



AWLS

University of
Utah School of
Medicine

Instructors Manual

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University of Utah School of Medicine

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TABLE OF CONTENTS

[Introduction](#)

[Role of the Instructor](#)

[AWLS Subjects](#)

[How Students Will Learn](#)

[PowerPoint Lectures](#)

[Possible Days of Instruction](#)

[Suggested Schedule for Instruction](#)

[Certification Exam](#)

[Practical Skills](#)

1. *[Patient Assessment](#)*
2. *[C-Spine Management](#)*
3. *[Dislocations, Fractures and Splinting](#)*
4. *[Pulls, Carries and Litters, Hypothermic Wrap](#)*

[Training Scenarios](#)

[Scenario 1: Abdominal Pain](#)

[Scenario 2: Trauma with Intra-abdominal injury](#)

[Scenario 3: Bike crash with fractured radius/ulna](#)

[Scenario 4: Ski Crash with multiple fractures](#)

[Scenario 5: Chest Pain](#)

[Scenario 6: High Altitude Pulmonary Edema](#)

[Scenario 7: Hypothermia / Submersion Injury](#)

[Scenario 8: Lightning](#)

[Scenario 9: Seizure](#)

[Scenario 10: HACE](#)

[Scenario 11: Femur Wrist Fracture](#)

[Scenario 12: Dislocated Shoulder](#)

[Scenario 13: Anaphylactic reaction to food](#)

[Scenario 14: Hypoglycemia requiring oral glucose.](#)

[Scenario 15: Ankle fracture requiring splinting](#)

:

[Appendix: Practical Skills Equipment List](#)

[Wilderness Medical Problems](#)

Infectious Disease Problems

INTRODUCTION

Advanced Wilderness Life Support (AWLS) was designed to teach and certify individuals with some medical background the essentials of wilderness medicine. It was developed at the University of Utah School of Medicine in 1997. All those who enter the back country should study this material. Wilderness medicine is new to most people who will study the AWLS material. Your job as the instructor of the AWLS course is to cover in a general manner the subjects that are needed to pass the AWLS certification examination.

ROLE OF THE INSTRUCTOR

The role of the lead instructor is to facilitate learning and answer questions. Students will at least need to take the online practice examination prior to attempting the AWLS certification examination. Instructors can help to answer these questions.

AWLS SUBJECTS

The following are the subjects to be studied to pass the AWLS certification examination.

- Patient assessment
- Wound management
- Hot-Cold Injuries
- Avalanche
- Lightning
- Water safety
- Medical problems
- Dentistry
- Dermatology
- Eye Problems
- Bites and Stings
- Infectious disease-diarrhea
- Wilderness Medicine Kits
- Water Treatment
- Altitude
- Diving Medicine
- Practical Skills

HOW STUDENTS WILL LEARN

1. All students will need to study online at www.wildmedu.org Listening only to lectures will not teach them the wilderness medicine that they need to know to pass the AWLS certification exam. They will have to study. Students learn better in different ways, so The University of Utah School of Medicine has provided several methods for students to learn.

Textbook: The AWLS is online and can be downloaded and then marked up by students using anyone of several programs. Since it is electronic, they are updated frequently. Older hard copy versions of the textbook are all outdated and inadequate.

Podcasts: These are the most popular way students will learn. The podcasts are found on all podcast platforms.

Practice tests: Learners should take the practice tests prior to taking the AWLS exam. The students are presented a question and then given an explanation.

On-line PowerPoint lectures: Some students like to listen and follow a PowerPoint lecture. There are several PowerPoint lectures online to watch.

In-Person PowerPoint lectures: Students in your class will hear lectures.

POWERPOINT LECTURES

- Patient assessment
- Wound management
- Hot-Cold Injuries
- Avalanche
- Lightning
- Water safety
- Medical problems
- Dentistry
- Dermatology
- Eye Problems
- Bites and Stings
- Infectious disease-diarrhea
- Wilderness Medicine Kits
- Water Treatment
- Altitude
- Diving Medicine

- Practical Skills

If you are giving a lecture, please listen to the podcast, or read the chapter, or take the practice test on that subject first. In this way, you will be an expert in that subject.

POSSIBLE DAYS OF INSTRUCTION

1. Multiple Day Course

Organizations, schools, medical schools, residencies use this method frequently. When students will be around for long periods, lectures and instruction can last for more than three days, weeks or even months to fit the students schedule. Students can study online material over the length of the program. This method gives great variability to the instructors.

2. Two Day Course

The AWLS will be taught over two days. A third day can be added if needed. This is a popular method if people are traveling or getting together for a limited time. It is suggested that students study online material prior to coming to the course and after the course before taking the AWLS certification exam. (This can be expanded into a three day course)

3. Hybrid Course

This course allows students to study the AWLS material entirely online and the instructors will teach the practical skills.

SUGGESTED SCHEDULE FOR INSTRUCTION

1. Patient assessment
2. Wound management
3. Hot-Cold Injuries
4. Avalanche
5. Lightning

Practical skills

- Water safety
- Medical problems
- Dentistry
- Dermatology
- Eye Problems

Practical skills/scenarios

- Bites and Stings
- Infectious disease-diarrhea
- Wilderness Medicine Kits
- Water Treatment

- Altitude

Scenarios

- Altitude
- Diving Medicine

Questions/review

Show the students the web site and make sure they know other ways to study.

Provide Code to take the online AWLS certification exam at: www.wildmedu.org

Note: The order of the lectures is not important except it is suggest that Patient Assessment and Wound Management be done first as the relate to the practical skills.

CERTIFICATION EXAM

The certification examination is given online at: www.wildmedu.org The exam must be completed in one setting, and it is timed. If students pass, a certificate will be given to them online immediately after passing. If they fail, the test can be reopened, and they can repeat the exam when they are ready.

Continuing Medical education – CME: If learners need CME, they can apply for this by going to the website: www.wildmedu.org They will need to enter codes that will be given to them when the register. The price of the course includes the CME credit.

PRACTICAL SKILLS

The instructors should watch the practical skills videos located at www.wildmedu.org They are listed below. This is the manner of practical skills that are to be included in an AWLS course. Teach these once you feel comfortable and have learned them.

1. **AWLS Training Scenarios** – Multiple scenarios to have the students practice their hands on skills in the field environment. This manual has several scenarios to choose from to make allow you to select those scenarios that best fit the setting for your course.
2. **AWLS Testing Scenarios** – Several scenarios to bring all the skills that the students have learned. These scenarios can be modified to meet the requirements

3. AWLS PRACTICAL SKILLS WORKSHOPS

Instructions on how to conduct practical skills workshops on the following four topics are described below:

1. Patient Assessment
2. C Spine Management - Moving the Injured Patient
3. Dislocations, Fractures and Splinting
4. Pulls, Carries and Litters
5. Hypothermia Wrap

These are self-explanatory, although a few explanations are in order. The Large Group Didactic Recommended Outline is just that, a recommended outline. If you would prefer to present the material in a different manner, please do so. "Large Group" refers to the all the AWLS students in the course. Finally, experience has shown the optimal group size for a small group practicum to be 6 persons, with 1 instructor supervising. This may not be possible, and the size of each group will need to be adjusted according to the number of instructors and students.

1. PATIENT ASSESSMENT – practical skills

WORKSHOP OVERVIEW: The purpose of the Patient Assessment workshop is to allow students the opportunity to practice the Patient Assessment as it was presented in lecture, and to begin the habit of developing a working differential diagnosis and plan based upon the assessment. Three standardized case scenarios can be used to meet these goals. You can create your own better suited to your location. Following a large-group review of the Patient Assessment, the group will divide into small groups of preferably with an instructor.

EQUIPMENT NEEDED

1. Tarps/Ground pad for patient scenarios

APPROXIMATE TIME

1. Large Group: 20 Minutes
2. Small Group Practice Sessions: 20 minutes per scenario (10 minutes per assessment, 10 minutes of debrief/review), for a total of 1 hour.
3. Total Time: Allow 1:30

LARGE GROUP RECOMMENDED OUTLINE

Review Patient assessment as it is presented in the AWLS Textbook.

1. Assess Scene Safety
2. Primary Survey: MARCH
3. Secondary Survey with the following mnemonics:
 - a. SAMPLE for medical history
 - b. CARTS for identifying sources of bleeding.
 - c. AEIOUTIPS for assessing altered mental status.
 - d. COLDERR for characterizing pain
4. Demonstrate Patient Assessment

SMALL GROUP OUTLINE

1. Assign 2 sub-groups of 3 persons each. Each person in the subgroup will rotate through the roles of caregiver, patient, and observer/assistant.
2. Read the Patient Description to the group. Cases 2 and 3 contain additional information that should be given to the patient only.
3. Begin the scenarios.
4. Each caregiver should be allowed 10 minutes to complete their assessment, form a short differential diagnosis, and develop a plan. Have the caregiver verbalize their differential.
5. The 3rd person in the group, the observer/assistant, should help with any patient care actions requested by the caregiver, but should not otherwise intervene.
6. At the end of each scenario, review the student experiences. Again, the focus of this exercise is to develop a methodical approach to the evaluation of the patient. A medical diagnosis and treatment are less

important than a well-performed assessment.

Patient Assessment - CASE 1

Patient: 22-year-old male found floating face down in shallow water, unconscious, after ejection from a raft and a subsequent float through a Class IV rapid.

Physical Exam:

- 1) Unresponsive
- 2) No lacerations or gross deformities noted.

Students should start their evaluation at this point

Learning / review points:

- 1) Basic review of the **primary survey** with a focus on:
 - a. Being systematic with the survey going M – A – R – C – H in that order.
 - b. Checking the patient for signs of major hemorrhage.
 - c. Opening and evaluating the airway, but with a concern for possible C-spine injury. Could consider using the jaw thrust maneuver instead of head tilt – chin lift.
 - d. Giving the 2 rescue breaths over one second each before moving on to a pulsecheck. The rescuer could also go straight into the chest compression instead of giving the two rescue breaths. Based on the new CPR guidelines the student could also start directly with the chest compressions for 2 minutes before giving the rescue breaths.
 - e. Good chest compressions at a ratio of 30 compressions to 2 breaths at a rate of 100 compressions per minute.
 - f. Complete the evaluation of the primary survey once the patient starts breathing on his own.
- 2) Completion of the evaluation by going through the **secondary survey**
 - a. SAMPLE history
 - b. Head to toe examination looking for other injuries.
- 3) Other discussion for this case: He has a normal exam, but he continues to cough and have some difficulty breathing. Should he be evacuated? Yes!!

Patient Assessment - CASE 2

Patient: 28-year-old male who is rock climbing unprotected and loses his grip. He falls 20 feet to the bottom of the cliff, landing on dirt. The patient is awake, alert, pale, diaphoretic and complaining of pain all over.

Additional information to give to the patient only (for the Primary and Secondary Surveys and PE).

- 1) Your pulse, if asked, is 120 bpm and thready peripherally.
- 2) You have no allergies, take no medications, have no medical problems, your last meal was 3 hours ago, and you fell because you lost your grip on the rock and fell backward.

Physical Exam:

All normal except the following:

- 1) Pale, diaphoretic
- 2) Bruising over the right lateral hip / pelvis. Severe tenderness to palpation throughout the abdomen, especially in the left upper quadrant of the abdomen (consistent with a spleen injury).

Students should start their evaluation at this point.

Learning/Review Points:

- 1) Clinical Signs of Shock:
 - a. Tachycardia
 - i. Pale, diaphoretic
 - ii. Thready radial pulse (SBP of at least 80)
 - 1) SBP of 60 = carotid pulse
 - 2) SBP of 70 = femoral pulse
 - 3) SBP of 80 = radial pulse
 - b. Why does this patient have shock?
 - i. Hemorrhagic shock
 - ii. Where is he bleeding? **(CARTS mnemonic review)**
 - 1) Chest – unlikely
 - 2) Abd/Pelvis – YES and most likely from his spleen although he may also have a pelvic fracture
 - 3) R – could have renal bleeding but no lower rib or back tenderness so less likely
 - 4) T – no thigh pain or deformity
 - 5) S – no pooling of blood or skin bleeding
- 2) Should this patient be evacuated – definitely yes!

Patient Assessment - CASE 3

Patient: You were hiking in the Alps and stumbled across a beehive. While running away you were stung, and you are allergic. When you were stung, you twisted your ankle and fell to the ground.

Students should start their evaluation at this point.

Additional information to give to the patient only (for the Primary and Secondary Surveys and PE).

Pulse: Thready and 120

Respiratory: rate 30-36, with significant difficulty breathing. Wheezing grossly audible. HEENT: swelling neck and around eyes

Extremities: swelling, bruising, tenderness over the lateral malleolus.
Unable to walk.

Learning/Review Points:

Review of anaphylaxis:

1. This is a true life-threatening emergency.
2. It begins like a generalized reaction, but rapidly results in the respiratory and or circulatory collapse.
3. Symptoms are not subtle and include itching, flushing, swelling of the tongue and lips, nausea, vomiting, diarrhea, cramping, hives, a drop in blood pressure, painful tightness in the chest, difficulty breathing, wheezing, convulsions, confusion, and loss of consciousness.
4. Treatment must be immediate as shock can result.
 - a. Injectable epinephrine is essential.
 - i. The EpiPen® contains a 0.3 ml auto-injection dose of 1:1000 epinephrine. There is also a 0.15 mg auto-injector (EpiPen JR®)
 - ii. A 2nd dose of epinephrine may be required within 5-20 minutes after the first, depending on the severity of symptoms and the initial response to the epinephrine.
 - b. Additional medications should be added to treat the anaphylaxis.
 - i. Antihistamines – chlorpheniramine or diphenhydramine.
 - ii. An H2 blocker should be administered as well – cimetidine.
 - iii. Steroids should also be given if available. The dose should approximate prednisone 1 mg/kg. Inhaled beta agonists such as albuterol can be used for wheezing

2. C-SPINE MANAGEMENT – MOVING THE INJURED PATIENT

WORKSHOP OVERVIEW: This workshop, building upon the assessment skills practiced earlier, teaches the assessment and transport of patients with a suspected cervical spine injury. It begins with a large-group demonstration of c-spine immobilization techniques, immobilization improvisation, and finally short and long-board immobilization techniques. This large-group demonstration is relatively long and involved compared to the other workshops. Instructor preparation and practice is very helpful to ensure a smooth-running workshop. After the large group demonstration, students will again divide into small groups. Finally, students will divide into smaller groups to practice patient-care scenarios requiring primary and secondary assessments, cervical spine immobilization, and short-distance transit.

EQUIPMENT NEEDED:

AWLS Practical Kit: Make sure that each practical kit has the following equipment. This can be altered if needed.

- Minimum 2 soft splints per group
- Jackets and clothing
- Rope
webbing
- Sleeping Bag
- Sleeping Pad
- Tarp
- Backpack with frame
- Long, rigid supports i.e. skis or hiking poles, boat paddles, tree limbs, etc.

APPROXIMATE TIME

Large group didactic: 30 - 45 minutes

Small group practice sessions: 60 minutes

LARGE GROUP DIDACTIC RECOMMENDED OUTLINE

A. Introduction to C-Spine Injuries

1. Review importance of cervical spine injury
2. Review backcountry mechanisms of head and neck trauma
 - a. Some spinal injuries can be “silent”.
 - b. In patient with femur fracture, be aware that MOI likely of sufficient force to warrant concern for spinal injury.
3. Review candidates for immobilization
4. Review consequences of immobilization in the backcountry: i.e. the decision to immobilize a patient converts a person who might otherwise be ambulatory and able to participate in their own evacuation into person who must be rescued using advanced evacuation procedures.
5. Generally, anyone with a significant MOI should be

immobilized.

B. Positioning

1. Generally, patients with spinal injuries are most easily transported and managed in supine, anatomical position:
 - a. Gentle axial traction back to anatomic position is indicated unless:
 - i. Return to anatomic position significantly increases pain or focal neurological deficit.
 - ii. Movement of head and neck results in noticeable mechanical resistance
2. **Demonstrate** gentle axial traction: with patient lying curled on side, return patient to anatomic position.
3. **Demonstrate** placing the patient in a position so that they can vomit if needed. (Recover position)

C. Rolling the patient

1. **Key points:**
 - Move the neck and spine in line or in a straight position.
 - Teach that once placed in traction, the neck must always then remain in traction.
 - One person remains at the head of the patient and is in charge of always maintaining integrity of spine.
2. **Demonstrate**
 - a. Rolling patient

D. Moving the patient

1. **Demonstrate:** moving a patient from a difficult position i.e., found in rocks or in trees.
 - a. This patient will be moved in the position that they are found to a place where they can then be rolled into the proper rescuing position.
 - b. Demonstrate how to keep the neck immobile when the patient is moved.
2. **Demonstrate:**
 - a. Lifting and moving the patient by lining up on either side and alternating arms under patient

E. C-Spine Collars

1. **Demonstrate:** C-spine can be initially stabilized with head and knees.
2. Review that all C-collars are used in conjunction with full spinal immobilization.
3. Desirable characteristics of improvised wilderness C-collars include:
 - a. rigid or semi-rigid construction

- b. proper fit from chin-to-chest
- c. allowance for victim's mouth to open.
- d. not choking the victim

4. Ideas for improvised c-collars:

- a. Duct Tape for everything
- b. **Demonstrate** the soft (SAM) splint: place vertical bend 6" from one end and secure this area of SAM splint snugly under patient's chin. Create bilateral flares to provide increased comfort under jaw. Wrap long end of splint around back of neck and over other end of splint. Angle long end inferiorly to allow good chin-to-chest distance.
- c. **Demonstrate** Fanny Pack or hip belt from backpack.
- d. **Demonstrate** bulky clothing rolled and wrapped around victim's neck as aides for further preventing movement.

F. Improvised spinal immobilization.

1. *Short board immobilization* examples: appropriate for short-duration transport (due to hazardous environment)

- a. **Demonstrate:** How to stabilize head. Be aware of victim's comfort and use padding where needed.
- b. **Demonstrate:** Inverted internal frame backpack can be used to secure spine. Use hip belt across forehead to secure head and surround with towels rolls or clothing. Use shoulder and sternum straps to secure rest of pack to patient (with improvised c-collar and with or without shovel).
- c. **Demonstrate:** Padding for comfort

d. Additional ideas:

- i. Snowshoe- widest part under patient's head.
- ii. Kayak paddle with oar under patient's head.

2. *Long board immobilization* examples: definitive immobilization for major transport

- a. **Demonstrate:** Continuous Loop System (mummy litter) See rope litter section for more details.

Equipment needed:

- i. long sturdy rope
- ii. stiff objects for backboard (skis, boat paddles, snowshoes, skis, poles, tree branches)
- iii. sleeping bag/pad or clothes for padding and warmth

b. Demonstrate: With full c-collar and spinal immobilization, head and neck should be further stabilized by securing items such as rolled towels, sand bags etc. on lateral sides of the head and neck. U-shaped head- support can also be improvised using SAM splints, clothing, etc.

c. Other ideas:

- i. Multiple external frame backpacks snugly tied together and may be secured with ski poles, branches, etc.
- ii. Kayak or canoe

G. Key Review Points:

- ALWAYS reinforce potentially uncomfortable interfaces with extra padding.
- C-collar should always be used in conjunction with full spinal immobilization and head should be further supported laterally (with towel rolls, etc.) and secured to improvised backboard.
- Be creative; take advantage of what you have available in a specific setting
- Whenever possible, make decisions WITH patient's consent and input.

SMALL GROUP PRACTICUM

A. Divide into groups of 6 students:1 instructor.
B. Each group should have an AWLS Practical Kit (See Appendix for the Kit contents)
C. Review key points of large group didactic and answer questions as necessary.
D. Subdivide into small groups of 3 persons each. Each group should obtain equipment from the practical kit sufficient to firmly stabilize a c-spine injury
E. Each team of 3 should rotate through the following three patient scenarios, taking turns in the role of caregivers, patient, and helper. Each caregiver should complete a primary and secondary assessment, manually stabilize c-spine and apply traction, and construct an improvised c-collar. Allow 10-15 minutes per caregiver. Each scenario should have the patient in a different position and thus allow practice of aligning C-spine and applying traction from different start-points.

1. Rock climber falls from 20' height
2. Mountain biker falls at high speed down an embankment
3. Skier strikes a thick branch with his head while traveling at high speed

Note: all patients are conscious and able to cooperate with the caregiver. Instructors/Students may improvise other patient-care scenarios as necessary

The goal of this practice session is to provide each student with the opportunity to construct a rigid cervical immobilization device while practicing the primary and secondary assessments.

After each student has practiced the above, regroup into the 6-person team. Pick one person to play the role of patient. Now the remaining 5 persons will practice the following scenario:

A woman falls while climbing and rocks continue to fall. She has a C spine injury causing loss of movement in both legs. Continuing rock fall from above necessitates urgent removal from the rock fall area.

The goal of this session is to quickly assess and stabilize a patient with suspected c-spine injury, then move that patient a relatively short distance (20 yards) using one of the methods covered in the large group didactic (short or long-board immobilization).

F. Debrief student's experiences/answer questions.

3. DISLOCATIONS, FRACTURES AND SPLINTING

WORKSHOP OVERVIEW: This session will provide a practical demonstration of the topics covered in the musculoskeletal injuries lecture.

EQUIPMENT NEEDED:

For each 6-person team:

- 3 soft (SAM) splints,
- tent poles, ski poles, hiking poles,

APPROXIMATE TIME

- Large Group: 30-40 minutes
- Small Group: 45-60 minutes

LARGE GROUP DIDACTIC RECOMMENDED OUTLINE

- 1) Introduction to fractures:
 - a. Check neurovascular status.
 - b. Apply longitudinal traction and reduce extremity to the anatomic position
 - c. Recheck neurovascular status.
 - d. Splint in the anatomic position
 - e. Traction:
 - i. Indicated for femoral shaft fractures.
 - ii. Cumbersome, for more distal femur fractures splint may suffice
 - iii. Reduces pain..
 - iv. Reduces blood loss
 - v. Should have the following components: rigid support longer than the leg, traction mechanism, proximal anchor at groin, ankle hitch, method for securing splint to leg, plenty of padding, durable.
 - vi. Should not: cause skin breakdown, compromise neurovascular status.
**Remember: like C-spine traction, once applied the traction must be maintained.
- 2) Dislocations:
 - a. Techniques of Reduction:
 - i. Shoulder
 - ii. Elbow
 - iii. Finger
 - iv. Patella
- 3) Splinting:
 - a. Sling/swathe (demonstrate improvised)
 - i. Reducing a shoulder dislocation

- b. Shoulder coaptation splint
 - i. Humerus fractures
 - ii. Forearm sugar tong splint
 - iii. Elbow dislocation
 - iv. Forearm fractures
 - c. Volar wrist splint
 - i. Distal radius fracture, hand fractures
 - d. Finger splints
 - i. Finger fracture/dislocation
 - e. Long lower extremity splints
 - i. Long leg anterior and posterior splints, sugar tong splints
 - 1. Distal femur fracture, knee injury, proximal tibia fracture
 - f. Short lower extremity splints
 - i. Short leg posterior splints, sugar tong splints
 - 1. Distal tibia fracture, ankle fracture or dislocation, foot injury
- 4) Femoral Traction:
- a. Demonstrate improvised traction device if time allows

SMALL GROUP PRACTICUM

1. Divide into teams of students and instructor.
2. Review key points of large-group didactic and answer questions as necessary
3. Divide into pairs.
4. Have each person create at least 4 different types of splints from the types that were covered in the large group didactic.
5. As time permits, students can practice with Femoral Traction device or improvised device in groups of 3.

4. PULLS, CARRIES AND LITTERS AND HYPOTHERMIA WRAP

WORKSHOP OVERVIEW: This workshop will provide students with the opportunity to learn about and practice pulls, carries, and litters. Also included is a large-group didactic on a hypothermia wrap.

EQUIPMENT NEEDED

AWLS Practical Kit for each 6-person team. Ensure that each

Kit has:
climbing rope
trekking poles/ski poles
sleeping bag
sleeping pad
tarps
extra padding

For Hypothermia Wrap:

sleeping
bags Tarp
Sleeping pad
Water
bottles

APPROXIMATE TIME

Large Group: 45 minutes
Small Group: 45-60
minutes

LARGE GROUP DIDATIC RECOMMENDED OUTLINE

1. Intro to packaging and evacuating patients:

Methods of transport when outside assistance is unavailable, and patient must be evacuated. Briefly discuss potential situations where this might occur—remote river trips, cold weather environment where waiting is not an option, unsafe scene where time is premium, etc.

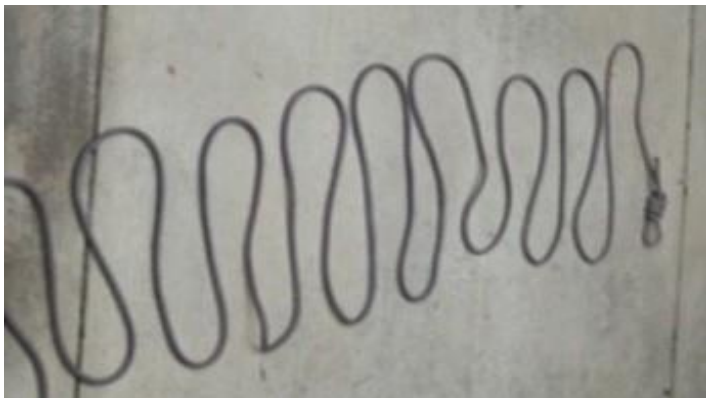
2. Demonstration of methods of transport

- a. Pull
- b. 4 hand seat with 2 carriers
- c. Seat patient on Oar or pole, which can rest on packs between 2 people
- d. Jacket litter with tree limbs or paddles (see picture below)



Works best if jackets are not too stretchy and some sort of cross stabilizer such as tent poles are used at ends. They can be tied on with rope, webbing or duct tape. Poles should be 1 to 1.5 feet longer at ends than the patient.

- e. Rope litter with climbing rope, sleeping pads, ski poles, tree limbs or paddles
 - i. Lay climbing rope on the ground in 2 to 3 ft wide S loops with the length slightly greater than that of the patient.
 - ii. Place a figure of 8 knot in the bottom end of the rope.
 - iii. Place stiffeners on top of rope (ski poles, limbs, etc.)
 - iv. Lay sleeping pads on top of stiffeners (a tarp can also be used to keep patient warm)
 - v. Move patient onto litter making certain to manage any C-spine issues. Make certain head is supported
 - vi. Weave rope through opposite knot beginning at bottom of litter.
 - vii. Tie off rope at upper chest height.





3. Hypothermia Wrap

a. Overview: Hypothermia definition and stages/progression.

- i. mild (91-95 degrees) - shivering, loss of fine motor skills, confusion, poor judgment, apathy, pale skin, elevated HR/RR
- ii. moderate (80-91 degrees) - loss of shivering, loss of gross motor skills (stumbling), increased confusion, decreased HR/RR
- iii. severe (<80 degrees) - muscle rigidity, obtunded, cyanotic skin, minimally or non- palpable pulses/respirations
- iv. exacerbating factors – dehydration, inadequate food intake, fatigue

b. Mechanisms of heat loss

- i. conduction – ground, water
- ii. convection - wind
- iii. radiation – exposed skin
- iv. evaporation – wet clothes/skin

c. Prevention of further heat loss

- i. remove wet clothes (evaporation)
- ii. stop/minimize environmental exposures: wind (convection); water (conduction, evaporation); ground (conduction)

d. Add heat

- i. heat packs/water bottles
 - ii. warm drinks (not for unconscious or confused patients)
 - iii. person-to-person contact?
 - iv. fire
- e. Hypothermia Wrap design—“The Burrito Wrap”
- a. Warmth close to body (increase heat through conduction)
 - i. heat packs in neck/axilla/groin, protect against burns!
 - ii. body-to-body contact?
 - b. Insulation layer (prevent heat loss through conduction)
 - i. sleeping bag X 3, pt inside middle bag with zipped bags above & below. Head should be encased in middle sleeping bag.
 - ii. air mattress
 - c. Windproof outer layer (prevent heat loss through convection)
 - i. large tarp, reflective blanket (also reflects radiant heat)

--See diagram on next page for hypothermia (burrito) wrap

DEMO--COMPLETE

**WRAP WITH
LAYERING**

AS IN DIAGRAM

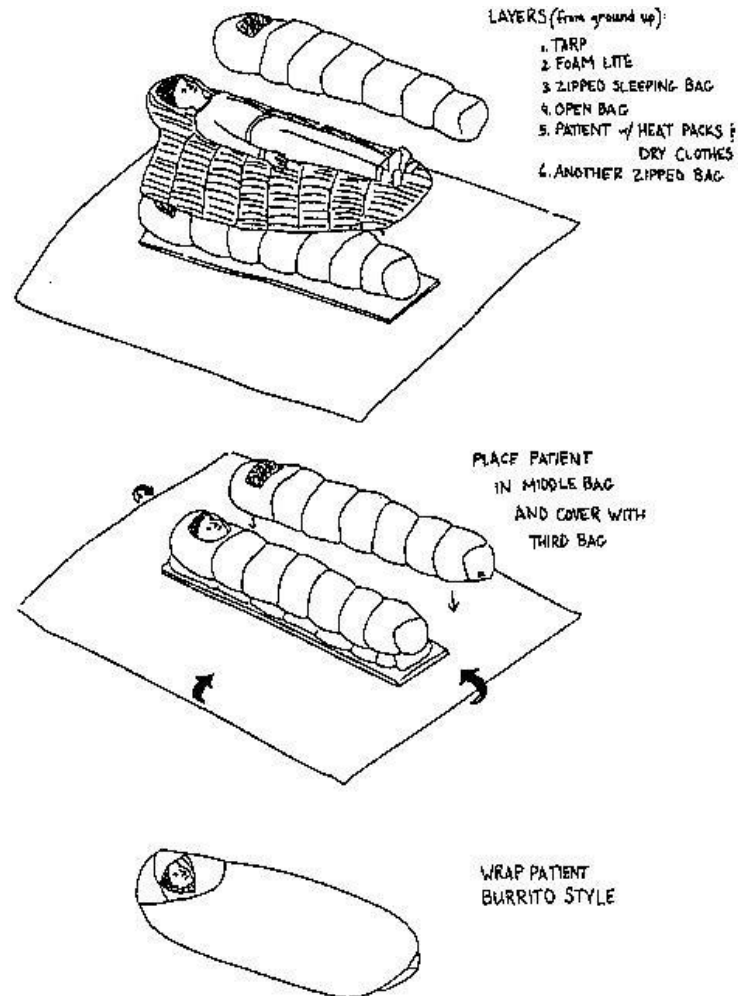


Figure 16-2: Hypothermia wrap

SMALL GROUP PRACTICUM

1. Divide into smaller groups.
2. Review key points of large-group didactic and answer questions as necessary.
3. Break into groups of two; each student should practice a pull and carry alone.
4. Break into groups of three and practice the two person carries.
5. Each group should construct litters, and the burrito wrap. Practice carrying group members of different weights. Each group should practice moving a patient with C-spine protected and transport a patient a minimum of 20 feet.

6. Debrief the session.

TRAINING SCENARIOS

WORKSHOP OVERVIEW: The following training scenarios allow students to integrate and practice knowledge from throughout their course in a “realistic” backcountry setting using mock patients. The scenarios are meant to give the students more hand-on practice in various wilderness scenarios that allows them to practice their skills in the areas of primary and secondary assessment, medical management, medical decision-making, and leadership.

You have 3 hours to rotate the students through the training scenarios. We understand that there are various settings in which you will be training them, so we have several scenarios that you may choose from.

Ideally students will perform the scenarios in 4 to 6-person teams, which will allow each student to serve as team leader and will be adequate to allow for patient packaging and transport.

1. **Setup:** We recommend that you engage people from outside the course to serve as mock victims for your scenarios and testing scenarios. This provides a more realistic and stimulating learning environment for the AWLS students. These victims may be family members, friends, hotel personnel or students. If you do not have a victim for each scenario the team will choose a patient. The group instructor will brief the patient explaining his/her role and past medical history, as described in “Notes to the Patient” and “Primary and Secondary Assessment” below. You may also hand the “patient” a printed copy of their symptoms/history to quickly read through. The instructor will then give the treating team a brief scenario introduction as found in “Notes to the Group.” Ideally you want to brief the mock victims/patients and place them in an outdoor setting so that the student group “walks up” to the scene without any prior knowledge of the scene. Again, greater realism creates a more robust learning environment.

Consider creating one longer scenario (40 minutes) in which the group has to assess the patient, treat them and then package and evacuate them. Following is an example of how you might structure your scenarios for a group of 30 students.

5 instructors each with a group of 6 students (each instructor has 1 victim)

Instructor #1- 1 scenario Multiple trauma with rope litter

evac 40 minutes Instructor #2- 2 scenarios #1 Abdominal

pain 20 minutes

#2 Lightning 20 minutes

Instructor #3- 2 scenarios #1 Chest Pain 20 minutes

#2 HACE 20 minutes

Instructor #4- 2 scenarios #1 Hypothermia 20 minutes

#2 Seizure 20 minutes

Instructor #5- 2 scenarios #1 Bike crash 20 minutes

#2 HAPE 20 minutes

You will rotate the group when done. The above set-up allows you to use one victim for each instructor for a total of 5 victims. We also suggest that you use props and moulage whenever possible. For example, if you create an open fracture victim for one scenario you cannot use that victim for a second scenario that does not include an open fracture.

The set up for the testing scenarios is similar, you can have 1 victim and instructor present 2 scenarios (for example 2a and 2b can be conducted by one instructor with one victim. For a larger group you can run multiple groups of testing scenarios simultaneously so that you complete the session in the allotted 3.5-hour period. For example, for a group of 30 students you can divide them into 6 groups of 5 students each. Then you can run 2 groups of each testing scenario (1-3) simultaneously as follows rotating the students so that each group completes all 3 scenarios only once.

Instructor 1- Scenario 1 w group #1 Instructor 2- Scenario 1 w group #2

Instructor 3- Scenarios 2 a-b w group #3 Instructor 4- Scenarios 2a-b w group #4

Instructor 5- Scenario 3 a-b w group #5 Instructor 6- Scenarios 3 a-b w group #6

In this format groups 1, 3 and 5 will rotate through instructors 1, 3 and 5 and groups 2, 4 and 6 will; rotate through instructors 2, 4 and 6.

2. **The scenario:** When the treating team begins their assessment, both the mock patient and the instructor will answer assessment questions as described in “Primary and Secondary Assessment,” the patient answering to the extent possible (i.e. with physical exam findings) and the instructor providing specific details (i.e. meds, allergies, etc.) or findings that the mock patient did not remember.

3. **Differential Diagnosis / Discussion:** The treating team should discuss some of the possible diagnoses (particularly with medical cases as opposed to traumas) and what, ideally, the treatment plan that the team will recommend for the patient. “Grading Points” are included to facilitate the instructor’s evaluation of the group at the conclusion of the scenario. Reviewing the scenario is very valuable for insight into the students’ thought processes and what they might

improve upon in the future.

EQUIPMENT NEEDED:

1 AWLS Practical Kit per 4-6-person team

APPROXIMATE TIME:

Scenario 1: Abdominal Pain (20 minutes)

Scenario 2: Trauma with Intra-abdominal injury and open forearm fracture (40 minutes) Scenario 3: Bike crash with fractured radius/ulna (20 minutes)

Scenario 4: Ski Crash with Fractured Radius and Ulna, Fracture Clavicle (20 minutes) Scenario 5: Chest Pain (20 minutes)

Scenario 6: HAPE (20 minutes)

Scenario 7: Hypothermia / Submersion Injury (20 minutes) Scenario 8: Lightning (20 minutes)

Scenario 9: Seizure (20 minutes)

Scenario 10: HACE

SCENARIO 1: Abdominal Pain (summer or winter)

Notes to the group

You are on the third day of a 5-day backpack/snowshoe trip. A 23-year-old female begins to complain of abdominal pain.

Notes to the Patient

You are a 23-year-old woman, with severe belly pain. You are moaning and nauseated. You have mild tenderness throughout your abdomen, especially in the right lower quadrant. Refuse to move quickly. Hunch over when standing up.

Primary & Secondary

Assessment M- no major

bleeding

A- talking and no suspicion of c-spine injury

R- talking

C- pulse normal, regular, no bleeding

H- normal body temperature, three days walk from hospital

A- penicillin

M- birth control pills

P- appendectomy (age 13), fractured wrist (age 8)

L- breakfast (granola) 5 hours ago, only water since

E- vague pain started 24 hours ago, growing steadily worse, now with diarrhea x6, very nauseated and vomiting x2 in 5 hours, only able to keep sips of water down

C- vague dull pain throughout abdomen

O- 24 hours ago

L- throughout abdomen (all quadrants) but worst in the right lower quadrant

D- 24 hours, comes and goes

E- movement

R- vomiting, passing stool

R- none

Physical Exam:

Vitals: HR 75, RR 15, afebrile

Abdomen: mild pain to palpation throughout abdomen but without peritoneal signs or guarding, bowel sounds hyperactive, no distension, no bruising, and no blood in the urine

Differential Dx: ectopic pregnancy, ovarian torsion, appendicitis (rule out with history), diverticulitis, constipation, gastroenteritis.

Diagnosis and Treatment plans: Pt likely with severe Gastroenteritis. Importance of assessing and managing hydration status. If unable to tolerate oral

intake, this becomes more emergent and requires evacuation

Discussion: Importance of history taking for ruling out appendicitis. The potential for pregnancy / ectopic pregnancy and how it would be ruled out. Did they bring along a quick urine pregnancy test? If so, it makes the decision much easier. Use this case to reinforce this point.

Grading Points

Scene survey, Primary Assessment, Secondary Assessment, (SAMPLE/COLDER), Treatment, Evacuation decision, Group Coordination, Leadership.

SCENARIO 2: Trauma with Intra-abdominal Injury and Open Fracture of Left Forearm

READ THIS PARAGRAPH TO THE GROUP: You are cross country skiing during the late in the afternoon in the back country. You watch as one of your friends loses control going down a hill and runs into a tree at a high rate of speed. You rush over to find your friend moaning in pain.

FOR EXAMINER AND PATIENT ONLY: You are enjoying a late-afternoon backcountry ski, when you suddenly lose control when traveling downhill, and collide with a tree at high speed. You are now complaining of abdominal pain, your abdomen is tender to the touch, and your left forearm is painful. You have no neck pain.

Suggested moulage:

- Ski gear
- Open fracture left forearm – bone wax surrounded by oozing blood and contusion
- Abrasion/contusion to left upper abdomen.

Assessment:

Scene safety:

- Danger – cold environment; make sure you keep self and pt warm; you are under a hill and must mark it so other skiers do not crash.
- Mechanism of injury – as above
- BSI – put on gloves/mask to breathe for patient
- # of patients – ONE
- General impression of patient – The patient looks uncomfortable, but is alert and oriented

Primary Survey: MARCH

M – No massive hemorrhage; bleeding from open fracture is controlled with direct compression
A – Airway patent and protected

R – Mild tachypnea; rate 22-24

C – Pulse initially 120 and rising; color is pale, radial pulse initially strong but becomes weak

H – Patient is lying in the snow; it is approximately 25 degrees out. Significant hypothermia risk

Vitals:

- LOC- alert and oriented x 3
- HR – Initially 80; rises to 120
- RR-22-24
- BP - all distal pulses palpable initially but quickly become thready

- Pulse Ox: 98

Medical History:

A – No allergies

M – None

P -

Appendectomy

L – 4 hours ago

E – As above

Secondary Survey:

- General: A & O x 4. He is in moderate pain, which is mostly in his abdomen.
- HEENT: Normal
- Neck: Non-tender to palpation. No complaint of neck pain but he will need a collar due to distracting injury of the abdomen.
- Chest: Normal
- Back: Normal
- Abdomen: Severe tenderness to palpation, especially in the LUQ and the LLQ. Positive for guarding and peritoneal signs (rebound).
- Pelvis: Non-tender to compression or palpation
- Extremities: Swelling, bruising, and tenderness of the lower left forearm that may be fractured. There is also a laceration from the ski that requires bandaging and splinting. This is a potential open fracture.
- Neuro: Normal

Diagnosis and Treatment Plan:

- Open fracture of left forearm, intra-abdominal hemorrhage due to splenic rupture
- Recognition of patient being in early shock – thready radial pulse, tachycardia, paleness, secondary to bleeding most likely from the spleen. (Evaluate areas using CARTS)
- Immobilization of the c-spine with a SAM Splint because the patient has a distracting injury with his severe abdominal pain.
- Bandage lower forearm to stop bleeding; splint forearm
- Hypothermic wrap and rope litter immobilization to allow the patient to be evacuated. They are located at least 2 miles from the nearest location where help can be obtained, and it is going to be dark within the next hour.

Critical Actions:

- Recognize developing shock (Use CARTS to look at potential areas of bleeding)
- Maintain c-spine stabilization due to distracting injuries.
- Control bleeding with direct pressure
- Take measures to prevent hypothermia.
- Prepare for immediate evacuation due to urgent surgical condition.

Teaching Points:

- What is the most appropriate measure to control the external bleeding in this case? Would a tourniquet be an appropriate initial measure? (No; there is no evidence of brisk or arterial bleeding; it is the abdominal injury that is causing the shock)

Grading Points: Scene survey, Primary Assessment, Secondary Assessment, (AMPLE/COLDER), Treatment, Evacuation decision, Group Coordination, Leadership

SCENARIO 3: Bike Crash with Fractured Radius and Ulna (summer)

Notes to the Group: You are on a biking trip on the White Rim Trail outside of Moab, Utah. One of the members of your group shouts to you that someone has fallen. You turn around to see what has happened and see the victim lying on his/her stomach at the bottom of a steep hill approximately 7 feet from his/her bike.

Notes to the Patient: You hit a dip at the bottom of the hill and went over the handlebars landing hard on your right arm. Your arm is killing you, but that is your only major complaint.

Survey the scene: Someone should warn other bikers that there is an injured biker in the trail.

M- No sign of major hemorrhage

A- Talking, patient does not report hitting head and c-spine can be cleared

R- talking, respiratory rate seems normal

C- pulse of 100, no major bleeding

H- 97 degrees Fahrenheit with no shade on a busy trail

Hx:

S- Intense pain in right wrist. Also throbbing pain in right knee 2/2 abrasion.

C- Sharp pain

O- As soon as I landed.

L- distal arm (about 2 inches proximal to wrist), Right side—point to injury

D- Since I fell.

E- Moving my arm.

R- Not moving it and supporting it makes it better.

R- none

A- none

M- Pepcid, ibuprofen

P- ACL surgery 6 years ago, otherwise healthy

L- had a cliff bar 15 minutes ago.

E- I lost control of my bike coming down the hill and flew over my handle bars. I'm not exactly sure what happened, but I landed with my right arm out in front of me. It hurts to move my arm and hand.

Physical Exam:

Vitals: HR 100, RR 14, A & O x4, Distal pulses all

palpable Cradling R arm in front of chest

Refusal to move wrist.

Mild wrist deformity/swelling

Normal sensation and motion in the hand, though with pain at wrist Point tenderness over distal radius/ulna.

Abrasion on right knee

Note: Patient did not hit head that he/she remembers. There is no evidence of mental status changes. As examiner goes through the questions for clearing the C-spine, pt answers appropriately to clear the spine. MOI, no MS change, no major distractor, no point tenderness, no neuro deficit.

Diagnosis and Treatment Plan: Pt has fractured the radius and ulna: needs splint and sling/swathe. Pt also with large abrasion on right knee which needs cleaning with squirt water and bandage. EVACUATE.

SCENARIO 4: Ski Crash with Fractured Radius and Ulna, Fracture Clavicle (winter)

Notes to the Group: You are on a ski tour in the mountains. One of the members of your group skis into a glade of aspen trees and suddenly falls in a cloud of snow. You turn around to see what has happened and see the victim lying face down in the snow about 100 feet away.

Notes to the Patient: You were skiing some nice powder when you lost control entering a grove of trees. You hit your left shoulder and arm hard on a tree while still going fast then crashed hard after that. You feel like you can't lift up your left arm and your arm is hurting badly.

Scene survey: Warn other skiers that there is an injured skier. No avalanche risk

M- no sign of major hemorrhage

A- talking

R- patient is talking but is somewhat groggy

C- Pulse of 115, no major bleeding

H- 25 degrees Fahrenheit in about a foot of new snow

Hx:

S- Intense left wrist pain. Throbbing pain in left shoulder and whole arm "feels weak"

C- Sharp pain

O- As soon as I crashed

L- distal arm (about 2 inches proximal to wrist), Left side—point to injury, also pain on front of L shoulder

D- Since I fell

E- Moving my left arm

R- Not moving it and supporting it makes it better

R-

none **A**

beestings

M- none

P- Diabetes

L- had a sandwich a couple of hour ago

E- I lost control skiing through the trees and crashed hard into a tree. I'm not exactly sure what happened, but I hit my left side and then tumbled afterwards. It hurts to move my arm.

Physical Exam:

Vitals: HR 115, RR 20, normal peripheral pulses, LOC-

A&Ox4 Head: no helmet, but no bleeding, bruising or

bumps noted Neck/back: no point tenderness, no pain

Cradling L arm in front of chest, refusal to move wrist

and arm Very tender to palpation on L clavicle, step off

noted

Mild left wrist deformity/swelling with point tenderness over distal radius/ulna Normal sensation, pulses and motion in the hand

Note: Pt may have hit head but can't remember. There are no mental status changes. C-spine, pt answers appropriately to clear the spine: no significant MOI, no MS change, no major distractor, no point tenderness, no neuro deficit

Diagnosis and Treatment Plan: Pt has fractures of radius/ulna/clavicle: needs splint and sling/swathe. No evidence of cranial trauma or C-spine injury. Recommend: EVACUATE.

Discussion: What characterizes a "distracting injury" to prevent clearing the C-spine? (difficult where to draw line, but definitely major injuries: femoral fx, head injury, shock, etc.)

SCENARIO 5: Chest Pain (summer)

Notes to the Group: You are on day 1 of a 8-day commercial river trip with friends on the Rio Futaleufu in Patagonia. Right before dinner, one of the guides approaches you and reports that one of the clients on the trip (but not a member of your party) is having chest pain. You go to investigate and discover the 63-year-old man sitting on a rock on the side of the river. He is clutching his right fist over his left chest.

Notes to the Patient: You were feeling a bit weak after dinner and went to your tent. You then felt sudden onset crushing pain over your left chest region with lightheadedness.

M- no major bleeding

A- speaking, no reason to suspect c-spine injury

R- speaking, but showing signs of shortness of breath

C- Pulse is 125, no signs of major bleeding

H- warm humid evening in January

Hx:

S- The man reports feeling nauseated although he has not vomited. He describes chest pain as follows:

C- extremely intense, crushing pain, rates pain at 10/10

O- started suddenly while he was setting up his tent

L- left chest

D- constant and worsening

E- exacerbated by walking

R- nothing brings

relief. **R-** radiation into the left shoulder and jaw

A- Sulfa drugs causes rash.

M- Lipitor

P- Hypercholesterolemia, 40 pack-year smoking hx although he quit last year, no cardiac hx,

L- About an hour ago.

E- He was setting up his tent when he had sudden onset of the crushing chest pain and lightheadedness. He is very concerned/anxious and has never had pain like this.

Physical Exam:

Vitals: HR 130, RR 20, palpable distal pulses No signs of trauma or bleeding.

Chest: no deformity noted, chest excursion symmetric Skin- cool, pale, clammy skin

Neuro/Psych- very anxious
Ext- pt holding right fist over left chest

Differential Dx: MI, Pneumothorax, aortic dissection, Pneumonia

Diagnosis and Treatment Plan: MI most likely.

- 1) Have patient chew and swallow four 81mg of ASA.
- 2) Give one pill of nitro under tongue every 10 minutes (do not give if suspect SBP<100mmHg). Continue to evaluate the radial pulse for strength. If it is weak or becomes weak do not give any more NTG.
- 3) Since patient has no major bleeding/trauma, may give 75 mg Plavix 30 min after onset of pain.
- 4) Give 25 mg of metoprolol 30 min after the onset of chest pain. Take one pill every six hours. Do not take if HR<60 bpm or if suspect SBP<100 mmHg.
- 5) EVACUATE IMMEDIATELY TO DEFINITIVE CARE. How are you going to evacuate him? Will it be OK to have him walk for a distance if this is the best that you can do? (YES)

Discussion: Where will you get any of the medications? If you do not carry them with you, then you can ask other members of your party if they have any of these medications with them and if you can use them for this patient.

SCENARIO 6: High Altitude Pulmonary Edema (winter)

Notes to the Group: You are climbing Mt Kilimanjaro in Africa with your family. You have hired several guides, and the group has a total of 15 people. The group stopped a little early today because Gary, the father of the other family, has been complaining of a headache since early this morning. You arrive at camp and at about 15,000 feet elevation. While resting around the fire, you notice that Gary, looking somewhat gray, heads for his tent while coughing and holding a cold cloth to his head. As the afternoon turns to evening, you decide to check on him and realize that he has not improved.

Notes to the Patient: You've been feeling gradually weaker and short of breath all day. Headache for 3 days. You noted some pink frothy sputum in a your cough this afternoon.

M- no major bleeding

A- airway is open and patient can speak, no need to stabilize c-spine.

R- breathing rapidly at rest (RR=24), patient reports feel short of breath all day

C- Pulse is 100, no bleeding.

H- patient is in sleeping bag and wearing a beanie, ambient temperature is 32 degrees Fahrenheit (0 degrees Celsius)

Hx

S- patient with achy head. Having difficulty catching his breath.

C- sharp pain when coughing

O- this afternoon

L- in lower rib cage, chest

D- while coughing. Pain not present when just breathing.

E- coughing

R- lying still

R- no radiation

A- Compazine causes panic attacks.

M- HCTZ for HTN

P- HTN

L- breakfast 8 hours ago

E- has slowly felt worse all day. Has had a low-level headache for three days. Today he was having more difficulty breathing while hiking but did not want to disrupt the trip so he did not tell anyone. After he came to the tent, he started having more problems breathing, even at rest. He reports having coughed up some pink, frothy sputum.

Physical Exam:

Vitals: HR 100, RR 28, Palpable distal pulses, pt feels warm (Temp = 101 F), A&O x4, Tachypneic, cough occasionally productive with frothy sputum, chest feels tight

Diagnosis and Treatment Plan: Patient initially suffering from AMS which has progressed to HAPE. Pt needs to be EVACUATED to lower altitude immediately.

Discussion: How can you distinguish between the presentation of early carbon monoxide poisoning and AMS?

SCENARIO 7: Hypothermia / Submersion Injury

READ THIS PARAGRAPH TO THE GROUP: You are camping near a lake. It is evening, near sunset. A 16 year old male fell into the lake while intoxicated and horse playing with a friend on the boat. Air temperature is 30 degrees and the lake is partially frozen at the edges. He is a poor swimmer and struggled to stay above water in the lake for about 10 minutes before his panicked friends were able to pull him back into the boat.

For examiner only: The patient aspirated water while struggling to keep afloat and also suffered hypothermia during the submersion.

Suggested moulage:

- Small abrasion on forehead, facial pallor, wet clothes (if possible)
- Supplies:
 - Blanket for patient.
 - Hypothermia/burrito wrap (heating blanket, solar blanket, ground mat, sleeping bag, solar cap or wool hat.

Assessment:

Scene safety:

- Danger – Environmental temperature is a potential, but not immediate danger. Pt's intoxication may turn to combativeness if he is not warmed quickly.
- Mechanism of injury – awkward fall overboard. May have hit head on boat; potential for c- spine injury.
- BSI – put on gloves/mask.
- # of patients – ONE
- General impression of patient – As above

Primary Survey: MARCH

M – No evidence massive hemorrhage

A – Airway patent and protected

R – Tachypneic, equal chest rise. Slight scattered wheeze if examiner listens to chest wall
C – Pulse 110, Weak peripheral pulses due to vasoconstriction.

H – Air temperature is 30 degrees; dry

Vitals:

- LOC- Alert and oriented (though coughing frequently and shaking)
- HR-110
- RR-26
- BP-all distal pulses palpable, though weakly due to vasoconstriction
- Temp – not initially available, with EMS arrival, temp is noted to be 92 deg F/
33.5 deg C

- O2 95%
- Glucose 70

Medical History:

Allergies- none

Medications-

None

Past Medical/Surgical Hx –

Event as above

Secondary Survey:

- General appearance: sitting upright with blanket wrapped around him, shivering shaking, coughing.
- Neurological: non-focal but slow to respond, shaking uncontrollably
- Mental Status: mildly intoxicated but cooperative.
- Head: atraumatic other than small abrasion over forehead
- Eyes: PERRL
- Ears: normal
- Mouth: normal
- Neck: no midline tenderness
- Skin: no abrasions or lacerations once undressed
- Chest: slight scattered wheezes heard throughout, patient is coughing continuously
- Heart: moderately tachycardic no murmurs
- Abdomen: soft not tender and non distended
- Extremities: no deformities, hands scratched up no open lacerations
- Back: no midline tenderness or deformity

Diagnosis and Treatment Plan:

1. Hypothermia – active external re-warming
2. Aspiration – monitor airway. Beta-agonists for wheezing if available.
3. Potential c-spine injury – maintain c-spine control (intoxicated, possible mechanism)
4. Potential LOC and head injury
5. Evacuate for airway monitoring, further rewarming, c-spine +/- Head CT

Critical Actions

- Evaluate airway, assess cardiopulmonary status
- Evaluate patient for potential trauma
- Document hypothermia – core temperature
- Treat hypothermia
- Consider aspiration and potential for pneumonitis / wheezing.
- Evacuate for monitoring and rewarming.

Teaching Points:

- What stage of hypothermia is this? – mild.
- What are different measures that can be taken to warm the patient (i.e. passive external, active external, active internal)?

SCENARIO 8: Lightning (summer)

Notes to the Group: You are hiking on a mountain small mountain peak with friends over a summer weekend. You didn't get going as early as you would have liked, so you are nearing the summit at about midday. As you scramble up the top you become aware of dark clouds quickly approaching from the west. Within minutes, the hair on everyone's head is slightly raised, then you hear a loud boom and hear screams from a group that had just passed you on their descent. You notice that two people in the party are now lying on the rocks below you, one is apparently not breathing.

Notes to Patient 1: You are unconscious; not breathing (can tell the treating team this).

Notes to Patient 2: You remember seeing flash and then getting thrown. You are speaking and frightened but feeling okay.

PATIENT 1:

M- no major

hemorrhaging

A- unconscious, open airway

B- R- apneic

C- pulseless, no evidence of bleeding ☑initiate CPR

H- storm is passing quickly. Cool and wet. Currently just above 14,000 ft. elevation.

Hx:

Likely struck by lightning

Physical Exam:

Vitals: LOC-unresponsive, HR-no palpable pulses, RR 0. No other findings

PATIENT 2:

M- no major hemorrhaging

A- speaking

R- speaking, breathing seems normal

C- pulse of 90, no evidence of bleeding

H- storm is passing quickly. Cool and wet. Currently just above 14,000 ft. elevation.

Hx:

Likely struck by lightning ☑patient thrown about 5 feet from other patient (was standing next to other patient when lightning struck)

S- no pain, just anxious

A- none

B- M- none

P-

none

L- power bar and water about 25 minutes ago on the summit

E- descending from summit when heard loud boom with a flash of light. Next thing patient knew, he/she was thrown back about 5 feet.

Physical Exam:

Vitals: AAOx4, HR- 90 with palpable distal pulses,

RR- 12 No other findings.

Diagnosis and Treatment Plan: The treating team should initiate reverse triage ☐Initiating CPR on pulseless, apneic patients before caring for patients with spontaneous signs of life.

*Reverse triage required to save the “nearly dead” patient first.

SCENARIO 9: Seizure (summer)

READ THIS PARAGRAPH TO THE GROUP: You and your work colleagues are on a climbing retreat. During the second morning, some of you are set to practice top-rope climbing while others decide to work on bouldering. After about 30 minutes, John runs breathlessly up to the top-rope group and tells them that they just found Mary lying unconscious below one of the boulders. He is not sure if she fell or why she is unconscious. You and the others in the top-rope group head to the scene.

Suggested moulage:

- Optional; rock climbing gear
- Backpack with Lamictal
- Medic Alert bracelet: "Seizure Disorder"

Assessment:

Scene safety:

- Danger – There does not appear to be imminent danger from falling rocks or the environment
- Mechanism of injury – it is unclear from initial assessment if trauma is involved
- BSI – put on gloves
- # of patients – ONE
- General impression of patient – The patient is wearing climbing pants and tank-top. Lying with head and trunk on bouldering pad and legs hanging onto the ground. She is incoherent. There is no clear evidence of trauma

Primary Survey: MARCH

M – No evidence massive hemorrhage

A – Airway patent and protected

R – Regular, unlabored

C – Pulse 100, no bleeding

H – Dry, 75 degrees, plenty of shade; minimal risk for hypo/hyperthermia

History:

Because the patient has an altered mental status and is unable to respond to

questions, the following information may be given in response to appropriate questions

A- No evidence of allergies

E- Medic-alert bracelet indicating epilepsy pt with Lamictal Rx in backpack

I- No wounds or injuries evident

O- No evidence of overdose

U- No evidence to rule-out underdose

T- Patient is lying under bouldering rock. No injuries clearly present on exam. I- No diabetic alert tag

P - No indication of psychological problems

S - (can check physical exam: no difference in pupil sizes-R=L, no one sided muscle weakness or paralysis, facial movements are symmetric.) No neurological deficits or weakness that would indicate stroke.

Vitals:

- LOC- initially unresponsive and then gradually responsive to pain verbal alert but post- ictal (increasingly able to answer questions as she becomes more aware)
- HR-100
- RR-14
- BP-all distal pulses palpable

Medical History:

A- Lortab causes nausea

B- M- Lamictal for epilepsy

P- Epilepsy last seizure 3 years ago

L- Breakfast 2 hours ago

E- She was bouldering by herself. She was taking a break while sitting on the pad. That is the last thing she remembers. Has very mild headache, no other symptoms or pain

Secondary Survey:

- HEENT: Unremarkable
- Neck - No tenderness to palpation
- Neuro (initially): disoriented, drowsy, not alert, unable to follow commands, but localizes pain.
 - 5-10 min after treatment: alert, orientated to person and place, has difficulty recalling past 30 minutes or so, now follows commands with normal gait and nonfocal exam, except for subjective general mild weakness and fatigue.
- Remainder of exam is unremarkable
- No evidence of trauma.

Diagnosis and Treatment Plan:

- Epileptic seizure
- Potential c-spine injury – Initiate c-spine control due to possibility of trauma
 - Can clear c-spine with focal exam after treatment
- Airway – Maintain patent airway using jaw thrust if necessary

Critical Actions:

- Evaluate for altered mental status using AEIOUTIPS.
- Maintain C-spine stabilization initially; reassess after LOC normalizes.
- Prohibit further climbing.

Teaching Points:

- Since epilepsy is already diagnosed it is okay to double the meds and monitor her.
- Consider routine evacuation as it is not advisable that she continue to climb.
- If you will be with her for a while, try to determine why she had the seizure. Was it just a break-through seizure, due to the heat or physical stress, did she miss any medications? Attempting to determine the cause will help you in the management of her seizures if she begins to seize again.

Scenario 10: HIGH ALTITUDE CEREBRAL EDEMA

READ THIS PARAGRAPH TO THE GROUP: You're hiking a tall mountain. You base camp approximately 3 hours ago (elevation 10,080) and are making a summit push. You come across another party at about 13,000 feet that has recently left the summit and is assisting one of their members down. Two individuals are supporting this person and are carrying his packs. They appear to be struggling with him. You ask if they need assistance.

Suggested moulage: Alpine climbing gear

Assessment:

Scene safety:

- Danger – there are crevasses around, but your position is well protected, you do not appear to be on an avalanche field
- Mechanism of injury – when asked, the team members do not report any trauma (the health care provider can forgo holding c-spine if (s)he gets this history)
- BSI – put on gloves.
- # of patients – ONE
- General impression of patient - The patient is mumbling incoherently, cannot walk without assistance without stumbling and falling over. Complains only of severe headache

Primary Survey: MARCH

M – N/A

A - Tolerating secretions

R - Rapid, breathing at 25 times/minute but does not appear to be in acute respiratory distress

C - Pulse 100, no apparent bleeding; blood sweep negative

H - Wearing full climbing gear, but at hypothermia risk due to environment

Because the patient has an altered mental status and is unable to respond to questions, the following information may be given in response to appropriate questions.

A - No evidence of allergies

E - No Medic-alert bracelet indicating epilepsy or diabetes

I - No wounds or injuries evident

O - No drugs or alcohol. No initial evidence of an overdose.

U - No indication of a medical underdose

T- Team members deny any trauma

I - No history of diabetes.

P - No indication of psychological problems

S - No neurological deficits or weakness that would indicate stroke.

History:

A - No Allergies

M - None

P - None

L - Ate light meal early this morning at camp Muir, prior to summit attempt

E - Pt is from Midwest, flew in to the area three days ago, and climbed to Camp Muir two days ago. He summited with his team this morning. About 600 ft before the summit, he began complaining of a severe headache and nausea, and began having difficulty ambulating. The team assisted him to the summit, and then quickly turned around to come down. Despite that, he has had increased confusion, ataxic gait and is unable to walk on his own, has vomited multiple times. You are currently at 13,000 feet and he is sitting on the snow in the middle of a glacier.

Vitals:

- HR-100
- RR-24
- BP-all distal pulses palpable

Secondary Survey:

- HEENT: No evidence trauma
- Neck: supple. No meningismus
- Neuro:
 - Mumbles name, unable to clearly give date/place/situation
 - Localizes pain
 - Eyes open to verbal command

- Mumbles incoherently
- Unable to adequately follow cranial nerve exam
- Cerebellar: significant dysmetria on finger-nose-finger, unable to perform rapid alternating movements or heel-shin-knee
- Mild hyperreflexia
- Wide-based, ataxic gait; unable to stand still without assistance
- Remainder of exam unremarkable

Diagnosis and Treatment Plan:

- High altitude cerebral edema (HACE)
- Administer oxygen if available
- Initiate IV – if possible. But it really is not on the snow field.
- Treat with dexamethasone 4mg PO, IM, or IV
- Devise litter for descent
- Can administer hyperbaric oxygen if Gamov bag is present and unable to descend further due to weather or awaiting technical rescue

Critical Actions:

- Diagnose probable HACE
- Administer appropriate treatments
- Plan for immediate evacuation

Scenario 11: Femur Fracture / wrist fracture requiring immobilization and transport

Notes for the Group: You are hiking on a remote trail in the Pyrenees Mountains when you hear a terrified yell and then see a saddled horse run quickly down the hill. You round a rock outcropping and see a man lying alongside a large rock screaming in pain. He is holding his right femur which appears somewhat misaligned. The right leg of his jeans is torn.

Notes to the Patient: You were riding your horse when it spooked and bucked you off. You remember landing awkwardly on a large and hard on your right leg. You are clutching at the leg and in excruciating pain.

M- no signs of major bleeding

A- speaking, no neck pain but nature of injury and distracting injury will not allow clearance of c-spine

R- breathing rapidly 2/2 pain

C- Rapid pulse (115), no signs of major bleeding

H- Warm, sunny day in August. Wearing a t-shirt, jeans and boots. Patient cannot walk or ride.

Hx:

S- Pt complains of intense pain in middle of R thigh.

C- sharp

O- started when hit rock

L- midshaft femur

D- constant

E- exacerbated by trying to straighten leg

R- nothing

R- no

radiation **A-** No

Allergies **M-**

Multivitamin

P- inguinal hernia repair as a child

L- ate lunch about an hour ago and has been drinking adequate water

E- Pt was trotting on horse when the horse was spooked by something in woods. It bucked and threw the man into a rock. He landed awkwardly on the rock and felt immediate pain.

Physical Exam:

Vitals: HR 115, RR 22, normal peripheral pulses
Abrasion on right knee and right elbow.

Mildly deformed right midshaft femur with significant edema and

discoloring. Pulses palpable and symmetric in feet

Sensation intact and symmetric in feet

The c-spine will not be able to be cleared due to:

- a. MOI (violently tossed off horse and thrown into tree)
- b. Distracting injury (femur fx)

Diagnosis and Treatment Plan: The patient has a femoral shaft fracture and possible C-spine injury. The team should make a traction splint of the femur while holding manual c-spine stabilization. In real-life setting, the team would need to build a litter with c-spine precautions. However, in this scenario, we are most interested in building the improvised femur traction splint and not clearing the spine.

Scenario 12: Dislocated Shoulder (summer)

Notes to the Group: You are on day one of a river trip with friends on the Río Pacuare in Costa Rica when the lead kayak guide injures his shoulder while trying to roll in a Class IV rapid.

When he gets to shore, you notice that his shoulders are asymmetric. His left shoulder appears to be sitting about 1½ inch below his right shoulder

Notes to the Patient: You were trying to roll your kayak and felt a sharp pain in your left shoulder, followed by weakness and a steady terrible pain in that shoulder. You don't remember hitting it on anything underwater.

M- no massive bleeding

A- talking, he was wearing a helmet and c-spine can be cleared

R- talking

C- pulse of 90, no evidence of bleeding

H- warm rain with outdoor temperature about 80 degrees F.

Hx:

S- Pain in left shoulder.

C- sharp pain

O- as soon he rolled

L- left shoulder

D- constant

E- moving my left arm

R- not moving it and supporting it against his chest makes it better

R- none

A- none

M- none

P- Dislocated his left shoulder a few years ago and had to go to hospital for reduction

L- pineapple and coffee about 3 hours ago

E- when he rolled in the rapid his arm got painfully impinged behind his head and he no longer had full strength in his left shoulder.

Physical Exam:

Vitals: HR 90, RR 14, A & O x4.

Holding L arm flexed, close to body while providing gentle upward support with the R hand Refusal to move L shoulder decreased range of motion

Mild L shoulder swelling, with point tenderness over L shoulder Normal sensation, pulses and motion in the hand

Note: He was wearing a helmet and c-spine can be cleared.

No significant MOI

No mental status changes.

No significant distracting injury

No point tenderness/pain in neck/back No neurological deficits

Diagnosis and Treatment Plan: Pt has dislocated L shoulder. The group is greater than 24 hours away from help so it would be best to try and reduce the shoulder and then apply sling/swathe for comfort. EVACUATE.

Discussion: When to reduce a joint? Now is best, if possible.

Scenario 13: Anaphylactic reaction to food

Notes to the Group: You are walking through a state park and notice a girl, about 15 years old, sitting on the grass hyperventilating and appearing in acute distress. You go to see if she is O.K.

Notes to the patient: You were eating some organic food that had a mixture of fruit and nuts when you started to feel flushed and short of breath. You are breathing fast and shallow and can only talk in 1-2 word sentences. Try to act out breath. May tell the examiner your physical exam findings when they are examining.

Scene Survey—assess for dangerous causes and ensure provider safety.

M- no sign of major hemorrhage

A- nearly closed from swelling in the throat, patient is unconscious.

R- breathing is fast and shallow.

C- pulse is 130, peripheral pulses are weak.

H- 77 degrees Fahrenheit and sunny in a state park

Hx:

S- unknown

A- unknown

M- unknown

P- unknown

L- unknown

E- unknown, no witnesses

Physical Exam-

Vitals: HR 130, RR 30, weak peripheral pulses, unconscious

Skin: pale, cold, moist to the touch, multiple raised red spots (hives), significant swelling throughout, including the lips and tongue.

Neurological: responds to voice but too short of breath to talk. **Respiratory:** shallow and rapid breathing, becoming worse

No other evident external injuries

Differential Dx: AEIOUTIPS, review this with them

Diagnosis and Treatment Plan: Team should look in patients backpack for epinephrine (EpiPen®). Give epinephrine. Group should be aware that the patient may need multiple doses. Put patient in recovery position and monitor. Should also give Benadryl (or other H1-blocker), cimetidine (or other H2-blocker) and consider steroids after the epinephrine administration.

Discussion: If in doubt on AEIOUTIPS, still okay to give epinephrine and apply sugar to mucosa.

Scenario 14: Hypoglycemia requiring oral glucose and evacuation.

READ THIS PARAGRAPH TO THE GROUP: You are hiking when you stop at a small break area on a trail hike. You see a lone person sitting on the ground looking around confused and mumbling. He/she is mumbling words that you can't quite make out. They appear to be about 20 years old and in good shape.

Suggested moulage: facial pallor, sprinkle water on face to simulate diaphoresis

Assessment

Scene safety:

- Danger – you are near a blind corner of the trail; the trail allows mountain bikers – make sure someone marks or guards the trail as you assess the patient.
- Mechanism of injury – it is unclear from initial assessment if there is an injury to the patient or not
- BSI – put on gloves
- # of patients – ONE
- General impression of patient – The patient is incoherent, does not look uncomfortable, no clear evidence of trauma. Mumbling, not oriented to place or time

Primary Survey:

MARCH M – N/A

A - Patent and protected

R - Regular, no abnormal breath sounds, equal bilaterally

C - Pulse 120, no bleeding

H - Wearing a T-shirt and shorts, may need to be kept warm

History:

Because the patient has an altered mental status and is unable to respond to questions, the following information may be given in response to appropriate questions

A - No evidence of allergies

E - No Medic-alert bracelet indicating epilepsy or diabetes
I - No wounds or injuries evident

O - a mostly full bottle of Ibuprofen is found in a pocket of the backpack. No drugs or alcohol. No initial evidence of an overdose.

U - no indication of a medical underdose

T - Patient is lying near the trail next to a large backpack that appears to have been removed voluntarily. No injuries present on exam. No evidence of trauma.

I - On further searching, a bottle of insulin and a syringe are found in the patient's pocket. **P** - No indication of psychological problems

S - (can check physical exam: no difference in pupil sizes-R=L, no one sided muscle weakness or paralysis, facial movements are symmetric.) No neurological deficits or weakness that would indicate stroke.

Vitals:

- HR-120
- RR-14
- BP-all distal pulses palpable

After finding the insulin, RESPONSE TEAM should attempt to provide juice or other source of simple sugar. Patient will become more alert and oriented within a few minutes after receiving sugar and can now give history.

Medical

History:

A No Allergies

M - Insulin

P - Diabetes

L - Missed breakfast, hadn't eaten since dinner last night

E - Needed to meet someone at in town by noon, so you hurried out of camp this morning and didn't get around to eating. You took your regular dose of morning insulin thinking that you would snack along the way, but forgot in your rush. You remember feeling weak, but forget exactly what else happened.

RESPONSE TEAM: wait until the patient is AAOx4 to clear the spine. Continue to encourage PO intake of carbohydrates.

Secondary Survey:

- HEENT: Unremarkable
- Neck - No tenderness to palpation
- Neuro - (prior to treatment) - disoriented, drowsy, not alert, unable to follow commands, but localizes pain.
- (5-10 min after treatment) - alert, orientated to person and place, has difficulty recalling past 30 minutes or so, now follows commands with normal gait and non-focal exam, except for subjective general mild weakness and fatigue.
- Remainder of exam is unremarkable.

Diagnosis and Treatment Plan

- Diabetic Hypoglycemia**
- C-spine - initiate c-spine control due to possibility of trauma
- Can clear c-spine with focal exam after treatment.
- Airway - maintain patent airway using jaw thrust if necessary.
- Administer sugar to treat suspected hypoglycemia.

Critical Actions:

- Evaluate for altered mental status using AEIOUTIPS.

- ❑ Locate insulin – avoid dangerous action: do NOT administer insulin.
- ❑ Administer sugar-containing substance.
- ❑ Reassess c-spine after exam normalizes.

Scenario 15: Ankle fracture requiring splinting.

Notes to the Group: You are a group of five on your way to do some climbing/skiing at the local crags when you come upon a person in obvious pain and holding their ankle.

Notes to the Patient: You are a rock climber/skier who has jumped off an 8-foot ledge, landed on your feet, and heard a distinctive cracking sound upon impact. You immediately sit down, as it hurts to stand or walk. You are in severe pain and holding your left ankle when the treating team arrives.

Primary Assessment: All normal

Secondary

Assessment:

A- No allergies

M- No medications

P- No PMH/PSH, no history of ankle or foot injuries

L- 2 hours ago

E- Pain as described above.

Physical Exam: All normal with the exception of the left ankle. The left ankle is severely swollen with tenderness to palpation laterally. The exam is consistent with a distal fibular and tibia fracture.

Diagnosis and Treatment Plan: The team is going to have to recognize the ankle injury as a probable fracture or severe sprain.

1. They are going to have to splint the ankle using the two Sam Splints. They should evaluate neurovascular status before and after placing the splint
2. They are going to have to consider how they are going to evacuate the patient out of the area. He can limp using his good leg with his arm wrapped around the shoulder of a partner to help him keep his weight off the ankle.

Discussion: Does it matter if patient has a severe sprain vs. fracture in this setting? Mobility is of greater importance regardless of the injury.

APPENDIX

AWLS PRACTICAL KIT FOR Each Group

1 Sleeping Bag
1 Sleeping pad
1 Tarp
1 Climbing rope (60 feet)
2 short climbing ropes (6 feet)
1 x 10 foot webbing
2 x 8 foot tree limbs or furring strips (for makeshift jacket litter) 2
x ski poles, trekking poles, skis, paddles (for making rope litter) 1
water disinfection bag

3 (OPTIONAL)

Filter pump
Info
pamphlets
Tablets
Duct tape
10 Ziploc bags 3 tent pole sections

6 SAM Splints
1 Hem-Con (OPTIONAL)
EpiPen trainers 8 Gauze rolls
8 Bandages
3 jackets (For creating jacket litters)
1 backpack for carrying supplies for testing scenarios (at least 30 liters capacity)

WILDERNESS MEDICAL PROBLEMS – SMALL GROUP INSTRUCTOR GUIDE

What follows is an optional way to teach medical problems in the back country. There are PowerPoint lectures on this and there are podcasts and practice questions. But it is possible to present this in small groups as well.

Objective: To present common medical problems that may occur in the backcountry in a case based, small group format, and to encourage the contribution of both the facilitator and the students in the discussion of each of these complaints.

Concept and General Approach: Divide the lecture group into smaller groups of approximately equal size with an instructor/facilitator for each group (based on the number of instructors available). If the total class size is 15 or less students you can discuss the cases as one group. The instructor/facilitator will present each chief complaint or diagnosis in a case based format. He/she will then have the students discuss, as a group, their approach to creating a differential diagnosis and management strategy as it applies to wilderness medicine. In order to provide the most benefit and learning opportunity, the instructor will encourage participants to share their experiences and expertise regarding each case as applicable. Each case is listed below. Included with each case presentation are questions that should be proposed to the group, as well as general information, clinical presentation, management and reasons for evacuation. At a MINIMUM, the case discussion must include each of these points.

1. ABDOMINAL PAIN – Ectopic Pregnancy

Case: You are on a fishing trip in the backcountry of northern Sweden when one of the women on the trip begins to experience pain in the lower abdomen. She is 22 years old. Her pain has been going on for 2 days and is getting worse. Her last menstrual period was 4 weeks ago. She has some mild vaginal bleeding. She has never been pregnant and denies any N/V. She denies any UTI symptoms. You are absolutely isolated and you are supposed to stay in the wilderness for an additional 5 days until the plane comes to pick you up. You do have a satellite phone that you can use to call for an earlier extrication.

Primary Assessment:

M- no major bleeding

A- intact and normal, no reason to suspect c-spine injury

R- normal

C- pulse is 80 and regular. Good skin color. Strong radial pulse.

H- No environmental concern, ambient temperature is 65 degrees Fahrenheit. You are completely isolated but do have a satellite phone to call for help if evacuation is necessary.

Secondary

Survey: A-

No allergies

M- No medications

P- No PMH/PSH

L- 2 hours ago

E- Pain as described above

EXAM: Normal down to the abdomen. She has moderate tenderness to palpation of the bilateral lower quadrants but there are no peritoneal signs.

ABD Pain

description: C-

Constant

O- 2 days ago

L- bilateral lower quadrants

D- fairly constant for the last 2 days without much relief with Tylenol or antacids

E- no exacerbating factors

R- no relieving factors

R- no radiation

Questions for the group:

1. What are the most common causes of abdominal pain in the backcountry?
Constipation, gastritis, other infectious causes

2. Which causes should prompt an immediate evacuation from the backcountry?
Ectopic pregnancy, appendicitis, any patient with a surgical abdomen, patients unable to maintain hydration secondary to vomiting and/or diarrhea
3. What are backcountry treatments for the most common non-life threatening causes of abdominal pain?
Stool softeners to relieve constipation, fluid, antacids, antiemetic.

General Information

1. Common abdominal problems in the backcountry include appendicitis, constipation and fecal impaction, food poisoning, gallstones, gastritis or gastroenteritis, kidney stones, ulcers and ectopic pregnancy.
2. Carrying a urine pregnancy test with the expedition medical kit can often help avoid unnecessary evacuation of female patients with abdominal pain and is worth carrying.

Clinical Presentation

1. Appendicitis – Fever, nausea/vomiting, periumbilical → right lower quadrant abdominal pain, loss of appetite.
2. Gallstones – Postprandial intermittent right upper quadrant pain progressing to constant pain, fever and vomiting. Patients have often had prior intermittent pain with eating fatty foods (biliary colic).
3. Kidney stones – Severe flank pain (unilateral) radiating down to the groin. Some may have blood in the urine. Patients often move around trying to find a comfortable position.
4. Ulcers/gastritis – Epigastric pain, worse with certain foods. May have vomiting with or without small amounts of blood.
5. Ectopic pregnancy – Abdomen/pelvic pain in a female patient is ALWAYS ectopic until proven otherwise with a negative pregnancy test. Menstrual history is NOT reliable. Sexual history is also often unreliable or misreported.
6. Constipation – Intermittent crampy pain, lack of fever/vomiting, history of delayed or difficult bowel movements relative to the patient's baseline.

Management

1. Symptomatic care and evacuation as listed below.
2. Ulcers/gastritis – antacids
3. Constipation – bowel stimulants, caffeine, hydration
4. Infectious causes (with associated vomiting and diarrhea) – appropriate antibiotics.

Evacuation

1. Any significant abdominal pain after trauma.
2. Abdominal pain accompanied by of the following conditions:
 - a. The pain is associated with the signs and symptoms of shock (dizziness,

- lightheadedness, pallor or poor perfusion)
- b. The pain persists for longer than 24 hours
 - c. The pain localizes and there is guarding, rigidity and tenderness
 - d. Blood appears in the vomit, feces or urine
 - e. The pain is associated with a fever greater than 102 degrees F
 - f. The pain is associated with pregnancy
 - g. The patient is unable to drink or eat

2. ANAPHYLAXIS

Equipment Needed: EpiPen demonstrator – you should have enough for all members of the group

Case: You are hiking along a trail in a national park when you come upon a 35-year-old male sitting in the middle of the trail. He appears to be in significant respiratory distress. His skin is very red and blotchy with hives. He is able to say “bee sting” between breaths but otherwise has too much difficulty breathing to talk. He points to his left hand where you note a small stinger still in the skin with a venom sac attached.

Primary

Assessment:

M- no major bleeding.

A- patient is moving some air, but is very stridorous and has swelling of his lips. No reason to suspect c-spine injury.

R- he has a respiratory rate of 28-30 and is having a lot of difficulty breathing. On exam he has significant wheezing throughout all lung fields.

C- thready radial pulse at a rate of 110.

H- ambient temperature is 75 degrees Fahrenheit.

Patient will rapidly improve with the injection of epinephrine

Questions for the group (for answers, see discussion section below):

1. What additional medications do you need to give the patient who has a bad allergic event or even anaphylaxis?
2. How should you manage the sting site if the stinger is still in place?
3. Does this patient need to be evacuated?

General Information:

- This is a true life-threatening emergency.
- It begins like a generalized reaction, but rapidly results in respiratory and or circulatory collapse.

Clinical Presentation:

Symptoms are not subtle. They include itching, flushing, swelling of the face, tongue and lips, throat tightness and voice changes, nausea, vomiting, diarrhea,

cramping, hives, a drop in blood pressure, painful tightness in the chest, difficulty breathing, wheezing, convulsions, confusion, and eventual loss of consciousness.

Management:

1. Injectable epinephrine is essential to carry and to manage these patients.

- a. The EpiPen® contains a 0.3 ml auto-injection dose of 1:1000 epinephrine. There is also a 0.15mg auto-injector (EpiPen JR®) available for children weighing 15- 30kg.
- b. A 2nd dose of epinephrine may be required within 5 - 20 minutes after the first, depending on the severity of symptoms and the initial response to the epinephrine.
2. Additional medications should be added to treat the anaphylaxis (one of each category if available)
 - a. Antihistamines – e.g. diphenhydramine, Loratadine, cetirizine.
 - b. H2 blockers – e.g. ranitidine, cimetidine, famotidine.
 - c. Steroids – dose should approximate prednisone 1 mg/kg.
 - d. Inhaled beta agonists – e.g. albuterol, especially in patients that are wheezing
3. Management of the sting site
 - a. Scrape away the stinger in a horizontal fashion along the skin, as it may continue to pump toxin into the wound.
 - b. Avoid grasping or squeezing the stinger sac as that may release more venom.
 - c. However, if one is unable to remove the stinger in a horizontal fashion, removing it any way possible is more important than waiting.
 - d. Wash the site with soap and water.
 - e. Place a cold compress or ice on the site.
 - f. Give oral analgesics as needed for pain relief.
 - g. Topical steroid cream can be helpful for swelling as well as oral antihistamines.

Evacuation

A rebound reaction may occur after medications wear off. All patients with symptoms of a significant or worsening allergic reaction or those with anaphylaxis should therefore be evacuated as soon as possible, even if they respond well to medications.

3. CHEST PAIN

Case: You are on day 1 of a 3-day commercial river trip with friends. Right before dinner, one of the guides approaches you and reports that one of the clients on the trip is having chest pain. You go to investigate and discover the 63-year-old man sitting on a rock on the side of the river. He is clutching his right fist over his left chest.

Primary Assessment:

- M-** no sign of a major hemorrhage
- A-** speaking, c-spine precautions not necessary
- R-** speaking but showing signs of shortness of breath
- C-** Rapid pulse, no signs of major bleeding
- H-** warm, humid evening in August

Secondary Assessment/History:

- S-** The man reports feeling nauseated although he has not vomited. He describes chest pain as follows:
 - C-** extremely intense, crushing pain
 - O-** started suddenly while he was setting up his tent
 - L-** left chest
 - D-** constant and worsening
 - E-** exacerbated by activity.
 - R-** nothing causes relief
 - R-** radiation into the left shoulder and jaw
- A-** Sulfa drugs causes rash
- M-** Lipitor
- P-** Hypercholesterolemia, 40 pack-year smoking hx although he quit last year
- L-** Had some soup about an hour ago.
- E-** He was setting up his tent when he had sudden onset of the crushing chest pain and lightheadedness. He has found no relief of the pain. He is very concerned/anxious and has no significant cardiac history. He has never had pain like this and rates it 10/10.

Physical Exam:

- Vitals:** HR 130, RR 18, distal pulses weak but palpable No signs of trauma or bleeding.
- Skin- cool, pale,
- clammy Neuro/Psych-
- very anxious
- Ext- pt is holding his right fist over his left chest

Questions for the Group:

1. What are some causes of chest pain in the backcountry?
 - a. Cardiac etiologies – angina, unstable angina, infarction.

- b. Pulmonary – pneumonia, pleurisy, pulmonary embolism, pneumothorax.
 - c. GI – gastritis, peptic ulcer disease
 - d. Musculoskeletal – muscle strain, costochondritis, (a diagnosis of exclusion)
2. Which ones can be life threatening and thus, if suspected, require immediate evacuation?

General Information:

Differentiating cardiac chest pain from other etiologies can be very difficult in the backcountry. Any patient over the age of 45 with concerning chest pain should be considered for evacuation.

Cardiac Chest Pain:

- Chest pain or pressure which results from an imbalance between cardiac muscle oxygen demand and cardiac muscle oxygen supply.
- Usually brought on by exertion (which increases heart rate and blood pressure). It may occur with less stimulation in the cold, under mental stress, fear, or the pain of trauma.

Angina Pectoris

- Angina is the sensation of chest pain or pressure caused by ischemia to the heart muscle, when a decreased supply of oxygen does not meet tissue demand.
- The majority of patients with angina have a chronic obstruction of a coronary artery, resulting in reduced oxygen delivery to the heart.
- Patients with **STABLE** angina have usually had similar symptoms in the past and, given time and reversal of factors aggravating to the heart, their symptoms resolve.
- Anemia or high altitude with low arterial oxygen content may bring on angina at lower levels of exertion in patients that usually have angina pain only under severe stress.
- Angina is considered **UNSTABLE** if the symptoms are new, occur at rest, or occur with less demanding activity than previously.
- Unstable angina is frequently a precursor to myocardial infarction (heart attack) and death rates from cardiac collapse are more likely to occur in unstable angina patients than in patients with stable, chronic angina.

Acute Myocardial Infarction

- This is the irreversible death of heart muscle tissue.
- It is almost exclusively due to the development of a coronary thrombosis causing complete obstruction of blood flow to the heart muscle. Muscle cell death begins in 15- 30 minutes if flow is not restored.
- Early death in the setting of acute myocardial infarction may occur in the first few minutes to hours as a result of electrical instability of the heart, causing arrhythmias.
- Death after 12 to 24 hours is usually due to overall pump failure and shock,

but sudden death due to ventricular fibrillation may occur at any time.

Clinical Presentation:

Angina Pectoris

- Chest pain or pressure: this may be described as a squeezing or tightness, often with a clenched fist over the chest. Initial symptoms may mimic heartburn in some patients. The pain is usually in the center of the chest, but may radiate to the arms, jaw, neck or back.
- Shortness of breath: usually mild
- Nausea or vomiting: this is a frequent symptom if the patient and the heart are strained.
- Cool or clammy skin, sweating, dizziness or a feeling of anxiety may occur

Acute Myocardial Infarction

- Severe chest pain: it is generally substernal, centrally located, radiating to the arms, jaw, back or stomach. While it is similar to anginal pain in character, it is more intense and not usually relieved by nitroglycerin or resting.
- Nausea and vomiting: commonly associated with MI.
- Shortness of breath: if this becomes progressive, it is a sign of cardiac pump failure.
- Light-headedness: often a result of arrhythmias with low blood pressure or shock.
- The symptoms of unstable angina pectoris and acute myocardial infarction can be difficult, if not impossible, to differentiate in a wilderness setting.

Management:

Stable Angina Pectoris

- Rest is the key to recovery from angina pain.
- In patients with stable, predictable angina symptoms similar to their baseline that resolve with rest and nitroglycerin you may consider allowing them to continue their trip, however care should be given to minimize any activities or circumstances that produces worsening symptoms

Unstable Angina or Acute Myocardial Infarction

- Nitroglycerin 0.4 mg may be repeated every 5 to 10 minutes until pain is relieved. Do not give it if you suspect low blood pressure or if it drops after the first dose. A weak radial pulse, increased lightheadedness, sweating or a rise in heart rate may suggest low blood pressure.
- Reduce environmental exposure to extremes of temperature or high altitude, as these may increase the heart's oxygen demand.
- Have the patient chew and swallow 324 mg of ASA.
- Consider 300 mg Plavix 30 min after onset of chest pain if available.
- Beta-blocker drugs may be considered, but carry a significant risk in an unmonitored setting and are therefore not recommended routinely
- Given time and rest, patients may be able to hike slowly downhill, but do not allow them to significantly exert themselves or climb uphill, especially if pain

is recurrent.

Evacuation:

Angina Pectoris

- If the patient's symptoms are exactly the same as their previous angina pectoris, and resolve easily with rest and the patients medications, they may be able to continue in the backcountry.
- Consider less vigorous activities.
- May need evacuation if symptoms recur or are persistent.

Unstable Angina Pectoris and Acute Myocardial Infarction

- EVACUATE IMMEDIATELY TO DEFINITIVE CARE using the most rapid means available. These patients can develop life-threatening dysrhythmias quickly, which are difficult if not impossible to treat in the backcountry. Walking may be the best way out.

4. HYPOGLYCEMIA

Case: You are camping on a mountain trail when you come upon an older woman in her 60s, who is confused and disoriented. When you ask her if you can help her she tells you that she is lost and needs to find her house. When you ask about her house she does not know where it is and that she needs to get home. You are located in the middle of the woods and there are no nearby houses.

Primary

Assessment:

M-no sign of bleeding

A- normal

R- normal

C- normal

H- ambient temperature is 75 degrees Fahrenheit.

Secondary Survey:

1. Exam – all normal with the exception of a medical alert bracelet that states “DIABETES” on her left wrist.
2. AMPLE History – patient is unable to tell you anything

At this point the student should treat the patient with glucose in some way.

Patient will rapidly improve with the glucose. She will tell you that she is on insulin and forgot to eat breakfast this morning.

Questions for the group:

1. Is there anything else you can do for her when she starts to come around to a normal mental status? Yes, you should give her some food.
2. Is there anything else you should be concerned about with her that may cause her glucose to fall low? Yes, you should be worried about infection

and ask her about any of those symptoms – all of which are negative for this case.

3. How can you carry glucose? You can carry oral glucose in a tube. Alternatively, you can carry cake frosting in a tube.
4. What are some other causes of altered mental status in the wilderness (consider discussing the presentation and management of these other causes)?

AEIOU TIPS mnemonic

- A**- Allergy/Altitude illness
 - E**- Epilepsy/Environmental (such as heat/cold)
 - I**- Infection
 - O**- Overdose of drugs, medications, alcohol
 - U**- Underdose of medications
 - T**- Trauma/Toxins (plant/animal exposure)
 - I**- Insulin (too much)
 - P**- Psychological disorders
 - S**- Stroke
5. Does this patient need to be evacuated from the wilderness? If the patient is truly hiking alone, evacuation should probably be recommended, as symptoms may recur, especially with long acting diabetes medications. If the patient has someone to keep an eye on him or her and ensure that they are taking in adequate nutrition, it may be reasonable for them to continue. A patient with persistent altered mental status can likely be evacuated from the wilderness against their will, but if their symptoms resolve, ultimately they will decide whether or not they leave the backcountry.

General Information:

Common reasons for a diabetic to become hypoglycemic in the wilderness include:

- Too much insulin or too much of an oral agent.
- Too little food intake in comparison to the diet they are on at home.
- Higher level of exertion than they are used to.

Clinical Presentation:

- Symptoms may mimic a stroke, so one must always consider hypoglycemia in the patient that appears to be having a stroke
- Rapid onset of confusion, irritability and even combativeness
- Loss of coordination or inability to ambulate
- Headache
- Slurred speech
- Diaphoresis
- Tremors
- Seizures can occur with profound hypoglycemia

Management:

- Glucose is the primary treatment: oral glucose, energy gels, cake frosting or any other available source of simple sugars can be spread on the gums, under the tongue or swallowed if able.
- Glucagon can be given IM if available
- After the patient becomes oriented again, they should be fed a regular meal with complex carbohydrates to prevent recurrent hypoglycemia.

Evacuation:

- Not all patients with hypoglycemia require immediate evacuation.

- Evacuate those with hypoglycemia that quickly recurs despite treatment.
- Evacuate those with hypoglycemia due to an oral hypoglycemic agent. This is important as these patients can have persistent or recurrent hypoglycemic episodes for 24-48 hours that requires hospital management.
- Evacuate those who do not have a rapid clearing of their neurological deficits.

5. SEIZURE

Case: A member of a hiking group with a known seizure disorder has a seizure while hiking on a three-day backpacking trip. The seizure is generalized in nature and is associated with a postictal period.

Primary Assessment:

- M- no major bleeding
- A- intact with no pooling secretions, no suspicion of c-spine injury
- R- No respiratory difficulty or stridor
- C- Strong distal pulses
- H- Ambient temperature is 80 degrees Fahrenheit.

Secondary Assessment:

AMPLE – Known history of generalized seizures, last meal 2 hours ago, otherwise unremarkable

Secondary survey: Very small tongue laceration from seizure with no active hemorrhage, patient is postictal as above, otherwise unremarkable.

Questions for the group:

1. What are some causes of seizures in the wilderness? Known seizure disorder, trauma, toxin exposure, stroke, severe infections
2. What are some medical problems that can mimic seizures? Hypoglycemia, syncope
3. What defines status epilepticus? Seizure greater than 15 minutes or multiple seizures without complete interim resolution of the postictal state

General Information:

- Seizures are not often seen in the back country, most people with this disorder tend to avoid this type of activity.
- Patients should be seizure free for about three months before attempting to go into the back country.

Clinical Presentation:

- Seizures can be generalized or focal. Some may progress from a focal to a generalized seizure.
- Patients are unable to communicate during a generalized seizure, but may be able to during a focal seizure.
- The postictal phase (persistent sleepiness or altered mental status that occurs after a seizure) can last anywhere from a few minutes to an hour.
- Rarely, after a seizure, a patient may be unable to move an extremity. This is called “Todd’s paralysis”. While it is not a stroke, it is impossible to differentiate this from a stroke in the wilderness.

Management:

- Seizures must run their course
- The trip must be stopped until the patient is out of their postictal phase
- If status epilepticus occurs you can try to administer a benzodiazepine, but this will be problematic. Accepted routes of administration include intravenously, intramuscularly, and rectally.

Evacuation:

- Evacuate those who have had a new seizure without prior history or who have any focal deficit or paralysis after a seizure.
- If this is a typical seizure consistent with their usual pattern, consider increasing their medicine (doubling the dose) and watching them for any recurrence, which should prompt evacuation.

WILDERNESS INFECTIOUS DISEASE – SMALL GROUP INSTRUCTOR GUIDE

What follows is an optional way to teach common infectious problems in the back country. There are PowerPoint lectures on this and there are podcasts and practice questions. But it is possible to present this in small groups as well.

Objective: To present common infectious diseases that may occur in the backcountry in a case based, small group format, and to encourage the contribution of both the instructor/facilitator and the students in the discussion of each of these complaints.

Concept and General Approach: Divide the lecture group into smaller groups of approximately equal size with an instructor/facilitator for each group (based on the number of instructors available). If the total class size is 15 or less students, you can discuss the cases as one group. We recommend presenting each chief complaint or diagnosis in a case based format. The students can then ask questions to elicit the Primary and Secondary Assessment data. The instructor/facilitator may then have the students discuss, as a group, their approach to creating a differential diagnosis and management strategy for each case as it applies to wilderness medicine.

In order to provide the most beneficial and learning opportunity, the instructor/facilitator should encourage the students to share their experiences and expertise regarding each case as applicable. Each case is listed below. Included with each case presentation are questions that should be proposed to the group, as well as general information, clinical presentation, management and reasons for evacuation. At a MINIMUM, the case discussion must include each of these talking points.

I. INFECTIOUS DISEASES AFFECTING THE GASTROINTESTINAL SYSTEM

Case: You are traveling on a rafting trip with a commercial river running company in the Grand Canyon of the Colorado River (USA). On day four of the trip, 15 people in the group develop profound diarrhea. You are known to be a medical person and are asked for your advice. You find that the diarrhea is profuse without blood. All of them are nauseated and several have vomited. All have been eating and drinking the same food and water. Several of the people are quite ill and have had significant fluid loss.

Primary Assessment:

M - No major bleeding

A - All patients' airways are open; No suspicion of c-spine injury R - Breathing is normal

C - Most patients have a slightly elevated pulse

H - Air temperature is about 100°F. Patients are too ill to walk or hike.

Secondary Survey:

Unremarkable history, exam findings unremarkable with exception of generalized malaise, some generalized weakness, and slightly elevated pulse rates.

Preliminary diagnosis?

Non-dysenteric Gastroenteritis

General Information: These patients have Norovirus (Norwalk Virus)

Discussion #1 and Questions for the Group:

1. What is Norovirus?

In the U.S., the most common cause of acute gastroenteritis, causing 21 million cases, 70,000 hospitalizations, and 800 deaths each year. (www.cdc.gov)

Transmission can occur from contact with an infected person, contaminated food or water, or by touching contaminated surfaces.

2. What is non-dysenteric gastroenteritis?

- A toxin-mediated diarrhea with secretion of water and electrolytes into the intestinal lumen
- Typically spread by fecal-oral contamination of food and water
- Caused by a variety of organisms
 - Enterotoxigenic E. coli - 30% – 70% of Traveler's Diarrhea
 - Viral gastroenteritis
 - Norwalk (cruise ships)
 - Rotavirus
 - *Vibrio cholera*
- Usually self-limited course

- However, some etiologies, i.e. *Vibrio cholera*, account for a significant number of deaths

3. What are some of the signs and symptoms of non-dysenteric gastroenteritis?

- Nausea and vomiting
- Profuse watery diarrhea without blood
- Abdominal cramping
- Malaise
- Adults are usually afebrile, but a low-grade fever may be present
- Incubation time from ingestion range from 12 – 72 hours
- Cholera can lead to massive fluid losses
 - Explosive “rice water stools”
 - Produced at a rate of up to one liter per hour

4. What is the management of patients in the backcountry who have non-dysenteric gastroenteritis?

- Typically a self-limited course with symptoms resolving within one week
- Primary treatment is fluid and electrolyte replacement
- Oral intake should at least approximate fluid losses in stool
- A variety of oral rehydration solutions may be used:
 - U.S. Public Health Service formula
 - WHO Oral Rehydration Solution
 - Sports drinks if diluted to half strength with disinfected water
- Urine volume and color are readily visible indicators of hydration status
 - Antidiarrheal medications, such as loperamide (Imodium), are helpful
 - Bismuth subsalicylate (Pepto-Bismol)
 - An effective treatment of travel related diarrhea
 - Comparable results to antibiotic therapy for mild-to-moderate cases
- More severe cases may warrant empiric antibiotics
 - First choice is Azithromycin twice daily by mouth twice a day for 3 days
 - Trimethoprim/sulfamethoxazole DS tablet by mouth twice a day for 3 days
 - An increasing rate of bacterial resistance
- Cholera is doxycycline 100 mg by mouth twice a day for 3 days
 - Azithromycin is also effective
 - Cipro can be used in life threatening cases

NOTE: These patients had developed Norovirus, which is becoming more common

- *Surface water contaminated with human feces or indirect spread from ill person*
- *“Winter vomiting disease” seen on the Colorado River and some cruise ships*
- *May be partially resistant to chlorine which is why it is seen on river trips*

- *Symptoms: fever, abdominal cramping, vomiting, and diarrhea*

Evacuation

All patients with these symptoms who do not respond to or worsen despite initial therapy should be evacuated as soon as possible.

Discussion #2 and Questions for the Group:

Although some bacterial organisms and viruses are associated with nausea, vomiting, and non- bloody diarrhea, what is another cause of food-related gastroenteritis?

Staphylococcal Enteritis

1. What is staphylococcal gastroenteritis?

One form of gastroenteritis associated with ingestion of a heat-stable toxin produced by *Staphylococcus aureus*, a bacterial that is part of the normal skin flora. Unwitting chefs contaminate their food with these bacteria if they do not wash their hands or wear gloves during food preparation and service. Unrefrigerated high protein foods are most conducive to overgrowth of *staphylococcus*,

- Mayonnaise
- Milk, cream, and custards
- Meat products

2. What is a typical presentation for staphylococcal gastroenteritis?

- Symptoms begin 1 – 6 hours after ingestion, average of 3 hours
- Acute onset of nausea, severe vomiting, mild diarrhea, and abdominal cramps
- Multiple victims present with vomiting and diarrhea after consuming the same food or water
- Self-limited with symptom resolution within 24 hours – hence the name “24-hour flu”.

3. What is the treatment for staphylococcal enteritis?

- Fluid and electrolyte replacement
- Anti-emetic medications may be used
- Antibiotic therapy is not recommended
 - Ineffective as there is no infection
 - Enterotoxin mediated and it cannot be neutralized

4. What is the best way to prevent staphylococcal enteritis?

- Use proper hygiene and sanitation with food preparation
- Hand sanitation with alcohol gels or hand washing with soap and water
- Food prepared in the wilderness should be consumed immediately
- Dispose of leftovers

Discussion #3 and Questions for the Group:

How would your differential diagnosis change if only one (or perhaps two) patient was symptomatic, but was experiencing a fever and bloody diarrhea? What is your preliminary diagnosis now?

Dysenteric gastroenteritis

1. What are some of the organisms known to cause dysenteric gastroenteritis?

- *Salmonella* species are widespread and are commonly found in raw eggs, poultry, and meat.
- *Shigella* is highly contagious and is easily spread from person-to-person as ingestion of only a few organisms can cause infection.
- *Campylobacter* is a very common contaminant of natural water supplies and is also common in unprocessed milk and raw poultry products.
- Enterohemorrhagic *E. coli* is transmitted in contaminated food and water, particularly undercooked meats, such as hamburger.
- *Aeromonas hydrophilia* is spread through contaminated water and is more commonly observed in children.

2. What is a typical presentation for dysenteric gastroenteritis?

- Acute onset of severe, intermittent abdominal cramps followed by diarrhea that may be copious, foul-smelling, and bloody – the latter being one of the clues that may help differentiate non-dysenteric (non-invasive) from invasive gastroenteritis
- Headaches, myalgia, and significant abdominal tenderness, and sometimes guarding, may be present
- Symptoms may persist for 1-10 days.

3. What is the treatment for dysenteric enteritis?

- Fluid and electrolyte replacement
- Empiric antibiotic therapy should be initiated in suspected cases, with the initial treatment of choice being Azithromycin by mouth twice a day for at least three days
- Anti-emetic medications may be used. Cipro is no longer recommended due to its very bad side effect profile.
- Antidiarrheal medications should be used cautiously and in conjunction with antibiotic therapy

Discussion #4 and Questions for the Group:

How would your differential diagnosis change again if the symptoms of nausea, abdominal cramping, and diarrhea began 1-2 weeks after returning from a backcountry trip? What is your preliminary diagnosis now?

Protozoal infection

1. What are some of the protozoal organisms known to cause diarrhea?

- *Giardia lamblia* is a single-celled parasite that exists in a cyst and trophozoite forms. Beaver, deer, dogs, cattle, sheep, and rodents are common carriers of *Giardia*, and many natural water sources may have *Giardia* cysts present despite being in remote or “pristine” locations.
- *Entamoeba histolytica* is the cause of amebiasis and prevalent in tropical countries. It too exists in a cyst and trophozoite forms. Ingestion of as little as one cyst can initiate infection.
- *Cryptosporidia* is present throughout the environment, including up to 97 percent of large streams, lakes, and reservoirs in the U.S. The organism is resistant to iodine and chlorine disinfectants, but it can be killed by boiling water.
- *Cyclospora cayetanensis* is prevalent in Central and South America.

2. What are some of the common features of each type of protozoal diarrhea?

- *Giardia lamblia*
 - Some may have mild to moderate amounts of foul-smelling soft stools, while others may experience copious and explosive bouts of diarrhea.
 - A characteristic “rotten egg” odor is associated with the intestinal gas and feces.
 - Chronic diarrhea, lasting weeks to months, may develop and can have a cyclical pattern of worsening symptoms every few weeks.
 - Treatment is Tinidazole, a highly effective, low side effect, one dose medicine
- *Entamoeba histolytica*
 - Symptomatic individuals may develop alternating constipation and diarrhea, abdominal cramping, weight loss, anorexia, and nausea.
 - Trophozoites may migrate to other locations in the body causing extraintestinal metastases in the liver, skin, pericardium, and brain.
- *Cryptosporidia*
 - Some Immunocompetent patients usually have a self-limiting course lasting a few days. Children are generally more severely affected than adults.
 - Immunocompromised patients develop a more severe infection that can last from months to years. These patients can lose more than three liters of fluid per day.
- *Cyclospora cayetanensis*
 - Infection typically causes watery diarrhea that may last for weeks.
 - Other symptoms include: anorexia, weight loss, bloating,

abdominal cramping, flatulence, nausea, vomiting, myalgias, low grade fever, and fatigue.

II. MOSQUITO TRANSMITTED ILLNESS

Case: During the second month of a humanitarian mission in Haiti, a 28-year-old male reports experiencing high fevers for the past 3-4 days.

Primary Assessment:

- M - No major bleeding A -
- Airway open
- R - Rapid breathing
- C - Elevated pulse rate
- H - Humid ambient air temperature.

Secondary Survey: Fatigued, diaphoretic and slightly-pale appearing; Reports chills last night. Tachypnic and tachycardic; Headache and diffuse muscle aches.

AMPLE: No known allergies to medications; Doxycycline (but not taking regularly because of he developed a rash several weeks after taking it and working in the sun); No past medical problems.

Preliminary diagnosis?

Malaria

Discussion #1 and Questions for the Group:

1. What is malaria?

A serious and sometimes fatal disease caused by the protozoa of the genus *Plasmodium* which is transmitted by the female *Anopheles* mosquito. It is one of the costliest infections worldwide, with 300 to 500 million cases and over 1 million deaths occurring per year. About 1,500 cases of malaria are diagnosed in the United States each year and thousands in Europe and other countries. Most cases are in travelers and immigrants returning from countries where malaria transmission occurs, many from sub-Saharan Africa and South Asia.

2. What are the six species of protozoa that cause malaria?

Six Species of Plasmodium That Cause Malaria

Organism	Distribution
<i>Plasmodium falciparum</i>	Worldwide, esp. sub-Saharan Africa, Amazon, Haiti, SE Asia
<i>Plasmodium vivax</i>	Worldwide, esp. Mexico, Central America, N. Africa, Middle East, India
<i>Plasmodium ovale</i> <i>P. ovale curtisi</i> and <i>P. ovale wallikeri</i> .	West Africa
<i>Plasmodium knowlesi</i>	Southeast Asia

- *P. falciparum* is the most virulent of the four species. It is also the most likely to have drug-resistant strains.
- *P. vivax* has a hypnozoite stage, which remains dormant in the liver. These parasites can reactivate and cause symptomatic disease if not treated properly.
- *Plasmodium knowlesi* is also called “monkey malaria” and has recently been found in humans

3. What are some of the signs and symptoms of malaria?

- Symptoms typically present 1 to 2 weeks after exposure to an infected mosquito.
- Initial symptoms include muscle soreness and low grade fever, which progress to paroxysms of shaking chills, high fever, and drenching sweats.
- Cycles of chills and fever last several hours and may occur every 2 to 3 days, depending on the specific organism.
- Headaches, myalgia, and backaches are also common and may be severe.
- Other symptoms include nausea, vomiting, diarrhea, severe anemia, and darkened urine (a.k.a. Blackwater Fever.)

4. What is the management of patients with malaria?

- A combination of personal protective measures and chemoprophylaxis is essential to avoid malaria infection in endemic areas.
- Medicine only provide partial immunity and keep a person from becoming very sick. The only way to avoid the malaria parasite is to avoid being bitten
- Consult with a travel clinic or the CDC recommendations to determine the appropriate chemoprophylaxis for the region of travel (<http://www.cdc.gov/travel>).
- Drug choice is based on the risk of chloroquine-resistant *P. falciparum* and patient contraindications (e.g. pregnant women, G6PDH deficiency). Chloroquine resistance is particularly common throughout sub-Saharan Africa and Southeast Asia.
- Options for chemoprophylaxis include:
 - Chloroquine
 - Mefloquine (Lariam)
 - Doxycycline
 - Atovaquone/proguanil (Malarone)
 - Pyrimethamine/sulfoxime (Fansidar)
 - Primaquine
- It is important to continue medications after returning home, if prescribed, to prevent illness from reactivated *P. vivax*.
- Treatment should be initiated when signs and symptoms suggest

- malarial infection and medical care is not immediately available.
- Anyone suspected of having malaria should be evacuated, especially in areas where *P. falciparum* is common.

Discussion #2 and Questions for the Group:

What are some other mosquito-transmitted illnesses?

- Zika
- Chikungunya
- West Nile Virus
- Dengue Fever
- Yellow Fever
- Eastern and Western Equine Encephalitis

III. TICK-BORNE ILLNESS

Case: A member of a 15-day river rafting trip in South Carolina (USA) has developed a rash on her arms and legs. You see her in a small medical aid station at the end of the trip. She has a headache and achy joints.

Primary Assessment:

- M - No major bleeding
- A - Airway open
- R - Breathing is normal
- C - Strong, normal pulses
- H - Comfortable ambient air temperature.

Secondary survey: She has a low-grade fever, and a rash is noted on her arms

and legs. Preliminary diagnosis?

A tick-borne illness, such as Rocky Mountain Spotted Fever

Discussion and Questions for the Group:

1. What are some common tick-borne diseases?

- Lyme Disease
- Rocky Mountain Spotted
- Ehrlichiosis
- Colorado Tick Fever
- Tularemia
- Borrelia Relapsing Fever
- Babesiosis
- Anaplasmosis

2. What are some of the important features of Lyme Disease?

- Caused by the spirochete *Borrelia burgdorferi*
- Transmitted by *Ixodes* species ticks
- 12 U.S. states report 95% of cases: NE coast plus Michigan and Wisconsin
- Stage I
 - Usually develops 3 days to 1 month after a tick bite
 - 50 – 60% of patients develop *erythema chronicum migrans*
 - A classic rash that may be uniformly red or have a more complex "bull's eye" appearance due to central clearing.
 - Other symptoms
 - Malaise, fatigue, lethargy 80%
 - Headache 64%
 - Fever and chills 59%
 - Stiff neck 48%
 - Multiple annular lesions 48%
 - Regional lymphadenopathy 41%

- Stage II
 - Neurologic problems
 - Radiculoneuritis
 - Cranial nerve palsies (esp. CN VII)
 - Meningitis
 - Cardiac problems such as carditis and heart block
- Stage III
 - Develops months to years later
 - Typically arthritis, often involving the knee
 - Treatment
- Doxycycline 100 mg by mouth twice a day or 1-2 mg/kg IV twice a day
- Amoxicillin 500 mg by mouth three times a day or 25-50 mg/kg/day three times a day

3. What are some of the important features of Rocky Mountain Spotted Fever?

- Caused by the spirochete *Rickettsia rickettsii*
- Transmitted by *Dermacentor* ticks (dog ticks and wood ticks)
- Despite its name, most cases occur in southern and eastern states of the U.S. It also occurs in Central and South America
- Mortality rate of 3 - 5%
- Incubation period of 5-10 days
- Symptoms
 - May be non-specific at the beginning, such as malaise and anorexia
 - Progresses to classic triad of fever, headache, and rash
 - Rash
- Treatment
 - Supportive care
 - Antibiotics include doxycycline and Chloramphenicol
 - Hospitalization likely

4. What are some of the important features of Tularemia?

- Caused by the bacterium *Francisella tularensis*
- Contracted through exposure to ticks, deer flies, and mosquitoes, or by eating contaminated meats.
- Reported in all 49 continental states, but most common in the south central states, mainly Arkansas, Missouri, and Oklahoma.
- Symptoms
 - Fever, chills, and myalgia, followed by an irregular ulcer at the site of the inoculation, which may persist for months, and these nodes may then become necrotic and suppurates
 - Regional lymphadenopathy develops, an
- Treatment
 - Supportive care
 - Antibiotics include doxycycline and streptomycin.

IV. RABIES

Case: A young 22-year-old female is sleeping in a one room hut along the Tour de Mt. Blanc in France. When she wakes up in the morning, she notices 2 bats flying around frantically on the inside of the hut. She opens the door and directs them towards the open door and then they both fly away. She is unsure when the bats got into the hut and whether she had any physical contact with them.

Discussion and General Information: This patient may have been exposed to a bat with rabies. Should the patient be given prophylaxis vaccines? The discussion should center on several issues. Students should know which animals are mostly likely to have rabies, which ones are most likely to transmit rabies to humans. Also, it is important to know that it is the behavior of the animal which will help determine if the animal has rabies. Patients should try to capture the animal, if possible and safe, to determine if the animal had rabies. Also exposure may not be clear in a given situation.

Discussion and Questions for the Group:

1. What is rabies?

Rabies is a zoonotic viral disease which infects domestic and wild animals. It is transmitted to other animals and humans through close contact with saliva from infected animals (i.e. bites, scratches, licks on broken skin and mucous membranes). Once symptoms of the disease develop, rabies is fatal to both animals and humans.

2. How common is rabies?

Although rabies in humans is very rare in the United States, between 16,000 and 39,000 people receive preventive medical treatment each year after being exposed to a potentially rabid animal. Reliable data on rabies is scarce in many areas of the globe, making it difficult to assess its full impact on human and animal health. WHO commissioned a reassessment of the burden of rabies in 2004. According to this study, the annual number of deaths worldwide caused by rabies is estimated to be 55,000, mostly in rural areas of Africa and Asia. An estimated 10 million people receive post-exposure treatments each year after being exposed to rabies-suspect animals.

3. What are its symptoms?

The first symptoms of rabies are usually non-specific and suggest involvement of the respiratory, gastrointestinal and/or central nervous systems. In the acute stage, signs of hyperactivity (furious rabies) or paralysis (dumb rabies) predominate. In both furious and dumb rabies, paralysis eventually progresses to complete paralysis followed by coma and death in all cases, usually due to respiratory failure. Without intensive care, death occurs during the first seven days of illness.

4. What are animals that commonly carry rabies?

Raccoons are the most common wild animals infected with rabies in the United States, Canada and Europe. Bats are the most common animals responsible for the transmission of human rabies in these countries, accounting for more than half of human cases since 1980, and 74% since 1990. Rabid bats have been reported in all over these countries. Skunks, foxes, and coyotes are also affected. The biggest carries and transmitter of rabies in the world is the dog.

5. What are animals that generally do not carry rabies?

It is very rare in small rodents (rats, squirrels, chipmunks) and lagomorphs (rabbits and hares). Fish, reptiles, and birds are not known to carry the rabies virus.

6. How is the virus transmitted?

For a human to get rabies, two things must happen:

- First, you must have contact with a rabid animal. *Not necessarily a bite or a scratch.*
- Second, the contact must allow for the transmission of infected material, which will involve exposure to the saliva of the infected animal usually through a bite or scratch.
- Contaminated tissue in the rabid animal includes saliva. Other potentially infectious tissue is in the brain or nerve tissue. The virus is transmitted only when the virus gets into bite wounds, open cuts in your skin, or onto mucous membranes (for example, into your eyes or your mouth). The virus then spreads from the site of the exposure to your brain and eventually spreads throughout your body's major organs.
- Bites are the most common source of transmission. Scratches by infected animals are far less likely to cause infection but are still considered a potential source of rabies transmission.
- Bites or scratches are often not confirmed in cases of human rabies traced to bats. Therefore, treatment might be necessary after a close encounter with a bat. In the 20 cases (since 1990) of human rabies associated with a bat, a definite history of a bat bite could be confirmed in only 1 case. It is unclear how the virus was transmitted in the other cases—perhaps by an undetectable bite.
- Rabies has rarely been transmitted by other means. Examples include inhaling a large amount of bat secretions in the air of a cave by two cave explorers and inhaling the concentrated virus in laboratory workers studying rabies.

7. What are symptoms of rabies in an animal?

- Animals infected with rabies may appear sick, crazed, or vicious.
- This is the origin of the phrase "mad dog". Unprovoked attacks have been traditionally associated with rabid animals, but, on many occasions, animals infected with rabies have also appeared overly friendly, docile, or confused. They may even appear completely normal.
- Seeing a normally nocturnal wild animal during the day (for example, a bat or a fox) or seeing a normally shy wild animal that appears strange or even friendly should raise suspicion that the animal may have rabies.

8. Medical Treatment:

Treatment to prevent rabies has 3 essential components if a high probability of viral transmission exists. Depending on the likelihood the animal has rabies and, in some cases, the availability of the animal for observation, you may not initiate the latter 2 steps involving shots against the rabies virus.

- Wound care involving soap and a virus-killing cleanser (this should always be done)
- A one-time injection of human rabies immune globulin (HRIG), which is a substance that provides rapid, short-term protection against rabies
- Injection of the first of a series of vaccine doses to provide protection against rabies after an exposure

9. Medications: Post exposure prophylaxis

- Treatment after exposure is highly successful in preventing the disease if administered within six days after infection and completion of a 14-day treatment regimen.
- Thoroughly washing the wound as soon as possible with soap and water is very effective at reducing the number of viral particles. Exposed mucous membranes such as eyes, nose or mouth should be flushed well with water.
- In the United States, patients receive one dose of immunoglobulin (HRIG) and four doses of rabies vaccine over a 14-day period.
 - If anatomically feasible, the full dose of HRIG is infiltrated around and into any wounds. Any remaining volume is injected intramuscularly at a site distant from vaccine administration. HRIG is not administered in the same syringe or at the same anatomic site as the first vaccine dose. However, subsequent doses (i.e., on days 3, 7, and 14) of vaccine in the 4-dose vaccine series can be administered in the same anatomic location in which HRIG was administered.

- The first dose of rabies vaccine should be given as soon as possible after exposure (day 0), with additional doses on days 3, 7 and 14 days after the first vaccination.
- Patients that have previously received pre-exposure vaccination do not receive the immunoglobulin, but should still receive the post-exposure vaccinations on day 0 and 3. Other countries may have different treatment protocols and should be followed.

10. Conclusion:

This patient has had 'exposure' to a bat that is acting out of character and may likely have rabies. A bat should not be out during the day and should be considered abnormal. Although actual exposure is not clear, she should receive the post-exposure treatment as outlined above.