Chapter 13: Patient Evacuation

Chapter Overview

The rope rescue environment is inherently challenging and can make patient evacuation particularly challenging. Whether executing a high-angle or low-angle rescue, a litter is an essential part of any rope rescue team’s equipment cache. Rescuers should become familiar with the different types and the advantages, disadvantages, and risk factors associated with each in order to be able to choose the best litter for a given situation. Medical equipment and supplies are also needed. While technology can be advantageous in some situations, all benefits must be weighed against any potential dangers that use of the equipment might result with its use (e.g., added weight, interference with ropes, etc.) and decisions carefully made as to which equipment should be carried in each situation.

In order for a rope rescue to run smoothly, all rescuers must know the various roles rescue and the expectations and responsibilities of each role. The rope rescue team must work in unison, with no confusion as to what should happen at any given time when evacuation a patient. The arduous act of carrying a litter requires great strength and coordination on the part of the rescuer; therefore, all precautions should be taken to protect the rescuer against strain. Proper training, real-world practice, team work, superb communication, and appropriate tools are absolutely essential to increasing the chances of a successful patient evacuation and decreasing the chances of injury for all involved individuals.

Objectives and Resources

**Knowledge Objectives**

After studying this chapter, you should be able to:

 Identify the types of litters used in rope rescue operations. (NFPA 1006: 5.2.20, pp. 244–247)

 Describe the considerations for choosing a litter for a specific operation. (NFPA 1006: 5.2.20, pp. 244–247)

 Provide an overview of medical care priorities during a rope rescue. (NFPA 1006: 5.2.20, pp. 247–251)

 Discuss the impact of medical technologies on rope rescue. (NFPA 1006: 5.2.20, p. 250)

 Describe the medical assessments and care common in rope rescue. (NFPA 1006: 5.2.20, pp. 247–251)

 Identify the patient packaging concerns that must be considered. (NFPA 1006: 5.2.20, pp. 251–259)

 Describe the methods of protecting a subject in a litter from hazards. (NFPA 1006: 5.2.20, pp. 254–255)

 Describe the methods of securing a subject in a litter. (NFPA 1006: 5.2.20, pp. 255–259)

 Describe the process of hand carrying a litter. (NFPA 1006: 5.2.22, pp. 259–261)

 Describe the methods of transitioning litter attendants. (NFPA 1006: 5.2.22, p. 261)

 Describe the use of a lift-assist sling to carry a litter. (NFPA 1006: 5.2.22, pp. 261–262)

 Describe the methods of negotiating obstacles with a litter. (NFPA 1006: 5.2.22, pp. 263–264)

 Describe the process of transferring the subject to the care of emergency medical services (EMS). (NFPA 1006: 5.2.20, p. 264)

**Skill Objectives**

After studying this chapter, you should be able to:

 Remove a subject’s helmet. (p. 254)

 Package a subject in a litter. (NFPA 1006: 5.2.20, pp. 251–258)

 Perform a burrito wrap to package a subject in a litter. (NFPA 1006: 5.2.20, p. 256)

 Perform upper 30 tubular restraint. (NFPA 1006: 5.2.20, p. 257)

 Perform lower 30 tubular restraint. (NFPA 1006: 5.2.20, p. 258)

 Carry a litter as part of a team. (p. 260)

 Perform the offset litter lift. (p. 260)

 Perform the tap litter attendant rotation method. (p. 261)

Support Materials

 Dry-erase board and markers or chalkboard and chalk

 LCD projector, slide projector, overhead projector, and projection screen

 PowerPoint presentation or slides

 **Navigate for Students**

 **Advantage**

 Each printed textbook comes with an access code that unlocks several valuable teaching and learning assets including:

 **Navigate eBook**.

 Online and offline accessibility ensures that the eBook is always available. Offline interactions are captured, cached, and uploaded the next time they are connected to the Internet.

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Reading and Preparation

Review all instructional materials, including *Rope Rescue: Principles and Practice,* Fifth Edition, Chapter 13, and all related presentation support materials.

Chapter Presentation Overview

Pre-lecture

I. You Are the Rescuer

Small-Group Activity/Discussion

Purpose

The purpose of this activity is to introduce students to concepts surrounding the understanding and management of water rescue incidents.

Instructor Directions

1. Direct students to read the “You Are the Rescuer” scenario found at the beginning of Chapter 13 (p. 244).

2. You may assign students to a partner or a group. Direct them to review the discussion questions at the end of the scenario and prepare a response to each question. Facilitate a class dialogue centered on the discussion questions.

3. You may also assign this as an activity and ask students to turn in their comments on a separate sheet of paper.

Lecture

I. Introduction

A. Review the learning objectives.

B. A litter is often required to extricate a subject from their predicament and transport them to definitive care.

C. The use of a litter should be carefully considered, as a subject with minor injuries may be more easily evacuated simply using a harness and a rope-raising or -lowering system.

D. The following foundational information is needed when working with litters:

1. How to properly secure the subject in a litter with consideration to their injuries

2. The type of evacuation methods to be use

3. The duration of time the subject will be confined to the litter

4. How to transport and move the litter once the subject

II. Litter Function

**A. Litters provide the following basic functions in the rescue environment:**

1. They serve as a means of transporting a sick or injured subject.

2. They help physically stabilize the subject during transport.

3. They protect the subject from physical and environmental hazards and from further injury.

4. They provide a means of attaching the subject to the rescue system.

5. They provide a platform for medical interventions and equipment.

III. Types of Litters

**A. Rigid litters**

1. Rigid basket litter is a common type of litter traditionally used in rope rescue operations and are characterized by the following features:

a. A stiff, hard-framed litter that has enough depth to contain the subject with at least some protection to the sides as well as beneath

b. The ability to place a subject in it (versus on it)

2. Rigid basket litters are constructed using the following:

a. Rugged materials – help protect the subject and resist damage in the rescue environment

b. Tubular frame – augmented with metal parts, plastic, or fiberglass for subject protection

c. Uniform rectangular shape (also may be tapered at the foot end)

i. A rectangular-shaped litter allows the subject to be loaded with the head at either end and permits use of wider spine boards, but the tapered style is more compact and not quite as heavy.

d. One-piece or two-piece design

i. One-piece litters are somewhat less expensive.

ii. Two-piece litters are easier to transport and usually nest as the result of a tapered foot, making them easier to store and carry.

3. Notes on maneuvering through confined spaces:

a. Traditional, rectangular rigid basket litters may be difficult to maneuver through confined space.

b. Some rigid basket litters are constructed with a particularly narrow profile, allowing them to be moved more easily through confined spaces.

i. A larger sized subject may not fit as well in these narrow litters.

ii. These do not accommodate many backboards.

4. Metal basket litters

a. A classic tubular metal-framed basket litters with wire mesh insert is often referred to as a Stokes litter.

i. More robust versions of this type of litter have support members constructed of tubular stainless steel.

ii. Litters made of conventional mild steel tubing and metal strap are less expensive but are not as durable or long lasting as the stainless models, and they require more maintenance to prevent rusting.

iii. Titanium tubing provides an extremely lightweight and strong basket; however, these models cost more than traditional metal basket litters.

b. Metal basket litters are a good choice for high-angle rope rescue for the following reasons:

i. They do not flex much even when suspended horizontally by a limited number of attachment points.

ii. They also offer good protection for the subject.

iii. Some metal basket litters have tie-in points specifically designed for rigging bridles for high-angle rescue.

c. Metal basket litters are typically lined with some sort of insert.

i. The insert is attached with straps to the bottom litter rail. Older litter models included inserts made of chicken wire; various forms of mesh have replaced the chicken wire in newer litter models.

ii. Pulled tight, an insert forms a flat, raised surface above the bottom of the litter, which adds to the subject’s comfort and makes it easier to slide the subject into the litter.

iii. Inserts should be used with care as they can raise the subject higher in the litter, changing the loading dynamics and balance.

d. While an open mesh litter does not provide much of a barrier to protect the subject from ground protrusions, it also does not hold water or create an airfoil, which can be an advantage in some situations.

5. Enclosed basket litters

a. Enclosed basket litters have become increasingly popular among technical rescue teams for their lighter weight and the amount of subject protection they offer.

b. Enclosed basket litters generally include the following:

i. Frame composed of aluminum, steel, or titanium

ii. Body laminated with carbon fiber or fiberglass composites, or even plastic resins

c. Advantages include the following:

i. Excellent subject protection and an excellent strength-to-weight ratio

ii. Available in similar size options as metal basket litters (tapered, rectangular, wide body, standard width, confined-space width)

iii. Available in one- and two-piece models

d. Composite or plastic-enclosed baskets

i. Composite or plastic enclosed basket can be carried, pushed, pulled, and dragged across rocks and other rugged terrain.

ii. Plastic litters are not as strong and usually do not last as long as the metal (stainless steel or titanium) basket litters.

e. Choosing an enclosed basket litter with a smooth bottom will help it to slide more easily over snow and rock scree.

f. Having a clear top rail is useful for subject tie-ins and also facilitates easier carrying and rigging by rescuers.

6. Basket litter strength and performance

a. At one time, basket litters were tested to a military specification; however, they are now governed by NFPA 2500, *Standards for Operations and Training for Technical Search and Rescue Incidents and Life Safety Rope and Equipment for Emergency Services.*

b. The NFPA standard requires that litters be subjected to a special test for strength and deformation (a similar test method may be found in ASTM Standard F2821, Test Methods for Basket Type Rescue Litters).

i. The test method pulls on the litter with a four-point bridle from the center single attachment point of the bridle, similar to a typical method of rigging a litter for lift, and requires that it withstands a minimum load of 11 kN (2473 lbf) without failure.

ii. The litter is also not allowed to deform more than 2 inches (50 mm).

iii. If the litter is designed to be lifted only from the head end of the litter for a vertical orientation of the litter, the attachment points for that rigging must pass the test, as well as be NFPA 2500 (1983) certified.

c. Unless a manufacturer provides verification from a third-party that their litter has passed this test, the user has little to go on to confirm strength and performance of the device.

**B. Flexible litters**

1. Flexible litter does not have an inherent rigid structure but, instead, wraps closely around the subject.

2. Usually constructed of flexible plastic or other durable material, their flexibility makes them a good choice especially for confined spaces.

3. These types of litters are also more likely to fit in smaller aeromedical transport helicopters.

4. Sked litter

a. Sked litter is a commonly used flexible litter that consists of a dense sheet of polyethylene plastic.

i. When conformed around the subject like a cocoon, the litter becomes more rigid.

ii. The litter has built-in straps and buckles to help secure it around the subject.

iii. Because it conforms to the subject’s size, the package is sometimes easier to move through confined spaces than basket litters.

b. Sked litters are designed with a configurable harness system that accommodates connection of a technical lowering or raising system:

i. This system allows rescuers to move the packaged subject in either a horizontal or a vertical alignment.

ii. For added rigidity and protection, the subject can be secured into an Oregon Spine Splint II (OSS II) before being packaged into the flexible litter.

iii. The OSS adds structural stability and an additional barrier for the subject, including a spreader at the shoulder to reduce the feeling of shoulder squeeze for the subject.

c. Some of the newer versions of flexible litters offer built-in subject restraint systems, somewhat like a harness.

i. They are encased in a durable, abrasion-resistant fabric.

ii. While such adjuncts increase comfort and security, anything added to the system increases weight, and any coverings over the bare plastic reduce the ability of the litter to slide as well across rugged surfaces.

d. Advantages of Sked litters include the following:

i. They can be rolled into a compact shape that is stored or transported in its own backpack.

ii. They weigh only 17 pounds (7.7 kg) (inclusive of straps).

iii. They are relatively easy to carry into a confined space or transport long distances.

e. Carrying a subject packaged in a flexible litter for long distances is an acquired skill as the number and configuration of carrying handles can be limited.

**C. Choosing a litter for rescue operations**

1. When selecting a litter for rescue operations, consider the following:

a. Whether the litter will be used for low- or high-angle rope rescue

b. Strength of the litter

c. Subject restraint

d. Level of subject protection

e. Presence and nature of injury to the subject

f. Rigging attachments and tie-in points

g. Number and location of handholds for carrying

IV. Medical Care

**A. Hazardous settings (e.g., electrical towers, structure fires, rockfall, avalanche danger, and lightning strikes) make the delivery of medical care during rescue even more challenging.**

**B. The wide range of conditions common to technical rescue requires that rescuers view each case independently and resist adopting a “one-size-fits-all” protocol-driven approach to medical care, packaging of the subject, and rescue rigging.**

**C. Advances have been made in reducing the division of rescue team members into riggers and rescuers.**

1. This has been achieved through cross-training in all disciplines critical to integrated technical rescue.

2. A well-rounded rope rescuer should be sufficiently competent with both technical systems and medical care.

3. Local standard operating procedure should be followed.

4. Each individual should follow the medical directives for their specific level of emergency medical training.

**D. Medical technologies**

1. Until recently, medical technologies employed in technical rescue were inevitably adopted from other emergency medical care settings, in particular, prehospital emergency medical services (EMS).

2. The rising demand for small, portable, robust medical monitoring devices in recent years has prompted the development of a number of rescue-viable technologies:

a. Wireless systems that allow packaged, hypothermic subjects to be monitored without unpacking them

b. Smartphone applications

c. Miniaturized ventilators

d. Compact heat systems for the treatment of hypothermia

3. Some simple preexisting technologies can also be adapted to work nicely in the vertical world.

a. For example, applying a heart rate monitor to the subject’s chest that transmits their heart rate to your watch can allow you to continuously monitor the subject while even several feet away.

4. Key attributes of technologies found to be helpful for subject care during rescue include the following:

a. Simple, adaptable, and durable

b. Small, light, and easy to handle

c. Durable extended power source

d. Valuable data and quality display or alarm settings

e. Reasonable cost with high return on investment

5. Whether equipment is derived from standard EMS settings or is intended for the rescue environment, the team must consider how and how often the equipment will be used for subject care.

a. Durability

i. Technical rescue exposes equipment to inclement weather, extremes of temperature, and physical damage caused by impact against elevated platforms or rock faces.

ii. Teams should anticipate that destruction of valuable equipment is likely.

iii. The use of expensive equipment should be carefully reviewed to determine the risk–benefit ratio for each rescue.

b. Usability

i. Many subject monitoring devices designed for urban prehospital EMS are too large, heavy, or complex for use in helicopter short-haul and high-angle rope rescue.

ii. Dependence on fragile, expensive, and potentially unreliable equipment may ultimately be a disservice to subjects.

6. In some cases, minimal changes in standard technique may be all that is required to accomplish a medical treatment objective.

a. For example, the controversy surrounding the use of rigid femur traction splints within litters:

i. There are multiple examples from the field of the splint becoming entangled with litter bridles or becoming hung up on obstructions during raising or lowering operations; however, the following can occur the longer a fracture remains unaligned:

1 Increased severity of injury to surrounding muscle and neurovascular structures

2 Increased potential for blood loss

b. There are a number of small, low-cost alternatives to traditional femur splints that are more appropriate for technical rescue.

i. The Slishman Traction Splint traction device or equivalent equipment is one example.

1 The rescuer should keep in mind that even a traction splint could have negative consequences by causing pressure necrosis from prolonged application.

2 Virtually all rescue teams have found it necessary to alter the rescue system to reduce interference with the care of the subject, or to change the manner in which medical care is provided to allow for certain technical rescue configurations.

3 It is important to remember that rescue of the subject and medical care of the subject are not conflicting priorities.

7. The choice of medical equipment should also vary depending on the following factors:

a. Resources

b. The needs of the rescue team

c. The needs of the subject population served

8. Benefit to subjects

a. Technical rescue is a treatment environment that imposes inherent limitations on the ability to deliver medical care.

i. Some teams, therefore, may find it impossible to provide certain levels of care to subjects.

b. The rescue team should critically review each piece of medical equipment to judge its benefit to the subject.

c. The advantages of specific medical devices should be weighed against alternative methods of performing the task required of the device.

i. For example:

1 Patient monitors are usually too expensive, cumbersome, and heavy for technical rescue.

2 The data provided by these devices can be acquired through a combination of skilled manual assessment of vital signs and the use of small, cost-effective devices such as finger-tip oxygen saturation monitors.

d. It is unwise to rely on systems that lack redundancy or have functions that can be duplicated with manual skills.

i. For example, global positioning system (GPS) units, or medical telemetry equipment:

1 Eventually, such equipment will be unavailable or inoperable, endangering mission readiness and subject care.

2 Teams should depend primarily on the assessment skills of the medical providers and traditional field craft such as map and compass skills rather than on the electronic readout of subject monitoring devices or miniaturized GPS.

3 Despite these concerns, electronic monitors can be useful to teams called to rescue subjects with a history of cardiac disturbances or complex medical illnesses.

4 The final decision regarding these technologies can be made only through experience and the opportunity costs resulting from purchase, training, and additional load to the team.

9. Technical rescue medical kit

a. A technical rescue medical kit (TMK) is designed as follows:

i. To work within the confines of a technical rescue system and should be used by the primary medical provider and/or medical attendant.

ii. To be light, portable, and easily accessible to provide medical resources for the duration of a technical operation.

b. Some providers will choose to have a TMK as part of their litter setup while others will choose to integrate this kit into the overall larger field medical kit.

c. Under field conditions, the best TMK has the following characteristics:

i. It is small and durable.

ii. It is constructed of waterproof, durable fabric. For caving or canyoneering and similar rescue environments, a hard shell may be preferable.

iii. It has a load-bearing connection point so that it may be suspended or secured.

iv. It is built so that items do not fall out easily.

v. It has sufficient chambers for organizing the equipment to be carried.

vi. It has internal fasteners for securing equipment (e.g., intravenous fluid bags).

vii. It has contents appropriate for treating high-probability injuries.

viii. It is appropriate to the provider’s level of certification.

d. The TMK design and contents require careful preplanning, preparation, and evaluation. Adapting the TMK to the skills and needs of the teams is an important first step.

i. Basic life support (BLS)

1 Trauma dressings, splints, oropharyngeal airways, and suction devices

ii. Advanced life support (ALS)

1 A few appropriate injectable medications; an IV/IO (intravenous/intraosseous) start kit, IV fluids; and ultraportable monitoring devices [e.g., fingertip oxygen monitors (e.g., Nelcor)]

e. The medical attendant must also be competent in managing the technology or intervention and know what to do in the event of an emergency.

i. This skill is particularly critical with intubated subjects transferred to medical attendants for lowering or raising operations.

1 In this situation, the tender must know what to do if the bag mask device becomes disconnected, the subject expels the endotracheal (ET) tube, or the artificial airway becomes compromised or dislodged.

**E. Assessment and interventions**

1. Triage

a. Technical rescue scenes can involve multiple injured subjects.

i. When faced with multiple subjects, it is advised to use a standardized triage protocol to aid in medical rescue decision making.

b. Assigning a triage priority to a subject will involve the following assessment questions:

i. Is this a rescue or recovery?

ii. What are the available resource capabilities?

iii. What are the resource priorities?

iv. What are the severities of subject injuries?

c. Several triage assessment tools are available to aid the provider in making rapid decisions when faced with a multiple-casualty emergency.

i. While specific guidance for assessing the different levels is at the discretion of the agency’s local medical authority, START triage (a tool frequently used in EMS that can be adapted to the technical rescue environment) separates the injured into four groups:

1 Black triage tag – the expectant, who are unlikely to survive given the severity of injuries

2 Red triage tag – the immediate, who can be helped by immediate interventions or transport

3 Yellow triage tag – the delayed, whose injuries are serious and life threatening but who are not expected to deteriorate significantly over the next several hours

4 Green triage tag – the minor, who have minor injuries and are unlikely to deteriorate over the next few days

d. Assigning a triage tag also set priorities for evacuation and transport.

i. Black triage tag – subjects are left where they are found and can be evacuated after all other triaged subjects have been evacuated

ii. Red triage tag – subjects should be evacuated by the fastest means possible (e.g., helicopter medevac if available)

iii. Yellow triage tag – subjects can have their evacuation delayed until all immediate subjects have been transported

iv. Green triage tag – subjects are not evacuated until all immediate and delayed subjects have been transported

e. It is important to continually reassess all triaged subjects to ensure that subjects do not need to be reclassified into a different triage category.

2. Severe bleeding

a. Severe bleeding from wounds to the arms and legs can result in shock and death.

b. If bleeding cannot be stopped with direct pressure, a tourniquet should be applied above the wound.

c. Follow all local medical protocols and your level of training.

3. Airway and breathing

a. While airway and breathing are primary concerns in all emergency medical cases, assessment and management of airway and breathing in a technical rescue setting are more complex than in other types of rescues.

b. Airway emergencies that occur during rescue operations, such as an airway becoming blocked by blood, bone fragments, or vomit, require immediate action under difficult circumstances.

c. If the subject is unconscious, the airway must be under constant supervision to prevent occlusion that can occur secondary to improper positioning, deterioration of the subject’s condition, or accumulation of body fluids.

d. It is advisable that a medical attendant be present with subjects at risk for the following:

i. Airway or breathing difficulties, including unconscious subjects and any subject with altered mental status

ii. Spinal motion restriction

e. Given the criteria, the majority of technical rescue subjects will require a medical attendant.

f. The following questions about the airway and breathing should be addressed before packaging and moving the subject:

i. Does the subject have a clear airway and normal mental status?

ii. Could the injuries or illness result in the onset of airway difficulties during technical rescue?

iii. Is the mouth free of tooth fragments, blood clots, gum, tobacco, and dentures?

iv. Is the subject at risk of vomiting (e.g., faint, nauseated, hypotensive)? (Note: Vomiting often occurs suddenly and sometimes regardless of the individual’s medical or trauma status)

v. How will the tender clear the airway during lowering or raising operations?

vi. Can respiration be monitored while the tender directs the litter over obstacles?

vii. How will the medical attendant perform rescue breathing if the subject develops respiratory failure?

g. Assessment and management of the airway and breathing in a subject may require BLS measures and devices, as well as ALS techniques. It is important to ensure medical rescue providers work with their respective levels of certification/licensure and within the parameters set forth by the rescue service medical director.

4. Head and spine considerations

a. Spinal motion restriction (or spinal immobilization) can have significant ramifications on the chosen path and equipment needed to extricate a subject.

b. Prehospital spinal motion restriction has been the topic of recent debate in the medical community.

i. The Wilderness Medical Society and the National Association of Emergency Medical Services Physicians (among other key organizations) now recommend a more liberal approach to cervical spine precautions.

ii. Asking your current rescue service medical director to review these guidelines can be a way of eliciting healthy conversation on such a controversial topic. It is beneficial in technical rescue operations to have a preexisting protocol to rule out cervical spinal trauma.

c. Indications of spinal injury can include the following:

i. Blunt trauma with a significant mechanism suspicious of spine trauma

ii. A severely injured subject

iii. Altered mental status (Glasgow Coma Scale [GCS] <15)

iv. Evidence of intoxication, neurologic deficits, thoracic or other significant distracting injury, and significant spine pain or tenderness (>7/10)

d. Generally speaking, if any of these indicators are present, most medical protocols will call for spinal motion restriction.

e. Conforming backboards

i. EMS providers have traditionally used rigid backboards when implementing cervical spine precautions, but these are very uncomfortable for long periods and can cause pressure ulcerations.

ii. A conforming backboard (e.g., a vacuum mattress), is the international standard for prolonged evacuation and evacuation in technical rescue and is recommended by the International Commission for Alpine Rescue.

iii. Conforming backboards must be properly secured with the subject in the litter so that no lateral or longitudinal movement occurs.

f. Head trauma subjects are prone to the following:

i. Nausea

ii. Vomiting

iii. Altered mental status

iv. Other critical injuries

v. Hypertension

vi. Bradycardia

g. Bleeding from head wounds may be considerable, and if not controlled, may result in shock.

h. Head trauma should be considered in subjects with the following:

i. Alterations in consciousness

ii. Inadequate or chaotic respirations

iii. Skull fractures

iv. Bloody fluid from the ears, nares (nostrils), or mouth

v. Facial injury

vi. Head cuts

vii. Lacerations or bruises

viii. Amnesia

ix. Ataxia (difficulty balancing)

x. Vertigo/dizziness

i. In the presence of suspected head trauma, the EMS provider should assess for the presence of Cushing’s reflex:

i. Increased blood pressure

ii. Irregular respirations

iii. A reduction in heart rate, indicating an increase in intracranial pressure

j. Questions about the status of the head and spine that should be answered before packaging and moving the subject include the following:

i. Is there a possibility of head or spinal injury?

ii. Should spinal precautions be performed before the subject is moved?

iii. Should the subject be secured to a spinal motion restriction device before being immobilized in a litter? (Virtually all multisystem trauma subjects are treated in this manner)

iv. Can the litter tender support the subject’s breathing and circulation during evacuation if needed?

v. Will the risk of immobilizing the subject dramatically increase the overall rescue risk to the subject or rescuers (i.e., can the subject move under his or her own power out of a technically dangerous environment – avalanche slope, cave, etc.)?

k. Simple positioning of the subject in an elevated head-up position is often the best treatment option for a head trauma subject with suspected increased intracranial pressure.

i. In a technical rescue setting, this can be accomplished by positioning the litter head up 30 degrees.

ii. Adjustable litter bridle systems can quickly accomplish this.

V. Packaging the Subject in a Litter

**A. Packaging is placing a subject in a litter and securing them for evacuation.**

**B. Rope rescuers may choose to evacuate a subject by litter, regardless of whether or not they are injured or require medical care. For example:**

1. Subject is very young or very old.

2. Subject is particularly frightened or distraught.

3. Subject has been awaiting rescue for an extended period of time.

**C. The moment rescuers begin to apply emergency medical care to a subject (i.e., the person being rescued), the subject becomes a patient and local medical directives apply to packaging and transport.**

**D. While the local authority having jurisdiction (AHJ) may have more to say on this subject, some of the common packaging concerns (whether for an uninjured subject or an injured subject) include the following:**

1. Immobilization (or spinal motion restriction) and provision for medical care, as described previously, including first aid, and BLS and ALS care at the level of the responder’s expertise.

2. Providing for the subject’s comfort and protection from physical hazards.

3. Securing the subject for the type of evacuation to be performed.

**E. Before packaging the subject, the litter must be secured from potential effects of gravity, such as falling over an edge.**

1. This can be accomplished with a safety line or belay lines, or perhaps even by changing locations.

2. If possible, the subject should be packaged in a level area.

3. If on a slope, normally the subject should be packaged with their head upslope unless medical conditions prevent this.

a. Having the subject’s head higher on a slope helps keep the subject more comfortable and spatially oriented.

b. The subject should be packaged so that they will not shift or fall out, regardless of the angle of the litter.

**F. Spinal motion restriction and medical considerations**

1. Airway management

a. As with other forms of emergency medical care, any subject must be packaged with concern for airway management.

i. A subject should be packaged so that rescuers can roll them, or turn them on their side, to allow the airway to be cleared in the event of vomiting or other airway threats.

ii. It is a good idea to keep a suction device handy.

iii. If a mask or pharyngeal airway (ET or nasotracheal tube) is required, it should be placed before the litter is moved, and stabilized to prevent displacement during movement.

b. Most technical rescuers wear protective leather or synthetic gloves to protect their hands during an operation.

i. As a practical matter, it can be difficult to clear the airway effectively—or perform other medical interventions—while wearing protective leather gloves.

ii. Medical attendants who may be exposed to subject contact should wear latex or nitrile gloves underneath the rope rescue gloves and should practice quick glove removal during training.

2. Immobilization (or spinal motion restriction)

a. Philosophies surrounding prehospital care of spinal trauma subjects are constantly evolving.

i. Older philosophies advocated for immediate immobilization all subjects with mechanism of or suspected spinal injury; however, negative consequences associated with full spinal immobilization, have led to agencies discouraging the use of full spinal immobilization, except in the case of a few specific subsets of subjects.

b. Rescue organizations should follow the protocols established by their medical authority, with full disclosure and dialog surrounding the differences between transporting a subject in a litter as compared with transporting a subject on a stretcher.

c. Responders should practice their spinal motion restriction technique with the litter to determine the best system in advance.

d. When immobilization (or spinal motion restriction) is indicated, the following should be considered:

i. Litters should not be assumed to be, by themselves, an adequate stabilization tool.

ii. Depending on local protocol, some subjects may require only cervical stabilization, while others may require full spinal immobilization.

iii. Whenever full spinal immobilization is required, subjects should first be fitted with a c-collar before full spinal motion restriction is performed and then, finally, placed into a litter.

iv. Whatever method of spinal motion restriction is selected, it should not interfere with technical evacuation systems or carrying methods and should allow rescuers access to the subject so that they can monitor condition during transport and offer medical intervention as needed.

e. Rigid backboard

i. Spine boards may be made of wood or plastic and are available in both long and short configurations.

ii. While rigid backboards provide very inflexible protection and can be a useful in extricating a subject from an awkward predicament or entrapment, they are also known to cause increased pain and discomfort, including pressure ulcers and aggravating injuries, especially in evacuations with long transport times.

iii. Rescuers who plan to use a full rigid backboard in a litter should ensure that it meets the following criteria:

1 Be appropriately shaped and narrow enough to allow placement inside the litter

2 Be made of strong, easily cleaned material

3 Have attachment points to allow attachment to the litter

4 Have handles for lifting

5 Allow insulation of the subject

f. Full-body vacuum splint

i. A full-body vacuum splint is an excellent, albeit bulky, alternative to a rigid spine board.

ii. Sometimes referred to as a beanbag, a full-body vacuum splint is an airtight mattress-like device filled with polystyrene beads that become interlocked when air is sucked out of the container.

iii. They are lighter weight and easier to transport than a rigid backboard.

iv. The full-body vacuum splint has been shown to provide the same degree of spinal motion restriction as traditional backboard methods while conforming comfortably to the subject.

v. Because they contour to the body curves, they are less likely to cause pain and tissue damage from pressure.

vi. Vacuum mattresses have the same overall weight as full spine boards, but they offer some advantages, including insulation from the cold, protection from water and snow, the ability to conform to the individual subject, and greater subject comfort in the extended transport environment (e.g., greater than 1 hour to the emergency department).

vii. Vacuum splints also have some disadvantages, although many of these have been improved upon in recent years.

1 The disadvantages include higher cost, risk of puncture (although the splints can be repaired in the field with a repair kit), retention of water and snow, and possible restriction of access to some areas of the subject, particularly the posterior aspects.

g. Flexible litters

i. Particular care should be taken when transporting subjects in flexible litters (e.g., the Sked).

ii. Even those who are not suspected of having spinal injuries may benefit from at least some spinal motion restriction, as this also helps to stiffen the flexible litter and provide additional protection to the subject.

iii. Especially in the case of flexible litters, there is always a balance between bulk and mass of the device used, versus its effectiveness.

iv. The Oregon Spine Splint was specifically designed to be used in conjunction with the Sked, but can also be used on its own for extrication, and/or in other types of litters.

3. Splinting

a. A litter-bound subject who will be subjected to high-angle or low-angle rope rescue activities will require special consideration to optimize their protection.

i. Hard-shelled basket stretchers provide the best protection for a subject suspected of having extremity fractures, especially long-bone fractures.

ii. Those transported by flexible or open-basket litters require more precautions to prevent further damage to the injured extremity.

b. In any case, fractures must be protected with protective splints and bandages that allow the extremity to be examined by the medical attendant to make sure the nerves and blood vessels remain intact.

c. Some femur traction splints commonly used in urban ambulance transport (e.g., the Hare splint) are too bulky and long to use in rescue litters.

i. They often extend above the litter top rail and beyond the foot end of the rescue litter, which can cause additional subject discomfort, can expose the affected limb to further injury, and can complicate rescue rigging and handling.

ii. Rescuers should plan to use and practice with more compact, portable femur traction devices (e.g., the Sager traction splint and the Kendrick Traction Device), with the understanding that traction devices can lead to skin necrosis over a prolonged period of time.

**G. Protecting the subject in the litter**

1. If the rescuer is certain the subject has no cervical spine injuries, and if local protocol permits, the subject may be packaged without any spinal motion restriction at all.

a. The area around the head should be padded, but the padding should allow for head movement.

b. If there are no injuries to the neck or head, the subject can be allowed enough space to raise or roll the head. This will allow subjects to orient themselves as the litter is moved.

2. A subject who may have been wearing a helmet at the time of an incident may need to be assessed for head or spinal injury, depending on mechanism.

a. In some cases, the helmet may need to be removed so as to not interfere with proper assessment, spinal motion restriction, or the subject’s airway and breathing status.

b. If none of these hazards is present, and if the possibility of cervical spine injury has been ruled out, the helmet may be left in place.

c. See Skill Drill 13-1: Removing a Helmet

3. A subject who may be exposed to injury from falling objects should be provided with some means of head protection before the rescue.

a. Depending on the directives of the medical authority, this may involve some sort of shield, a helmet, or both.

b. If a helmet is used, rescuers need to remember that the back of the helmet will tend to lift the subject’s head off the stretcher, leading to forward flexion of the neck.

c. Unintended flexion of the neck should be managed, for example by slight elevation of the shoulder and neck using a thin layer of padding behind the neck.

4. If no helmets are available, the head area can be packed with blankets, packs, clothing, or other soft material and the head can be taped in place with duct tape across the forehead only.

a. Perspiration, moisture, and blood all reduce the adhesive ability of duct tape.

b. Rescuers should not rely on duct tape alone to hold the subject’s head in position.

c. Spinal immobilization straps and duct tape can accidentally slip on the subject, increasing the risk of the subject choking.

5. For the comfort of the subject, available padding material can be used to create a nest for the subject, particularly for lengthy carryouts.

a. The subject should be protected from relevant environmental conditions, including wind, temperature, and moisture.

b. If the subject will be in the litter for more than about 20 minutes, comfort is a real concern; beyond this time, minor discomforts are amplified, and can even create safety concerns.

6. Subjects, especially those who are much smaller than the interior dimensions of the litter, may benefit from filler padding, constructed of blankets or other material that are rolled up and secured in place along both sides of the subject and around their head.

a. In carryouts where the litter may be jiggled and jostled and tilted in various directions, these rolls help to prevent subject contact with the litter frame and reduce chafing.

b. Potential chafe points which require particular attention include clavicles, shoulders, hips, and other protrusions.

c. Beneath the subject, thermal insulation as well as protection from rub points in the bottom of the litter should be provided.

i. Protecting the underside of the subject is of particular concern in a mesh or wire basket litter, as it offers little protection on the bottom from protruding objects such as debris and rough surfaces.

ii. Using a beanbag-style subject immobilization system is a good way to add subject protection, immobilization, and comfort. Alternatively, the litter may be lined with material such as a closed-cell foam pad and/or blankets.

7. When securing a subject in a litter, pad the following areas:

a. Under the hollows of the body (e.g., behind the knees, in the small of the back, and, unless cervical immobilization is a factor, behind the neck)

b. Bony parts such as the occiput (e.g., back of the skull)

8. For extended transport, consider adding insulation and moisture protection.

a. While some agencies find a tarpaulin-based burrito wrap to be useful, the benefits of this should be weighed against the need to access different parts of the subject to monitor injuries or medical conditions.

b. See Skill Drill 13-2: Burrito Wrap.

9. Where extended transport is likely, sleeping bags with zippers or Velcro closures that open all the way around the subject’s torso can be useful.

a. Remember that subjects may saturate the insulation with blood, spilled IV fluids, and waste (e.g., urine), and this increases heat loss.

b. Wet insulation should be removed and replaced at the first opportunity.

10. A subject packaged securely into a litter is unlikely to be able to shield their face from light, debris, or other hazards.

a. Head, face, and eye protection should be provided in the form of a helmet, face shield, and/or goggles.

b. Although many subjects report experiencing claustrophobia beneath even a clear litter shield, these can provide excellent protection for the subject’s face and head.

**H. Securing the subject in the litter**

1. During an evacuation, the litter will be lifted, tilted, and carried at various angles.

a. The subject must be packaged so that they do not slip lengthwise in the litter, slide from side to side, or come out of the litter.

b. Any tie-in system must allow access to the subject for periodic assessment and treatment, in case the subject’s condition changes.

c. It also must allow for breathing and circulation and for subject movement for comfort.

2. Litters often come equipped with simple strap systems.

a. These may be adequate for gentle terrain, but these often do not fasten securely enough to prevent the subject from slipping around beneath them, especially when jostled side to side or tipped lengthwise.

b. Inclusion of a seat harness or full-body harness can be a nice touch for a subject facing a rope rescue operation, but in truth, if the litter restraint system is sufficient, a harness is not required.

c. Tie-in straps should not be placed directly over a subject’s knees or neck.

d. Chest straps should not be tightened in a manner that compromises breathing.

e. To help prevent subject movement, straps should ideally be secured to the lower litter bar.

3. Improvised litter restraint

a. Every rescuer should be capable of tying a subject into a litter using nothing more than a couple of long pieces of webbing.

i. There are a number of different methods appropriate to accomplish this, so rescuers should choose one to commit to memory.

b. 30-30 tubular restraint method – so called because it utilizes two pieces of 1-inch (25-mm) tubular webbing, each piece 30 feet (9.1 m) in length.

i. Tubular webbing is preferred over flat webbing because it is softer and more pliable than flat webbing, making it more comfortable for the subject, and more likely to hold knots.

ii. The preference for 1 inch (25 mm) is based on this being wide enough to not exert undue pressure on the subject, while still being narrow enough for easy rigging.

iii. See Skill Drill 13-3: Upper 30 Tubular Restraint.

iv. See Skill Drill 13-4: Lower 30 Tubular Restraint.

c. Consider the following safety tips:

i. Webbing should not be lashed horizontally across the upper chest or neck. If the subject slides down in the litter, a line of webbing across this area could strangle the subject.

ii. If the webbing is too tight, prolonged loss of circulation could result in serious medical problems, such as compartment syndrome.

1 In extreme cold, reduced circulation can increase the potential for frostbite or for burns from rewarming sources such as hot water bottles or heating pads.

2 Pressure points should be padded by tie-ins.

3 The subject’s circulation should be checked after the tie-in is completed and rechecked at regular intervals.

iii. Litter tie-ins can work loose. Rescuers must constantly monitor the litter lashing.

iv. When lacing a subject in the litter, it is also important not to impede breathing by lacing across the throat or compressing the chest and not to cause further discomfort by lacing across the knees.

d. Yosemite litter packaging method

i. This works best for a subject who might not be wearing a harness and who is expected to undergo moderate jostling, as with a trail carry in uneven terrain.

ii. This method uses several nylon runners, allowing modifications as needed to accommodate for injuries or unique challenges.

iii. To secure a subject in this manner, two 18-foot (5.5-m) runners are used to perform figure eight wraps through the groin and over the shoulders, and then several additional circumferential cross straps (approximately 12 feet [3.7 m] each in length) lock the subject down in the rescue litter.

4. Manufactured litter restraint

a. Manufactured, prebuilt subject tie-in systems can save rescuers time and effort when securing a subject into a litter.

b. Some subject tie-in systems are designed to not require the subject to wear a body harness, while others are designed to require the subject to wear a body harness.

c. Manufactured litter restraints should be preinstalled in a rigid basket litter before a rescue and include the following features:

i. Color-coded shoulder, upper torso, and leg straps assist rescuers in properly securing a subject, while wide foot stirrups keep the subject from sliding down toward the litter foot end.

ii. Strength-rated buckles connect securely without knot tying.

iii. There is also a quick-secure connection for when the subject needs to be wearing a seat harness.

VI. Carrying the Litter

**A. A rope rescue operation rarely occurs in isolation; typically, some additional transport of the litter is required to reach a waiting ambulance, air transport, or more definitive care.**

**B. Rope rescuers, and those who support these operations, should be trained and prepared to work together to transport the packaged litter across difficult or uneven terrain.**

**C. Carrying a loaded litter over any distance is hard physical work.**

1. Sharing the load among four to six rescuers, perhaps supplemented with some carrying accessories, can help reduce wear-and-tear on rescuers and prevent the litter being dropped.

2. The most difficult part of carrying a loaded litter together is learning to work in unison, and not against one another.

**D. Subject care**

1. Prior to moving the litter, the subject should be advised of the entire evacuation plan and dialog should be continued throughout the operation.

a. Being strapped into a litter and carried on your back is disconcerting at best, and spatial orientation is difficult when staring at the sky.

b. A properly secured subject has no way of blocking the sunlight from their eyes, protecting themselves from falling debris, ducking clumsy rescuer arms, or even wiping their own nose.

c. The subject’s needs should be anticipated whenever possible. When rescuers take breaks for water, food, or personal relief, the subject should also be given such opportunities as well.

**E. Litter team roles**

1. A litter is typically carried with two to three rescuers, called litter attendants (or litter bearers) on each side.

a. This arrangement makes the total cross-section (width) width of the carried litter about 6 feet (1.8 m).

b. As a result, most rescuers' feet will often not be on stable footing while carrying.

c. When possible, erring toward six (rather than four) litter attendants will make for greater security for the subject and a lighter load for rescuers.

2. The greatest challenge with a six-person litter carry is the ability for rescuers to space far enough apart to maintain footing and keep from bumping into one another.

a. This is particularly true when rescuers are wearing heavy clothing, equipment, or backpacks.

b. Most people tend to be heavier through the torso than in the lower extremities, so rather than centering themselves according to litter dimensions, litter attendants should space themselves in a way that corresponds to equitable distribution of the load.

i. This typically means erring everyone toward the head-end of the litter.

ii. A litter is only about 7 feet (2.1 m) long, so rescuers will need to adapt their spacing to ensure that they each have sufficient working space, while at the same time being sure to carry their share of the load.

3. During an extended carry, litter attendants may or may not have assigned roles, such as medical attendant or litter captain.

a. Medical attendant is a litter attendant responsible for ensuring the medical/personal needs of the subject are attended to at any given time, at least for as long as they are in that role.

i. This may or may not be the same person who has assumed overall medical responsibility for the subject, but for the purpose of the litter evacuation is simply the point of contact who will make a point of ensuring that medical appliances such as oxygen or splints are in place and functional, monitoring whether the subject needs a bio-break or comfort adjustment, and that the directives of the medical authority are being adhered to.

ii. There should be one medical attendant on the litter team at any given time.

iii. Sometimes this role is assigned based on position (i.e., the person nearest the head of the subject on the left-hand side of the litter) and sometimes it is identified as a specific person.

b. Litter captain is a litter attendant identified as being responsible for the forward progress of the litter and the performance of other litter attendants.

i. For the duration of time that they remain in that role, they will monitor speed and direction of the litter, stability and security of the evacuation, and any needs that the other attendants may have.

ii. They will also be responsible for issuing verbal commands to the litter team as needed.

iii. There should be one litter attendant on the litter who is identified as litter captain at any given time.

iv. Sometimes this role is assigned based on position (i.e., the person nearest the foot of the subject on the right-hand side of the litter) and sometimes it is identified as a specific person.

4. A litter may be carried feet-first or head-first, depending on medical needs of the subject or other parameters.

a. When carrying a subject downhill, carrying them feet first will put their head a little higher than their feet which, as long as it is not contraindicated for shock or other reasons, can be a little more comfortable and prevent disorientation.

b. Litter attendants should work in teams of two persons who are approximately similar in height and arm length.

i. With one on each side of the litter, the subject will have a relatively level ride.

ii. These two attendants can switch sides periodically so that each arm has opportunity to rest.

c. Side-sloping surfaces create an even greater challenge and require practice to negotiate effectively.

**F. Lifting and carrying the litter**

1. Lifting a litter should be done with the legs, not the back; however, the various challenges facing rescuers, including uneven terrain, shape of the litter, weight of the subject, proximity of other rescuers, etc., can make this especially difficult.

2. Using offset leverage to levitate the litter

a. See Skill Drill 13-5: Offset Leverage Litter Lift.

b. The offset leverage method of lifting a litter depends on cooperation and finesse rather than brute strength and will result in the litter rising smoothly and effectively to its position of function.

c. With practice, the same effect can be achieved with litter attendants facing forward, one hand on the litter rail.

d. Litter attendants should lean slightly away from the litter, arms straight, and pulling slightly outward, against the attendant on the other side.

i. Having even one litter attendant in the group who insists on lifting with a crooked arm as though they are curling a dumbbell will disrupt and imbalance the entire operation.

ii. Teamwork and cooperation are key here.

iii. Setting the litter down is simply the reverse operation of the lift: head up, derriere down, litter attendants should keep their backs straight as they adjust elevation using their knees.

**G. Rest breaks**

1. Rest is an important consideration for rescuers who must carry a litter long distance, as anything over about a half mile (0.8 km) can put a significant drain on resources.

2. A litter carry can be a time- and energy-consuming endeavor, and usually requires more personnel than may seem logical.

3. If sufficient resources are available, especially in rough terrain, switching out personnel every 200–500 yards (183–457 m) is good practice, and helps keep rescuers fresh.

**H. Litter team transitions**

1. There are a number of viable methods by which litter teams can switch rescuers on and off the litter to maintain continuity and keep personnel rested and refreshed.

a. Setting the litter down occasionally

i. This method allows litter attendants switch out, or at least switch sides.

ii. This method requires minimal coordination among team members, is simple to learn, and leaves little room for misunderstanding.

iii. It arguably also increases risk, offering increased opportunities for wrenched backs and pulled muscles each time the litter is set down or picked up. It also takes a few moments each time a stop occurs, requires level and secure ground on which to switch, and the repeated bending and lifting requires more energy.

b. Tap litter attendant rotation method

i. More efficient method for switching out litter attendants even while the carried litter maintains forward progress, but this requires practice and experience to be effective.

ii. The tap method involves a new pair of litter attendants (left and right) inserting themselves into the litter team by grasping the trailing end of the litter on opposite sides and tapping the litter attendant in front of them who, in turn, shifts their grip forward on the litter rail and taps the litter attendant in front of them who, likewise, shifts their grip forward on the rail and taps the person in front of them.

iii. When the litter attendant at the front of the litter is tapped out, they simply let go of the litter and step up their speed to leave distance between themselves and the progressing litter behind them.

iv. Once rotated off the litter, attendants should move as quickly as possible to get in front of all of the other available reserve litter attendants, where they can catch their breath, swap sides so their next carry is with the other arm, and rehabilitate as necessary.

v. This cycle can be repeated every few hundred yards, or at intervals dictated by terrain, availability of personnel, and duration of the evacuation.

vi. Skill Drill 13-6: Tap Litter Attendant Rotation Method

vii. Some of the challenges that can disrupt the tap litter rotation method are lack of practice, lack of teamwork, and litter attendants who refuse to tap out on cycle.

**I. Lift-assist sling carry**

1. A lift-assist sling can be devised from a 6- to 10-foot (1.8- to 3-m) loop of webbing when numerous rescuers cannot be deployed to a long carryout.

a. In this case, the rescuer will simply girth hitch the webbing to the litter rail just behind the litter attendant’s hand, run it up and over their shoulder from back to front, and then grasp the other end of the webbing with the hand furthest from the litter and press down.

b. This will transfer the bulk of the load from the hand that grasps the litter rail to the litter attendant’s shoulder. The wider the strap, the more comfortable it will be going over the shoulder.

2. The use of a lift-assist sling can extend the endurance of a litter attendant significantly.

a. These can be left attached to the litter throughout an evacuation so that they can be re-used by incoming litter attendants who switch into the carry.

b. For extended carries, litter attendants who are wearing a seat harness can try clipping the end of the sling into their seat harness waist-attachment.

**J. Litter wheels**

1. For agencies where long carryouts are a reasonably likely event, a litter wheel is a worthwhile investment.

2. Litter wheels are available in a variety of designs, some of which are litter dependent.

a. For maximum versatility, use a wheel with a universal mount, to fit a wide range of litter styles and brands.

b. Single-wheel models that incorporate a robust mountain bike or other recreational vehicle wheel offer good mobility, versatility, and optimum weight-to-performance ratio.

3. Cascade Rescue Terra Tame

a. Light, fast, and lean litter wheel

b. Weighing just over 15.4 pounds (7 kg), it sports a titanium frame and fork along with a 4.25-inch (10.8-cm) fat tire bike wheel.

c. A disk brake with an attached actuator lever helps control the load in steep terrain.

d. The wheel is attached to the litter by means of straps or other clamping mechanism.

e. It can be quite difficult to load an incapacitated subject into a litter that is already mounted to a wheel, so a frame mount or quick-attachment system is especially useful.

f. It is important to practice using the litter and wheel combination before trying to implement them in an actual rescue.

4. Use of a wheel does not completely relieve litter attendants of their duties, but it can effectively reduce manpower requirements from six litter attendants to four litter attendants—or even two, if handles are used.

a. Use depends on finesse – not force

i. When using a wheel, the role of the litter attendants changes from carrying the litter to managing its stability and speed.

ii. Attendants still perform their role by grasping the litter rail and using their body to leverage the litter into place, but with the wheel already opposing the effects of gravity, lifting is no longer the issue. Instead, it becomes all about balance and rate of travel.

5. When transporting a litter with a wheel, attendants still work opposite a partner litter attendant at the other side of the litter, arm extended with hand grasping the top rail for control, but here the similarities end.

a. Instead of pulling outward to levitate the litter, attendants pull in the direction they want the litter to go, with just enough offset leverage against their partner to keep the litter level.

b. On a flat surface, they will pull forward, arm extended behind them, to drag the litter forward.

c. On a downhill run their arm may need to extend in front of them as they use their body weight to prevent it running too fast.

d. When rescuers encounter a minor obstacle, such as a rock or log, the litter can be rolled up and over it just as one might lift and roll a bicycle up, over, and down the other side of an obstacle.

6. Rescuers should practice using the wheel before using it for a rescue.

7. Litter handles

a. Derived from the old Akja-style ski toboggans, special litter handles are now available to assist with the carrying of basket-style litters.

b. Although they can add as much as 10 pounds (4.5 kg) to a trail evacuation system, with a wheel and four handles two litter attendants can effectively perform an extensive evacuation with limited person power.

c. The best handle systems can be removed or unobtrusively tucked into the litter when not in use, so they are easily transported into the field, and then offer adjustability in angle to allow litter attendants to easily accommodate varying terrain.

**K. Negotiating obstacles with a litter**

1. Traveling control lines

a. Sometimes a carryout must be performed on a low-angle surface, stairs, or other terrain that is not quite steep enough to justify a technical rescue, but a bit too sporting to leave litter attendants to deal with the situation unaided.

b. Traveling control lines may be created using short lengths of rope (30–50 inches [76.2–127 cm]) attached to the head-end and foot-end of the litter; manned by rescuers, can help control speed on downhill runs and provide assistance uphill.

c. A low-angle litter bridle may be devised to mount traveling control lines to a litter by wrapping a short loop of webbing several times around the end of the litter and clipping it with a carabiner.

d. Traveling control lines may be clipped into the carabiner on the bridle when needed, and the entire system simply draped inside the litter when not in use.

e. With a traveling control line system at each end of the litter, additional personnel may be deployed as needed to assist with moving the litter.

f. When needed to help pull the loaded litter uphill, the rescuer on the uphill line serves to assist in hauling and when the litter gets going a little too fast downhill the same rescuer can serve as slowing the litter down.

g. Rarely will a rescue team encounter an evacuation route that is all uphill or all downhill, so it is advantageous to make these traveling control lines capable of both hauling and slowing progress.

2. Hand pass

a. Often a litter team will encounter a short segment of particularly dicey terrain or an obstacle that is particularly unstable (e.g., fence, a short garden wall, a piece of machinery, or a steep and rocky trail section).

b. A hand pass can be used in these situations wherein, the litter team simply stops at the point where the obstacle becomes impassable, while available reserve litter attendants pass them by and position themselves on the other side of (or even, if necessary, in the middle of) the obstacle.

c. The most difficult part of a hand pass is for litter attendants to commit themselves to not trying to climb up, down, or over the obstacle. The following steps should be taken to avoid this:

i. With feet firmly planted, all of the litter attendants shift the litter forward, reaching toward and even over the obstacle as far as possible without letting go and without compromising the security of the load.

ii. Meanwhile, the reserve litter attendants nearest the litter on the other side of the obstacle reach out to receive the litter, with the new litter-captain-to-be informing the original team of litter attendants, “Got it!” as soon as they have a firm hold.

iii. Without stepping forward or moving their feet, the original team of litter attendants simply begin passing the litter forward, toward the new team of litter attendants on the other side of the obstacle.

iv. As soon as any of the litter attendants from the original litter team are no longer supporting the litter, they let go and reposition themselves as needed on the other side of the obstacle.

v. This process simply repeats until the obstacle is passed.

d. On particularly challenging terrain, such as in a cave, this method is sometimes used with rescuers assuming a seated position before receiving the litter, to effect what is also known as a lap pass.

VII. Transferring the Subject to EMS

**A. Patient transfer report**

1. While local patient transfer forms should be used during the patient hand-off, all patient transfer reports cover a basic complement of information, including the following:

a. Mechanism of injury/illness

b. Chief complaint

c. Additional complaints

d. Vital signs

e. Treatments

2. Verbal communication

a. Most patient handoff reports during an evacuation will be simple and verbal.

i. To help with continuity of care, it is useful to use visual markers along the way. Consider the following examples:

1 A long strip of medical tape placed on the patient’s arm next to a blood pressure cuff can be used to mark down the subject’s vitals (pulse, respiration rate, blood pressure) and the times the vital signs were taken during the evacuation.

2 A bright piece of flagging tied to the litter or to an injured extremity can help ensure rescuers avoid bumping it.

3 A large “T” written on the subject’s forehead can be used to indicate presence of a tourniquet.

b. The span of time available for a handoff report is typically quite limited.

i. Rescuers should practice delivering (and receiving) information in a succinct but thorough manner so that it is easily remembered.

ii. The MIST mnemonic is part of many prehospital care report protocols.

3. Written communication

a. Written reports are typically used when one provider agency or organization transfers a subject to another. Most agencies have a standardized report form specifically for this purpose.

i. The written report is essential in that it provides the long-term memory for what happened with the subject.

ii. All who contributed to the care of the subject should also contribute to the report.

iii. Reports should be written immediately at the conclusion of an incident, so that memories are fresh and information more likely to be accurate.

iv. The written report should tell a relatively complete story of what happened, including facts about the incident, times, patient care, and other objective observations.

v. Opinions and subjective information are not relevant here.

vi. A history of what happened, when and how rescue resources were activated, arrival details, and relevant care and packaging should all be carefully recorded.

**B. Delivering the subject to EMS**

1. Sometimes the agency performing the technical rescue is the same as the transporting agency, sometimes not.

a. Likewise, sometimes a rescuer will accompany the subject to the hospital, sometimes not.

b. Depending on the situation, the transfer from technical rescue to prehospital transport may involve multiple agencies, or it may be the same agency all the way through.

2. Most prehospital transport resources (ground ambulance, air ambulance) use stretchers that can be fixed into place and secured during the ride.

a. Rescue litters do not fit well into these, and so typically the subject must be removed from the litter and placed on the stretcher of the receiving agency.

b. Medical authority is typically transferred to the receiving agency only after the subject has been placed on or in the receiving resource.

3. Upon arrival at the ambulance (or other receiving agency), the rescuer who has been caring for the subject up to that point should confer with the EMS provider who will take primary responsibility for the subject from that point forward.

a. Together they will agree on a plan of action, usually utilizing personnel from both agencies to effect the transfer.

b. Rescuers who have been involved in subject transport to that point should not leave the subject or the litter until the medical authority has confirmed that they are no longer needed.

VIII. Summary

 **Transportation of a subject from the rescue environment to the next stage of care often requires a litter.**

 **Rescuers may choose between flexible litters and rigid basket litters, depending on need.**

 **Enclosed basket litters offer additional protection to the subject.**

 **Flexible litters wrap closely around the subject and may be a good choice for confined spaces.**

 **Under the challenging conditions of rope rescue, a balance must be achieved between the delivery of on-scene medical care and expedient evacuation/extrication from dangerous environments. Follow local protocols and your level of training.**

 **Medical considerations during rope rescue include triage, spinal motion restriction, and patient packaging.**

 **Key packaging concerns include whether the subject should be immobilized, providing for the subject’s comfort during evacuation, and securing the subject to the litter.**

 **Litters for high-angle rescue must be strong enough to allow rigging for rescue and to support the weight of the subject and medical attendant.**

 **Subjects suspected of having spinal injuries who are transported in flexible litters, such as the Sked, also require spinal immobilization.**

 **Devices used for spine immobilization include commercial devices such as spine boards, half boards, and vacuum mattresses.**

 **Basket stretchers with hard shells provide the best protection for a subject suspected of having long bone fractures.**

 **Before packaging the subject, secure the litter from falling downslope or over an edge.**

 **Any subject restraint system must allow access to the subject for periodic assessment and treatment, in case the subject’s condition changes; it also must allow for breathing and circulation and for subject movement for comfort.**

 **Carrying a loaded litter over any distance is hard physical work, so the load should be shared between multiple rescuers and perhaps supplemented with some carrying accessories.**

 **A litter sling can help relieve the load of carrying a litter with one hand on the litter rail by spreading weight to the shoulder.**

 **Hand pass methods may be used to transfer a loaded litter a short distance across an obstacle.**

 **When using a litter wheel, rescuers walk beside or at the ends of the litter (or in both places), holding and balancing the litter, because the wheel supports most of the weight.**

 **The transfer of the patient to medical care may occur at various points throughout the evacuation, such as when the subject is moved from a rope rescue environment to a trail carry or ambulance, or it might occur when a medical provider of greater authority arrives on scene.**

 **Local patient transfer forms should be used during the patient hand-off, but most patient handoff reports during an evacuation will be simple and verbal.**

Post-lecture

I. After-Action Review

Individual/Small-Group Activity/Discussion

On Scene

This activity is designed to help the student understanding how to approach a fire investigation. This activity incorporates both critical thinking and the application of basic trench rescue knowledge.

Purpose

To allow students an opportunity to develop responses to critical thinking questions.

Instructor Directions

1. Direct students to read the “On Scene” questions located in the After-Action Review section at the end of Chapter 13 (p. 266).

2. Direct students to read and individually answer the discussion questions. Allow approximately 10 minutes for this part of the activity. Facilitate a class review and discussion of the answers, allowing students to correct responses as needed.

3. You may also assign these as individual activities and ask students to turn in their comments on a separate piece of paper.

Answers

1. Under what conditions might a rigid basket litter be preferred over a pram, or a flexible litter?

- Where greater physical protection for the subject is desired

- Where rigidity for patient packaging is of high importance

- Where the litter is likely to be dragged over rugged terrain or bumped into structures

- Where multiple rescuers will be manhandling the litter during evacuation

2. When packaging a scaffold worker who has sustained a fall and been caught by a fall arrest system, what protective measures should be?

- Immobilization, as required

- Ability to maintain and monitor airway and mental status

- Protection of and access to injury site(s)

- Adequate comfort and security for the type and duration of evacuation

- Provision for rescuers to react appropriately to vomiting, loss of consciousness, or breathing interruptions

3. While carrying a child out of a remote park area, your team encounters a steep, rocky section of trail about 30 feet (9.1 m) in length. How will you manage the litter down this section to reduce risk to subject and rescuers?

Given the methods discussed in this chapter, traveling control lines would be the preferred option.

4. Under what circumstances might you choose to use lift-assist slings? How should these be attached to the litter?

When rescuers must carry a loaded litter for an extended period of time or distance, the lift-assist sling can improve endurance. The sling may simply be girth hitched around the rail of the litter.

5. What are the potential advantages of a beanbag-type backboard? Limitations?

Advantages: Lighter weight and easier to transport to the scene, less likely to cause pain and tissue damage from pressure, insulation value, greater comfort for extended transport

II. Lesson Review

Discussion

Note: Facilitate the review of this lesson’s major topics using the review questions as direct questions or slides. Answers are found throughout this lesson plan.

1. Identify the basic functions of litters in the rescue environment. (Lecture II A)

2. What characteristics are associated with rigid baskets? (Lecture III A)

3. What is a Sked litter? (Lecture III A)

4. Identify the key attributes of technology used during rescues. (Lecture IV D)

5. Identify the criteria used to assign a triage priority to a subject during a rescue operation. (Lecture IV E)

6. Identify and describe the triage priority levels. (Lecture IV E)

7. Identify circumstances that might require the use of a litter if the subject is not injured (Lecture V B)

8. Describe the old and new philosophies on spinal motion restriction (i.e., immobilization). (Lecture V F)

9. Identify the roles assigned to rescuers during an extended carry. (Lecture VI D)

10. What type of information should be included in all patient transfer reports? (Lecture VII A)

III. Assignments

Lecture

A. Advise students to review materials for a quiz (determine the date/time).

B. Direct students to read the next chapter in *Rope Rescue: Principles and Practice,* Fifth Edition, as listed in your syllabus (or reading assignment sheet) to prepare for the next class session.