the rescue party. It is important to remember that the victim and members of the party remaining with the victim are relying solely on the messengers at this point. They are assuming that the message is getting to the proper authorities and that help will soon be on its way; therefore it is doubly important that the messengers travel in a safe manner. The certainty, not the swiftness, of message delivery is the most important factor.

Sometimes it may not be possible to send for help at all, in which case efforts should be made to signal someone visually or auditorily; the victim and party then await rescue. Such situations exemplify the necessity of leaving the intended route and estimated time of return with a responsible person who will notify the proper authorities if the party fails to return.

Once in contact with civilization the messengers call the county

sheriff, National Forest or Park Service personnel, or the local authorities in charge of the region, and ask them to relay a message to the local Mountain Rescue group or to provide the needed help themselves. *If evacuation must be accomplished over technical terrain, the authorities must be made aware of the necessity for personnel trained in technical rescue work.*

The messengers' job is not ended at this point. They must make certain messages are sent at once, accurately, and that they reach their destination. Often the organization of a rescue depends upon a chain of communication, messages relayed from person to person via telephone and radio until finally a rescue leader is reached. Along the way vital information may be lost by non-mountaineers who do not understand the words they are asked to convey. In the interest of efficiency and accuracy, the messengers should talk directly with some trusted fellow climber. The line of communication must not be broken. If the rescue leader cannot be personally contacted, then messengers must be insistent with intermediaries to the point of being obnoxious, if necessary. Messages garbled along the way – or simply not forwarded – have directly caused a number of tragic rescue failures.

The party must have a clear grasp of the problem and of its own capacities and needs before deciding how much and what form of aid to request. Once a team has been dispatched to obtain help there is no way to control what they do or say. Excited messengers hurrying to reach the road with little idea of the party's needs only cause confusion.

Enough information must reach the rescue leader so that an effective rescue plan can be devised and executed. A completed accident report form (see example) contains the necessary information and should be filled out in duplicate at the scene of the accident for each injured member of the party. One copy should be sent out with the messengers reporting the accident and given to the responsible agency; the other copy should be retained by the party leader for future reference in making any required reports. In addition, a map with the exact location pinpointed is helpful to rescuers.

Having established contact with the rescue leader, the messengers should remain by the telephone until the rescue party arrives. The rescue leader may need to contact them for further information, to advise them of unexpected developments, or to make progress reports. Careful consideration must be given to the matter of informing relatives of people in the climbing party. In a large party this requires making a written list of names and telephone numbers before leaving the accident scene. It is cruel to keep family members waiting in anxiety for hours or days, but it might be well to await the arrival of the rescue leader so that efforts to

reach the messengers for further information will not be hampered by busy telephone lines. Also, the rescue leader will have had a wealth of experience in dealing with concerned relatives and the public news media.

A last and important function of the messengers is to meet the rescue party at an agreed-upon rendezvous, rested and ready to lead the way back to the accident scene. If they are incapacitated by fatigue or injury it is all the more important that wherever possible the trail be marked on the way out.

Evacuation on Technical Terrain

Except for relatively minor injuries, evacuation of the victim over technical terrain is best left to outside help utilizing specialized equipment and procedures. This recommendation is made not only for the safety and comfort of the victim, but for the safety of the other party members as well. A tense accident situation is no time for persons not familiar with technical evacuation to experiment with another's life and limb, no matter how minor the problem appears.

TRANSPORT ON NON-TECHNICAL TERRAIN

In many rescues the hardest job begins when the steep terrain is past and ropes are put away. No longer aided by gravity, the party must carry its burden, very fatiguing work on rough ground. Under some conditions, however, a few simple techniques extend the capacity of the small party so that it need not call for help.

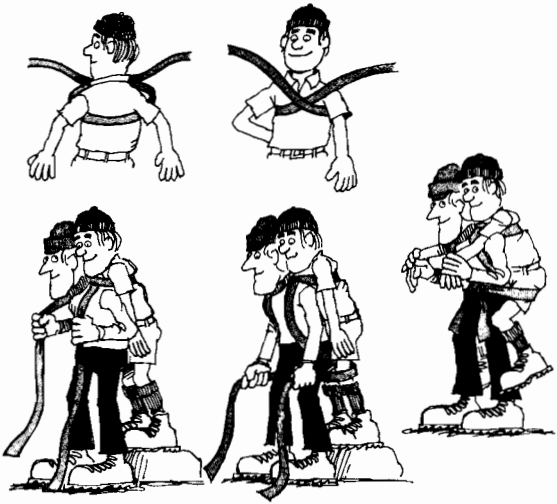
The *four-hand seat* is useful for short distances if the two carriers are the same height. Standing side by side, each grasps his right wrist with his left hand, palms down. Each carrier then grasps the wrist of the other with his free hand to form a seat.

For longer distances the *ice axe carry* is better: carriers wearing rucksacks stand side by side with joined ice axe shafts resting between them in their pack straps; the victim is seated on the padded shafts with his arms over their shoulders.

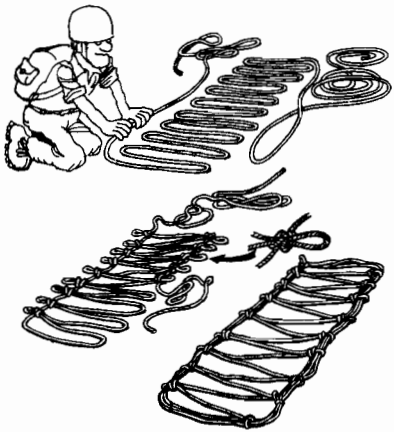
A strong climber can carry a person on his back for long distances provided the weight is distributed properly. The back carry using nylon webbing (Page 29), works well on non-technical terrain. Another form of back carry, the *rucksack carry,* involves slitting a large rucksack on the sides near the bottom so the victim can step into it like a pair of shorts.

Another method of evacuation is by rope stretcher constructed and used with or without the aid of ice axes and/or branches as follows:

Place the rope, preferably 150-foot, extended, on the ground, and find the center (Page 29). From the center make 16 180-degree bends, 8 extending on each side of the center. The distance between the bends



Nylon webbing carry.



Rope stretcher.

should be approximately as wide as the victim and the full 16 bends approximately as long as the victim's length. Bring the rope ends around the sides of the stretcher adjacent to the bends. Tie a clove hitch in the rope section adjacent to each bend and insert the bend. Continue tying clove hitches and inserting bends until all the bends are bound. Leave a small loop between the apex of the bend and the knot. Insert the remaining rope through the loops until the entire remainder is coiled around the stretcher. Snug up the knots, tie off the ends, and pad the area which will support the body from neck to hips.

Someone should try out the stretcher, whether it is constructed of rope or branches, before placing the victim on it, to determine the need for additional padding or supporting material without causing discomfort to the victim. CAUTION: evacuation by rope or any improvised stretcher is usually very rough on the victim. If there is a chance that further injury will result, WAIT until trained rescue personnel with proper equipment are available to assist.

Radio Communications

Two-way radio communication, when the gear is both light and efficient, immensely facilitates mountain rescue. The main problem is obtaining reliable transmission and reception despite heavy timber, intervening ridges, long distances, and bad weather.

Air Rescue

The helicopter has revolutionized mountain rescue. It has plucked people from cliffs and glaciers and rushed them to hospitals in hours rather than the days required by ground transport—over and over again meaning the difference between life and death. Therefore a climber should know some of the principles of helicopter operation as well as their limitations.

A helicopter can take on a load either by landing, or when that is not feasible, by hovering and lowering a sling or a stretcher on a cable attached to a power winch. The most important factors governing its ability to evacuate are visibility, wind velocity and turbulence, and air density.

In mountain flight continual visual contact with the ground is essential, and thus in poor weather a helicopter cannot operate. It can maneuver safely in winds up to about 35 mph, a wind of about 10 mph being better than still air. Turbulence which usually accompanies high winds is dangerous, although under some conditions steady breezes are actually helpful. The maximum altitude at which a helicopter can operate is de-

termined by air density, which decreases as altitude and temperature increase; less dense air reduces the lifting force of the rotor blades.

When choosing a helicopter landing zone select an area where a "drop-off" during takeoff is possible rather than a "climb-up." The landing zone should have a 360-degree choice of landing and takeoff directions which allows the pilot to land or take off into the prevailing wind. An area around the touchdown pad at least 75 feet in diameter should be cleared of obstacles such as brush and loose objects, and made as level as possible, with a slope of not more than 10 per cent. The landing area should be clearly marked with colored tape or brightly colored objects, securely anchored. Streamers, plastic ribbon, or smoke should be used to indicate wind direction to the pilot, preferably at the edge or downwind of the area so as not to obstruct his vision. It cannot be overstressed that all loose items near the landing zone should be well secured, especially those used to mark the boundaries. If the helicopter lowers equipment, allow it to touch ground first to dissipate static electricity. If there is a last minute danger to the helicopter, "do not land" should be indicated by moving the arms from the sides horizontally to overhead several times. If the party has no streamers or smoke, members should stand with arms extended toward the landing area with the wind at their backs indicating "landing here; my back is into the wind." The downwash winds from the rotor approach 60 to 100 mph depending on the size of the machine, so do not stand near the edge of a cliff. Watch out for flying debris, use eye protection, and again, have all gear safely secured.

WARNING: Never approach a helicopter unless signalled to do so by the pilot or a crewman and then duck down and always approach or leave from near the front so the pilot can see you at all times. Also, do not approach or leave the helicopter from any side where the ground is higher than where the helicopter is standing. Stay away from the rear rotor; when spinning it is nearly invisible and can kill an unwary stroller. All other personnel should stay at least 75 feet away from the landing area. Be sure to secure the victim and any gear going with him so there are no loose straps, ropes, or clothing, and shield his face and eyes to protect him from flying debris and assure proper respiration. Remember it will take time to secure the victim to the stretcher. Do not let the fact that the helicopter may be waiting rush you in this operation, for the safety of the victim is at stake. Request the pilot to wait or to return at an appropriate time.

SUPPLEMENTARY READING

American Academy of Orthopedic Surgeons. *Emergency Care and Transportation of the Sick and Injured*. Menasha, Wisconsin: American Academy of Orthopedic Surgeons, 1977.

American National Red Cross. *Standard First Aid and Personal Safety*, and *Advanced First Aid and Emergency Care*. Garden City, New York: Doubleday and Company, 1980.

Hackett, Peter H., M.D. *Mountain Sickness*. New York: The American Alpine Club, 1980.

Houston, Charles S., M.D. *Going High*. Burlington, Vermont: Charles S. Houston, M.D. and The American Alpine Club, 1980.

Lentz, Macdonald, Carline. *Mountaineering First Aid, 3rd ed.* Seattle: The Mountaineers, 1985.

Wilkerson, James A., M.D. ed. *Medicine for Mountaineering*. Seattle: The Mountaineers, 1985.

Wilkerson, James A., M.D. ed. *Hypothermia, Frostbite and other Cold Injuries*. Seattle: The Mountaineers, 1986.

ACCIDENT REPORT FORM

This form is to be completed in duplicate AT the scene of the accident for each injured member of the party. One copy should be sent with those going for help and the other form retained by the leader.

ACCIDENT

Date: | Time: AM ☐ PM ☐

LOCATION

Quadrangle: | Section:

Exact Location (include marked map):

Terrain: Glacier ☐ Snow ☐ Brush ☐ Timber ☐ Rock ☐ Trail ☐
Heather ☐ Easy ☐ Moderate ☐ Steep ☐ Other:

COMPLETE DESCRIPTION OF ACCIDENT

Ascending ☐ Descending ☐
Roped ☐ Unroped ☐
Rock Fall ☐ Ice Fall ☐
Avalanche ☐ Illness ☐
Excess Heat ☐ Cold ☐
Equipment Failure ☐

Witnesses: | Other:

INJURED PERSON

Name: | Age:

Address: | Male ☐ Female ☐

Phone:

Whom to Notify: | Relation: | Phone:

INJURIES

Overall Condition	Good ☐ Fair ☐ Serious ☐ Fatal ☐ Unconscious: Yes ☐ No ☐ If yes, length of time:
Injury 1	Location on Body: Type of Injury:
Injury 2	Location on Body: Type of Injury:
Other Injuries	Location on Body: Type of Injury:

FIRST AID TREATMENT

General:
Bleeding Stopped ☐ Shelter Built ☐
Artificial Respiration ☐ Warm Fluids Given ☐
Treated for Shock ☐ Evacuation ☐

Injury 1

Injury 2

Other Injuries:

ON-THE-SCENE PLANS	Will stay put ☐ Will evacuate to trail ☐ to Road ☐ Will evacuate a short distance to shelter ☐ Will send some members out ☐ Other:
PERSONNEL	Number: Inexperienced ☐ Experienced ☐ Intermediates ☐ Advanced ☐ Capability for a bivouac: Yes ☐ No ☐
	ATTACH the pre-trip prepared LIST OF PARTY MEMBERS including names, address and phone numbers to the ACCIDENT FORM BEING TAKEN OUT.
EQUIPMENT AVAILABLE	Tents ☐ Sleeping Bags ☐ Ensolite ☐ Flares ☐ Saw ☐ Hardware ☐ Stove and Fuel ☐ Ropes ☐ Other:
WEATHER	Warm ☐ Moderate ☐ Freezing ☐ Snow ☐ Wind ☐ Sun ☐ Clouds ☐ Fog ☐ Rain ☐ Other:
TYPE OF EVACUATION RECOMND'D	Lowering Operation ☐ Carry-Out ☐ Helicopter ☐ Rigid stretcher ☐ None until specialized medical assistance ☐ Specify:
PARTY LEADER	Name:
MESSENGERS SENT FOR HELP	Names:
FURTHER INFORMATION, IF ANY.	
RECOMMEN-DATIONS FOR FUTURE CLIMBS	Equipment: Leadership: Route: Abilities:

QUICK INDEX

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