

Snakes

- Pit Vipers: Rattlesnakes, copperheads, and water moccasin (cottonmouth)
 - Triangle head, catlike pupils
 - 25% bites are dry
 - Venom is hemotoxic: attacking blood and tissue – so pts have strong local reaction and can potentially become coagulopathic
 - Clinically: severe burning, swelling, bleeding, bruising, N/V, weakness, perioral numbness, fasciculation, increased HR, RR, decreased BP, shock
 - Treatment:
 - Evacuate with minimal physical activity, alert EMS ASAP
 - Monitor A,B,C's
 - Clean wound locally, cover, immobilize area
 - Remove tight clothes, jewelry
 - Avoid
 - Vacuum extractors, sucking out venom
 - Tourniquets
 - Electric shock
 - Ice
 - Catching the snake
 - Aspirin
 - Alcohol
- Coral Snake
 - Red on yellow – kill a fellow, black on yellow-venom lack
 - Venom is neurotoxic – mild local reaction
 - Clinically: mild transient pain, no local swelling, rapid systemic symptoms: N/V, headache, abdominal pain, diaphoresis, numbness, drowsiness
 - Treatment:
 - Same as above
 - Consider elapid wrap: wrap area snugly with fabric to impair lymphatic flow but not venous or arterial flow – monitor for swelling as wrap might become too tight!
 - Avoid: same as above

Mammal Attacks:

- Avoid animal attacks if at all possible
 - Generally: Don't approach, confront, surprise or threaten animals
 - Dogs: don't pet unfamiliar dogs, don't approach injured, nursing or sleeping dogs, don't separate fighting dogs physically, avoid angry dogs
 - Cats: don't threaten a cat
 - Bear: make noise, avoid common bear areas, pepper spray only works at about < 30 ft aimed at head
 - Brown bear: do not look into eyes, no sudden movements, do not run, do not act aggressively, if attacked assume fetal position protecting neck and face
 - Black Bear: yell, throw things, act aggressively – these bears usually flee, if attacked assume fetal position
 - Cougar: act aggressively, talk loudly, don't turn and run, fight back using anything you have available
- Treating Animals Attacks:
 - Generally: wash wound well with soap and water, antiseptic if possible (especially if concern for rabies), closing wounds is controversial, abx amoxicillin-clavulanate (augmentin) if no allergy, consider different abx if attack occurs in fresh or salt water
 - Dog: treat with abx, think about rabies
 - Cat: higher infxn rate, treat with abx, think about rabies
 - Bear: worry about blunt injury, deep penetrating injury, immediate evacuation, rabies prophylaxis
 - Cougar: same as bear
- What about Rabies?
 - 96% of cases involve raccoons, skunks, and bats. Others include foxes and coyotes. Suspect in any unprovoked attack
 - Infxn can occur with saliva. Virus moves along nerves to brain. 100% fatal if not treated. Since virus travels on nerves the closer the bite to the brain, the faster it can cause problems.
 - Washing with soap can decrease viral load. Using alcohol or iodine antiseptic can further decrease viral load
 - Rabies prophylaxis: Pt receive 1 dose of immunoglobulin (1/2 in wound and ½ IM) immediately, and 5 doses of rabies vaccine over 28 days.
 - If the animal is captured or killed it can be watched or autopsied looking for rabies virus
 - Sign/Symptoms: nonspecific, malaise, fatigue, anxiety, agitation, irritability, insomnia, fever, nausea, vomiting, sore throat, Later: aggressive behavior, hyperactive, irrational, seizures, hallucinations

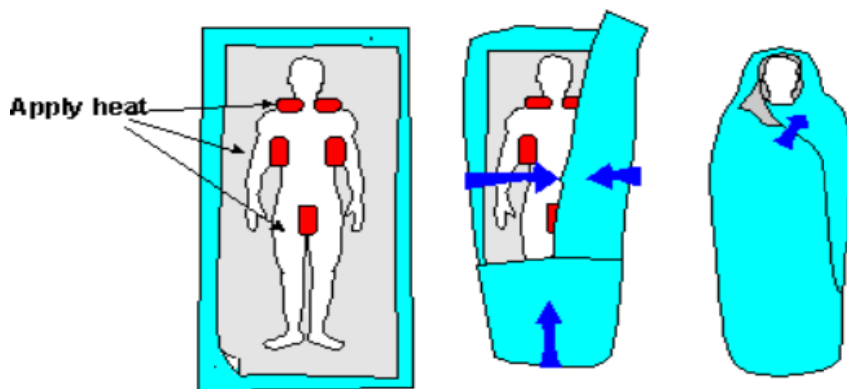
Heat Illness

- Types of heat illness
 - Heat edema: swelling in hands, feet, ankles – usually self limited, resolves without treatment
 - Prickly heat: heat rash (red, itchy, bumpy) caused by plugged sweat glands in wet areas. Consider antihistamine, staying out of heat
 - Heat cramps: muscle spasms after exertion in heat. Consider massage, fluids with salt, rest in cool place
 - Heat syncope: standing, plus blood vessel dilation decreases blood flow to brain, causing fainting. Have pt lie in Trendelenburg position (feet elevated, head down), move to cool place
 - Heat exhaustion: malaise, headache, weakness, nausea, vomiting, dizziness, dehydration, T normal up to 104, victims continue to sweat and have normal mental status. Treat: move to cool place, remove hot clothes, rehydrate, cold packs, mist with water
 - Heat stroke: potentially deadly, similar to heat exhaustion – pt can still sweat, as it progresses pt become dry. Pt displays erratic behavior with altered mental status, seizure and coma are late manifestations. T>105, Tachycardia, incr RR, decr BP Treat: cool rapidly, don't give orals due to aspiration risk, no ASA, no Tylenol, use cold packs, evaporative cooling, treat for shock, recheck T regularly
- Main difference between heat exhaustion and heat stroke is Altered Mental status. Don't use oral rehydration due to risk of aspiration
- To prevent:
 - Stay hydrated: feel thirsty when you are 2-3% dehydrated. Urine color is a good gauge of hydration status. Salt is important but don't eat it alone
 - Avoid extreme temperatures: hike in early morning or evening to avoid hottest times of the day
 - Wear lightweight, loose fitting, light colored clothing

Hypothermia

- Hypothermia is defined as the cooling of the body's core temperature to below 35 degrees Celsius.
- It is important to realize that death from hypothermia may result within 2 hours.
- The body loses heat via 4 physical mechanisms- radiation, evaporation, convection, and conduction
- Hypothermia affects a multitude of organs and causes multiple metabolic derangements, which can result in death.
- **Mild** hypothermia (33-35 degrees Celsius) is characterized by tachypnea, tachycardia, hyperventilation, ataxia, dysarthria and impaired judgment, and shivering.
- **Moderate** hypothermia (31-32 degrees Celsius) progresses to reduced pulse and cardiac output, hypoventilation, CNS depression and hyporeflexia, decreased renal blood flow, and loss of shivering.
- **Severe** hypothermia (less than 31 degrees Celsius) can lead to pulmonary edema, oliguria, areflexia and coma, hypotension and bradycardia, ventricular arrhythmias, and asystole.
- Goals of therapy should be aimed at reducing further heat loss.
- Minimal handling is important for all patients who have an altered sensorium, to avoid cardiac arrhythmias.
- Fluids should be provided orally if patients can swallow (while in the field).
- Insulate the patient as much as possible with warm clothes and remove wet clothes. Body heat from another individual in a sleeping bag may be the only means for rewarming while in the field.

Hypothermia Wrap



Lightning

Lightning: Mechanism of injury

- Direct Hit: lightning directly strikes a person, conducted over skin surface
- Splash: more common: bolt first hits an object (person, tree) and then jumps to the victim, as victim is path of least resistance
- Step Voltage: lightning hits ground or object and the current spreads like a wave to the victims, often cause of multiple injuries
- Blunt trauma: explosive force of pressure waves created by lightning cause ruptured TMs and other blunt trauma. Lightning known to throw victims ~10 yards

Injuries

- Cardio/Pulm:
 - MCC of death: Myocardial depolarization causes asystole and medullary depolarization leads to respiratory arrest. Organized cardiac contraction typically resume in a short period of time due to automaticity, but medullary paralysis is longer leading to prolonged respiratory arrest. Unless pt receives ventilation assistance hypoxia can lead to arrhythmias and secondary cardiac arrest
- Neuro
 - MCC of long term sequelae
 - CNS:
 - Electricity can cause: hemorrhage, seizures, sleep disturbances, endocrine dysfunction, paresis, paresthesia, ataxia, aphasia
 - Anterograde amnesia and confusion: almost universal in strike victims, lasts hours to days
 - Long-term: PTSD, mood disturbances, HA, dizziness, tinnitus, chronic pain
 - PNS:
 - Pain and paresthesias most common – can have delayed onset
 - Keraunoparalysis: in severely injured affected limb may be cold, clammy, mottled and pulseless secondary to sympathetic instability and vascular spasm – typically resolves within hours.
 - Burns:
 - Linear Burns: 1-4 cm wide, follow areas of heavy sweat concentrations
 - Punctuate burns: multiple closely spaced, discrete circular burns, may resemble cigarette burns, may be full thickness.
 - Feathering (Ferning) pathognomonic for lightning, not true burn as no skin damage, likely represent red blood cell extravasation from capillaries into superficial skin, usually pinkish to brownish in color.
 - Thermal: occur if clothing is ignited or victim wearing metal
 - Blunt Trauma:
 - Can cause internal organ damage, long bone fx, eye injuries, ear injuries (ruptured TM in about 50%)

Prehospital Care:

- Reverse Triage: first priority are the patients who are in cardiopulmonary arrest, fixed and dilated pupils may be result of autonomic dysfunction, pts may have meaningful recovery – however if no response to CPR after 20-30 minutes chance of recovery is slim
- Spinal immobilization, assessed like a trauma patient, complete exposure important
- Physical Findings: Htn and tachycardia common – possibly due to SNS activation and resolve, peripheral pulse may be difficult to obtain secondary to vasospasm – however important to rule out other causes of hypotension
- All patients need to be thoroughly evaluated in preferably a trauma center.

Prevention:

- 30-30 rule: when time between lightning and thunder is > 30 seconds seek shelter and wait 30 minutes to resume activities after last lightning is seen
- Avoid tall objects, don't hold metal objects
- Indications of imminent strike: cracking, ozone smell, hair standing on end
- Lightning position: squat with both feet together and ears covered, minimizes height and surface area in contact with the ground

Dislocation/ Reduction/ Fracture

- What are the dangers associated with femur fx?
 - Exsanguination (applying traction decreases risk)
 - Acute compartment syndrome (due to long bone fx, tight traction device)
 - Sign/Symptom: pain out of proportion to injury, pallor, pulseless, paresthesias, tightness, weakness
 - Pain (muscle spasms)
 - Patient likely to be nonambulatory making evac difficult
- What are the indications for emergent reduction of dislocated shoulder in the field?
 - Neurovascular compromise
 - Pain reduction (soft indication)
- What are some different methods for reduction?
 - Traction- counter traction (modified Hippocratic)
 - Scapular manipulation (tip of scapula pushed medially)
 - Milch – abduction w/ external rotation (slow).
 - Stimson – somewhat more difficult in wilderness.

Chest Pain

Cardiac versus Non Cardiac

- Cardiac causes: Angina, MI, tamponade, pericarditis, myocarditis, dissection, arrhythmias
- Non Cardiac: Pulmonary (embolism, pneumothorax, pneumonia), trauma, GI (esophageal spasm, GERD, cholecystitis, pancreatitis), shingles, panic attack, musculoskeletal

Cardiac Risk Factors

- Known coronary artery disease (CABG, previous MI, stents)
- Tobacco use
- Hyperlipidemia
- Family history
- Diabetes
- Hypertension

Wilderness Tx:

- Aspirin (325) if available, Nitro (if available), O2
- Immediate medical attention – “Time = Muscle”

Improvisation

- Stethoscope: ear to chest, tactile (feel pulse, watch chest excursion)
- Blood Pressure: Distal Pulses usually fade with systolic <80 mmHg

Quick Reference Chart: CPR

	Adult	Child (1 year to Puberty)	Infant
1-Rescuer Compression: Ventilation Ratio	30:2	30:2	30:2
2-Rescuer Compression: Ventilation Ratio	30:2	15:2	15:2
Compression Rate	100	100	100
Compression Depth	1 ½ - 2 Inches	1/3 to ½ the depth of the chest	1/3 to ½ the depth of the chest
Hand Placement	2 Hands Center of breastbone between nipples	1 or 2 Hands Center of breastbone between nipples	<u>1-Rescuer</u> 2 Finger Technique <u>2-Rescuer</u> 2 Thumbs-Encircling Hands Technique Just below the nipple line
Pulse Check	Carotid	Carotid	Brachial
Advanced Airway in Place	<ul style="list-style-type: none"> • A 1-second breath every 6 to 8 seconds • No pauses for ventilations—continuous compressions • Provide 8 to 10 breaths/minute 		

BLS:

When to say when:

- Normothermic patient:
 - Discontinue BLS after 30 minutes in no spontaneous pulse
- Hypothermic patient:
 - BLS **should not** be initiated if:
 - Puts rescuers at risk
 - Core body temperature <60F
 - Chest wall is frozen
 - Submersed in cold water >60 min
 - Obvious lethal injury present

- BLS would significantly delay evacuation to controlled rewarming

Auerbach: Wilderness Medicine, 5th ed.

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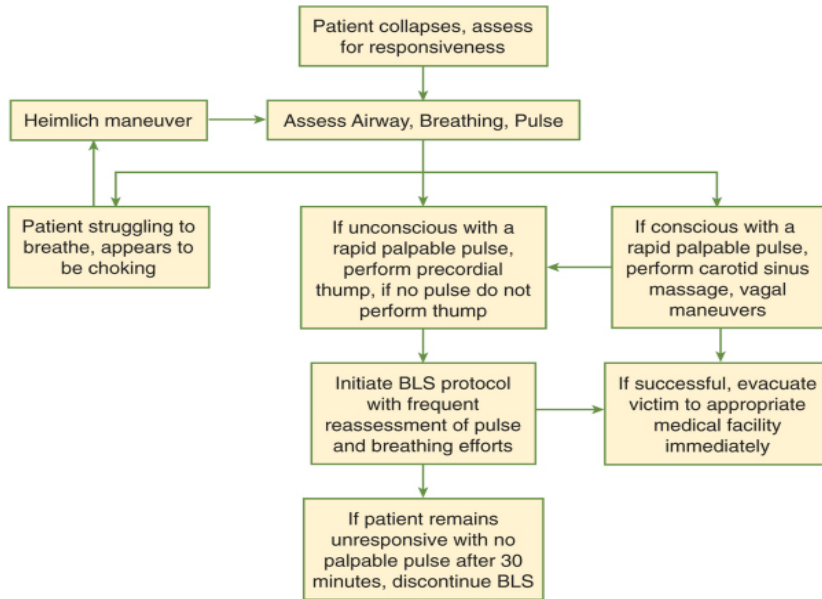


Figure 27-6 A response algorithm for evaluation and treatment of a person who collapses in the wilderness. BLS, basic life support.

Anaphylaxis

Anaphylaxis is a severe allergic reaction characterized by: hives, wheezing, chest tightness, shortness of breath, drop in blood pressure (causing dizziness, lightheadedness and possible syncope), soft tissue swelling - most concerning when in the neck as it can constrict or occlude the airway.

Possible causes of anaphylaxis include: drugs (NSAID, penicillin), food (nuts, shellfish), idiopathic, hymenoptera, latex, IV contrast

Molecular level: On initial exposure, the antigen elicits generation of an IgE antibody. The antibody residue binds to mast cells and basophils. On reexposure, the antigen binds to the antibody, and the receptors are activated. Clinical manifestations result from release of immune response mediators such as histamine, leukotrienes, tryptase, and prostaglandins. The same mechanism occurs when a nonimmunogenic foreign substance binds as a so-called hapten to a native carrier protein, creating an immunogenic molecule. Factors influencing severity of a reaction include degree of host sensitivity and dose, route, and rate of administration of the offending agent. (from emedicine "Anaphylaxis overview").

Pathophys: Rapid onset of increased secretion from mucous membranes, increased bronchial smooth muscle tone, decreased vascular smooth muscle tone, and increased capillary permeability occur after exposure to an inciting substance. These effects are produced by the release of mediators, which include histamine, leukotriene C4, prostaglandin D2, and tryptase. (from emedicine "Anaphylaxis overview").

Treatment:

- Epinephrine: injectable epi is available in a spring loaded cartridge which contains 2mL of Epi 1:1000 USP. It delivers a single dose of 0.3mg of epi IM. Newer cartridges called TwinJect contain an additional dose of epi.
- For children (less than 66 lbs) Epi junior contains 1/2 of the adult dose.
- Antihistamine: Benadryl (25-50mg) can be given orally if available after Epi as it will decrease the allergic reaction.
- Vital to immediately transfer the person to a medical facility as the reaction can rebound after the initial dose of Epi wears off

Hypoglycemia

- defined as serum glucose <50 mg/dl
- decrease in glucose resulting in signs and symptoms.
 - Altered mental status
 - Sympathetic stimulation (fight or flight – tachycardia, tachypnea, diaphoresis)
- Hx: Ask about:
 - Diabetes (insulin vs oral drugs)
 - Meds
 - Nutritional intake, alcohol
 - Infections
 - CNS signs (headache, confusion, personality changes)
 - GI symptoms, Cardiac symptoms
 - Adrenergic (sweating, anxiety, tremulousness, nervousness)
- Physical
 - Assess vital signs for hypothermia, tachypnea, tachycardia, hypertension, and bradycardia (neonates).
 - The head, eyes, ears, nose, and throat (HEENT) examination may indicate blurred vision, pupils normal to fixed and dilated, icterus (usually cholestatic due to hepatic disease), and parotid pain (due to endocrine causes).
 - Cardiovascular disturbances may include tachycardia (bradycardia in neonates), hypertension or hypotension, and dysrhythmias.
 - Respiratory disturbances may include dyspnea, tachypnea, and acute pulmonary edema.
 - GI disturbances may include nausea and vomiting, dyspepsia, and abdominal cramping.
 - Skin may be diaphoretic and warm or show signs of dehydration with decrease in turgor.
 - Neurologic conditions include coma, confusion, fatigue, loss of coordination, combative or agitated disposition, stroke syndrome, tremors, convulsions, and diplopia.
 - (from emedicine “hypoglycemia overview”)
- Causes:
 - Diabetes
 - Medication changes, changes in activity, infection, diet changes,
 - Factitious (classic healthcare worker – look at C-peptide)
 - GI surgery, hepatic disease, islet cell tumor, exercise in DM, pregnancy, renal glycosuria, adrenal insufficiency, hypopituitarism, enzyme deficiency, sepsis, starvation, artifact, or idiopathic
- Treatment
 - Ideally measure blood glucose (if possible)
 - Give glucose (oral if mental status ok)
 - if mental status in field makes swallowing impossible, rub sugar-containing energy gel or honey on gums
 - Typically patients will return to normal when glucose is corrected
 - Decision to send to the hospital is dependent on the situation –
 - Definitely in first time hypoglycemia, if patient seized, if patient not responding to glucose, any other injuries

C-Spine

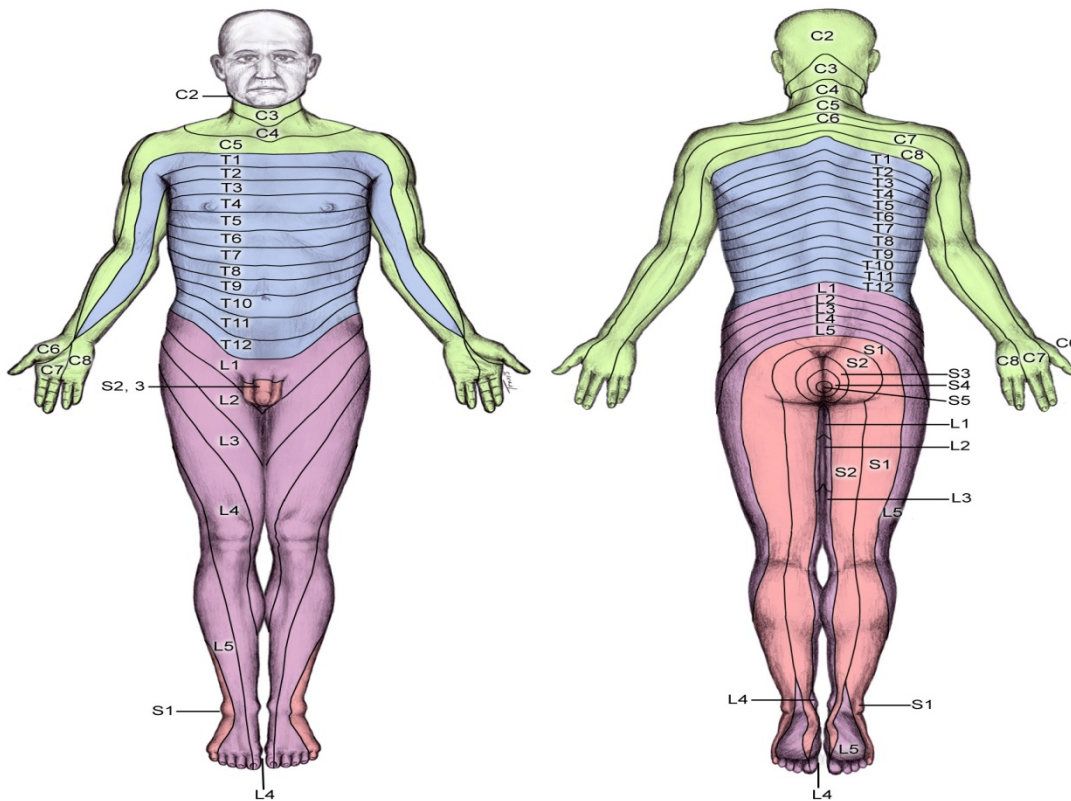
Reasons for c-spine immobilization:

- Unconscious victim
- Pain in back or neck (or pain with palpation)
- Numbness, tingling, altered sensation in extremities
- Unable to move extremities or weak (not explained by another injury)
- Altered level of consciousness or under influence of drugs/ EtOH
- Distracting injury (usually long bone fx or another painful injury)

Improvised cervical collars: (Note even with collars you still need to immobilize onto a spine board before “letting go”

- SAM splint: Create a bend in the SAM splint approx 6 inches from the end to form a chin support, place the front support underneath the chin and wrap the remainder of the splint around the neck. Create side supports by squeezing the slack in the splint together to form flares under the ears. Secure with tape.
- Sleeping pad: fold pad long ways into thirds and center it over the back of the victim’s neck. Warp the pad around the neck, under the chin, and secure with tape
- Clothing: any bulky item can work. Wrap a wide ace type bandage around the entire item first (or roll it) to make it more rigid. Use this to wrap the neck. It can be crossed in the front to provide additional stability.

Spinal cord levels:



Neurogenic shock: characterized by severe autonomic dysfunction resulting in hypotension, bradycardia, and peripheral vasodilation and hypothermia. Typically does not occur with injuries below T6.

Spinal shock: complete loss of all neurologic functions, including reflexes and rectal tone associated with autonomic dysfunction

Hemorrhagic shock: Loss of blood typically from skin, chest, abdomen, pelvis, or femurs resulting in hypotension and initially compensatory tachycardia.