AMERICAN COLLEGE OF EMERGENCY PHYSICIANS
SCIENTIFIC ASSEMBLY
1999

Rescue in the Wild

Emergency medicine is designed to bring emergency care to victims in a vast array of circumstances. Hazardous environments require special personnel, equipment, and training. The lecturer will present a variety of rescue situations and methods needed to ensure success. Wilderness, mountain, cliff, cave, mine, and water rescues will be discussed. Environmental problems will also be discussed (eg, extremes of temperature, snake bites, and others).

- Explain the unique characteristics of each rescue setting.
- Discuss the specialized training and equipment necessary for specific wilderness rescue situations.

TU-107
Tuesday, October 12, 1999
4:00 PM - 4:55 PM
Room # N242
Las Vegas Convention Center

**Part owner: Adventure Medical Kits*

FACULTY

*Eric A Weiss, MD, FACEP

Assistant Professor, Surgery, Division of Emergency Medicine, Associate Director, Trauma; Associate Chief and Director of Continuing Education, Stanford University Medical Center, Stanford, California; Medical Consultant, National Geographic Society

Rescue In The Wild

Eric A. Weiss, MD

Modem day mountain search and rescue is based on techniques derived from both technical advancement and experience. Equipment For technical climbing has advanced rapidly in the past two decades. Sport climbing and the current athletic /gymnastic approach to both rock and ice climbing has created a demand for technical gear that is more efficient for anchor placement and better for the environment. Rescue teams have been able to employ some of this technology. However, rescue in the high alpine environment demands more than efficient use of equipment and the ability to perform extreme gymnastic climbing moves. Alpine rescue demands total awareness of the mountain environment, critical understanding of the circumstances involving each mission and the judgement of knowing when to employ specific search, stabilization and evacuation techniques that will enhance survival for the distressed and minimize risk to personnel.

In mountaineering accident situations, there can be several motivations to call for help; sickness, injury, disorientation and psychological problems to name a few A good general rule when making such a decision to call for help is: if you feel that your efforts to stabilize and evacuate the patient from the situation may cause further harm or a significant delay in care, it's best to get some help. The modern day advent of cell phones has increased the rapidity with which the word gets out to rescue teams. A recent study in Grand Teton National Park revealed that 17% of accidents were being reported by cellular telephone. Some say, "the 1990's survival kit is a GPS receiver a cell phone and a credit card"! Preparing for a trip with self-rescue in mind is always a good idea.

The workings of a search and rescue operation can be loosely divided into four stages: locate, reach, stabilize and evacuate. All of these stages can involve varying lengths of time, complexity and sophistication. Each operation must be prioritized based on the circumstances involved with regard to medical urgency, environmental situation and equipment and personnel available to perform an operation.

As a model. Grand Teton National Park has a topography which allows mountaineers to access extreme alpine climbing terrain from the front country in a matter of a few hours. Hence the park and surrounding backcountry see heavy use. One in three thousand climbers have an accident. With proximity to the front-country so close, the word gets to rescue personnel quickly and teams must be mobilized in a rapid fashion to respond. Rescue efforts for the high alpine terrain are co-ordinated by the Jenny Lake Sub-district Ranger and the additional seasonal climbing rangers during summer months. Medical control is provided under the direction of Dr. Rich Sugden with the assistance of Lanny Johnson PA-C and the medical staff of St. John's Hospital.

Since the 1950's, formal techniques for both medical stabilization and evacuation have been modified to enhance survival of the injured and to minimize risk to the highly trained rescue team members. Most recently, helicopter short haul techniques have been employed to extricate high priority accident victims from the extreme alpine terrain. These techniques are high risk but reduce the critical patient field time and eliminate massive technical rescue operations which require large numbers of people and

equipment over extended periods of time. The "golden hour" philosophy can be applied to the critical backcountry trauma patient with a more realistic "golden three or four hours" as the possible extrication, stabilization and evacuation time from the first report. In the recent past these techniques have saved a number of critically injured climbers who otherwise may have died without rapid stabilization and evacuation.

LOCATEPHASE:

The location phase of rescue may be simple or exponentially complex. This concept is based on whether the operation is a search vs. a response to a known location. A search situation should always be considered an emergency until proven otherwise. In the event of a search several modalities may be employed:

1. Ground search: may involve many people, dogs and vehicles.
2. Air search: involving low numbers of searchers in slow moving aircraft such as helicopters or small fixed wing STOL aircraft.
3. A combined multi mode search.

In the event of good weather and the use of aerial search, ground teams must back up an operation. In an aircraft, hearing, smell and other senses are eliminated and the call for help may be undetected. Many searches by helicopter have been carried out in mountain terrain over-flying victims closely, then detected later on the ground by dogs or ground searchers.

REACH, STABILIZE AND EVACUATE PHASES:

The reach, stabilize and evacuation phases may be carried out with respect to urgency and the modes available to the given time period. Then are many situations in the mountains when an air operation may be impossible due to weather. Often times a rapid hasty team must climb to the scene to size up the situation and perform basic medical assessment and stabilization. Depending on the technicality of the situation and the number of personnel available, this team may have limited medical tools capable of airway and cervical spine stabilization' and protection from the elements. At times, the degree of injury, environmental location and lack of practical alternate rescue means makes air the best option for patient access and evacuation.

With respect to stabilization, the only difference between backcountry trauma and front country is the exposure to the elements and the potential length of time spent in the pre-hospital setting. Aggressive airway management, c-spine stabilization, fluid management and careful monitoring of patient vital signs are essential. Critical head, chest and abdominal trauma need rapid evacuation and are frequent killers.

WILDERNESS CARE PEARLS:

1. First avoid further injury; perform a global survey then get the patient to a safe location for treatment. The mountain environment is full of objective hazards. Situational awareness is essential.

2. Minimize risk to personnel and equipment for body recoveries.

3. The airway takes priority over all other problems. Intubations should be supported with the ability to perform adequate suctioning and oxygen delivery; nasopharyngeal airways and oropharyngeal airways are good alternates. Situate the patient to provide good respiratory effort adequate drainage of oral secretions.

4. When administering supplemental Oxygen, regulate flow to avoid waste Often a flow of two to three liters by nasal cannula will be quite adequate and last much longer than 10 liters a minute by mask A finger pulse oximiter can be helpful if the patient has adequate capillary flow.

5.

6. CPR is of little benefit in remote locations particularly in traumatic cardiopulmonary arrest. Acceptions are cold water immersion injuries of less than an hour and electrocutions with lightning etc. There may be psychological benefit to those caring for the patient to make an attempt at least until qualified personnel arrive or medical control concurs.

7. Perform cervical spine immobilization when indicated. Recognize that if the patient is committed to such care they become a non-ambulatory transport usually in the supine position requiring mom manpower and equipment.

8. Transport patients in mountain tenain with head uphill, globally. Transporting with the head downhill increases ICP and limits diaphragmatic expansion compromising shock states. People transported head downhill rapidly experience vertigo. In addition unconscious patients without protected airways may aspirate gastric contents.

9. Insulate patients from the ground up protect to from heat loss. Snow, rock and ice under a patient will lower core temperature quickly.

10. IV therapy should be aggressive with warmed fluids approaching body temperature. Store extra fluids under jackets against the body and use chemical heat packs and insulators. Avoid running IV tubing through cold air and over cold objects.

11. If the Patient is incapacitated or unconscious, consider placing a Foley or Texas catheter to monitor urine output and prevent unexpected soaking of bedding with urine.

12. Avoid poor patient examinations because of clothing. This is particularly important in assessment of the chest and abdomen. Visualize all injuries.

13. Non-pressurized aircraft evacuation involving more than one thousand feet in elevation change can cause closed airs space injuries to deteriorate and cause equipment problems; a pneumothorax may expand and become worse, MAST trousers may release Velcro patches and air splints will become loose or too tight. Glass bottle IV fluids should be avoided or vented properly.

14. Prophylactic antibiotics should be given to patients with deep wounds or serious orthopedic injuries and considered for others that may require immediate surgery.

15. Administering pain medications and sedation can have great benefit to the Patient but may produce deleterious complications at high altitude; generally starting near 8,000 ft above sea level. Compromised patients from sea level may have deleterious effects even lower. Use judiciously.

16. In the wilderness environment medical over-sophistication gives way to practicality and improvisation.

MODES OF TRANSPORT AND EVACUATION:

Single one on one carry:
Only a good idea for a very short distance to get a patient out of danger or into cover. Even expert porters in the Himalayas burn out within a few miles. If this is the only way possible don't bother cutting up packs or loading chairs onto porter baskets to fashion carrying devices. A simple "piggyback style carry is good especially if a carrying sling is used to make a small support under the patients rear end and over the *carrying* person's shoulders.

Snow litters:
If you can move primarily downhill with a litter or sled a single person can move another by dragging over snow for many miles. As soon as gravity is working against you or the snow is not firm enough to walk on, your highly limited.

Horses:
Generally a good packhorse can be used for transport of patients with isolated upper extremity injuries, lacerations, sick but ambulatory and occasionally sprains and strains of the lower extremity. Anyone with a considerable potential for more extensive injuries or deterioration should avoid riding,

Trail wheel:
just about any patient can be transported in a trail wheel and litter. The only limiting factor is terrain; one must have good single-track trail similar to most class two back packing areas. It is possible to cross some rocky areas but a switch to carrying slings on the litter may be required if it gets really rough. Uphill can be painstakingly slow. Send in at least four teams of two to keep the litter moving for long periods.

Litter carry:
To carry a litterover rough, non-climbing, mountain terrain a minimum of sixteen people should be used with an ideal of twenty or more. Carrying slings should be used on the litter to avoid arm strain. Also a rope for belaying the litter on steeper ground is very helpful and increases safety.

Helicopter:

The decision to use helicopter techniques for any phase of a rescue operation should be made with great caution. The efficiency and ease of flying vs. an overland evacuation is great, but the consequences of error or an accident can be devastating.
Helicopters can be configured for utility in rescue or for medical application. If a critical patient **transport** is being made, where an efficient delivery of treatment is required, a purely medical configuration with trained flight nurses paramedics or physicians are ideal. To perform critical care techniques in a utilitarian helicopter that is not configured well for medical purposes is marginal at best. In some cases it is best to transfer to ground ambulance where more space and configuration allows for adequate care.
Please see the attached risk analysis and critical thinking pages related to helicopters.

Twelve Standard Aviation Questions That Could Save Your Life

1. Is this flight necessary7
2. Who Is In charge7
3. Are all hazards identified and have you made them known?
4. Should you stop the operation or flight due to:
   - ✔ Communications?
   - ✔ Weather7
   - ✔ Turbulence?
   - ✔ Personnel?
   - ✔ Conflicting Priorities?
5. Is there a better way to do it?
6. Are you drlven by an overwhelming sense of urgency7
7. Can you justify your actions?
8. Are there other aircraft In the area?
9. Do you have an escape route?
10. Are any rules being broken?
11. Are communications getting tense?
12. Are you deviating from the asslgned operatlon or flight?

WHEN IN DOUBT- DON'T!

to the lenses prevents fogging for up to 30 minutes. Polarizing lenses reduce glare off the water but do not filter UVR and infrared radiation.

Venomous snakes, especially pit vipers. along with scorpions, spiders, and fire ants are frequently encountered by river enthusiasts and should be considered potential hazards. Paddlers should know appropriate first aid measures for envenomations.

Paddlers commonly consume wild foliage. which may produce severe illness. In one published report, six rafters were poisoned and one of them died after eating water hemlock. *Cicuta douglasili.*[31]

Swift Water Rescue

Time is the most important factor in river rescue and often precludes the use of technical rope-based systems. Basic equipment includes throw ropes, a rescue life jacket. and knife. Experience and an understanding of river dynamics are essential.

The most common rescue scenario involves a swimmer who has exited the craft. Swimmers can be pulled from the water by other rafts, safety kayaks. and canoes or with shore- or raft-based throw ropes.

Rescue from entrapment requires a higher level of skill and often presents greater potential risk to the rescuer. The method used depends on whether the victim can maintain adequate freeboard. If the entrapment site is accessible, direct contact With the victim is quickest and most effective. A rescuer may wade to the entrapment site or reach it by boat if there is a stable site to exit the craft. The river downstream should be scouted for hazards. and if possible a rope thrower should be stationed downstream in the event the rescuer loses footing.

A strong swimmer rescue is the next quickest method but entails significant risk to the rescuer (Fig. 49-13). The rescuer is tethered to a rope that provides added stability against the force Of the current. If a quick-release harness is not available. a loose loop of rope can be passed under the rescuer's armpits.

A tag line rescue should be considered if the victim cannot be reached directly. A tag line is a rope stretched across the river downstream that is then brought upstream to the victim (Fig. 49-14). Getting the line across the river sometimes constitutes an insurmountable obstacle. If the river is narrow, it may be possible to throw the line across. Otherwise, it can be ferried across by a boat or team of swimmers. During a ferry, as much of the rope as possible should be kept out of the water to avoid drag.

There are two types Of tag lines (Fig. 49-15). A floating tag line has a life jacket or some other flotation device attached to the middle to keep the rope on the surface, which helps support the victim. A snag tag is a weighted line submerged and walked upstream to snare a foot or other body part that has been trapped under the surface. A snag tag can be made by joining together two throw bags filled with rocks (Fig. 49-16).

The surge Of interest i" White-water sports and the regular occurrence of natural flooding have created the need for formal training of raft guides and emergency personnel in swift water rescue techniques. The Swift Water Rescue Technician course. designed and taught by Rescue 3 in Sonora. California. has become the industry standard. Guidelines have recently been established by the United States Life-Saving Association to certify basic and advanced Swift water rescue technicians. Students learn techniques of shallow water crossings, tethered swimmer systems. vehicle rescue. and low-head dam survival.

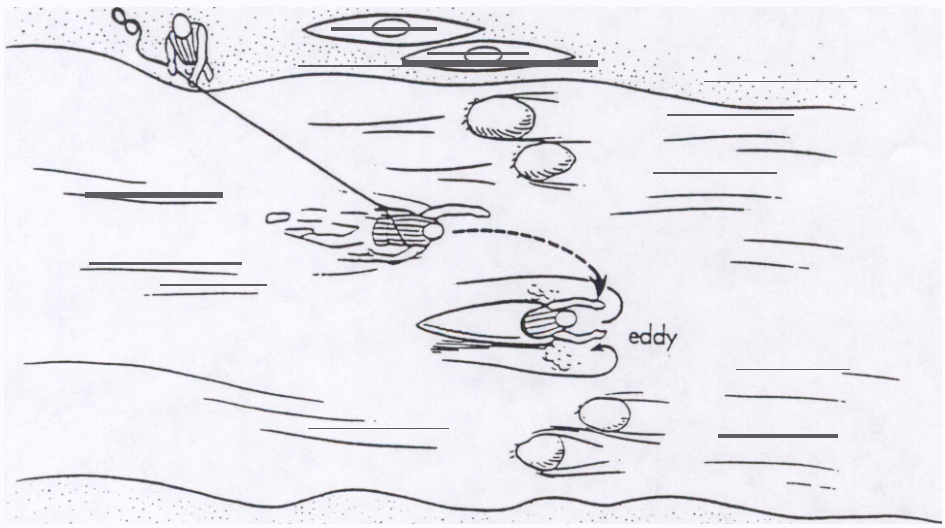

Fig. 49-13 Strong swimmer rescue.

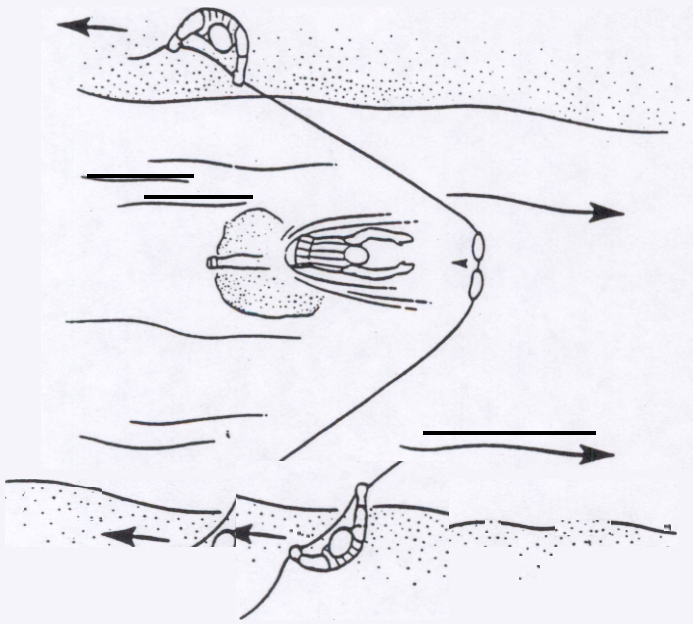

Fig. 49-14 Tag line.

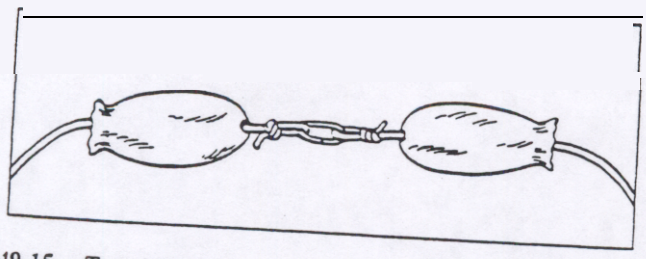

Fig. 49-15 Two throw bags connected with a carabiner to make a tag line.