Wilderness First Responder

Quick Reference Guide

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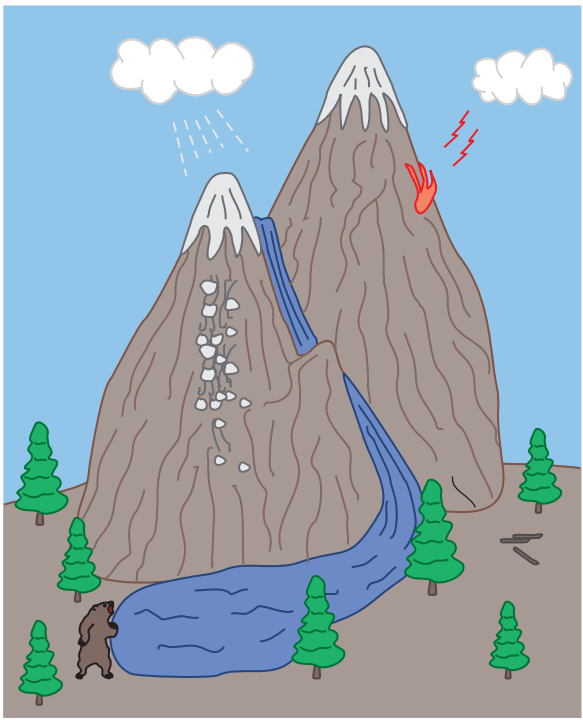

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Cover design by Raschel Jones.
Revision 03

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1.0 Initial Assessment and Stabilization

1.1. Scene Safety

Before attempting to aid a victim you need to assess whether the scene is safe. The worst thing you can do when someone is injured is create more injured parties. The rules are:

- You are the most important person on the scene, insure your own safety first.
- Other rescuers and bystanders come second, insure the safety of everyone else before aiding the injured party.
- The injured party comes last, do not attempt to help them unless everyone is safe and can remain safe while rendering aid.

Continually reevaluate scene safety. If resources are available assign someone to oversee and monitor scene safety.

The unfortunate reality is if you can't insure scene safety you may have to watch someone die because you can't safely help them. Never create additional injuries trying to render aid!

1.2. Body Substance Isolation

Any bodily fluid can contain pathogens and pathogens can also be airborne or spread in droplets from coughing, or sneezing. You need to select appropriate personal protective equipment (PPE).

1.2.1. Recommended PPE:

- Gloves - should always be worn. Nitrile is the best, Latex is effective but some people are allergic to Latex, Vinyl may not protect against viruses so only use vinyl if nothing else is available.
- CPR mask - use if mouth to mouth resuscitation is to be performed. CPR masks contain one way valves and filters to prevent pathogens from travelling from the patients mouth to the rescuers mouth.
- Goggles - should be worn if there is a risk of fluids splashing or spraying into your eyes. If the risk is high, a full face shield may be required. Any mucous membrane such as the corner of the eyes, inside the nose or mouth can present entry points for pathogens.
- Mask - if air borne pathogens are suspected or if there is a risk of fluids splashing or spraying into your mouth or nose, a mask is needed. N95 or N100 are the minimum for air borne pathogen protection. N95 and N100 masks are not liquid proof but will provide some protection against splashes and sprays. If a mask isn't available use a bandana or shirt to provide some protection.
- Liquid proof clothing - the standard is DuPont TyChem QC or better (Tyvek is not liquid proof although it is better than nothing). A rain suit made of GoreTex or other liquid resistant fabric can provide some protection. Gloves and boots should be taped to the suit with ChemTape or Duct Tape is ChemTape isn't available.
- Boots - if liquid is pooling on the ground.

- Insect repellent, netting, long sleeve shirts and pants - insects can be vectors for pathogens.

The order that you put on and remove PPE is important to prevent contamination.

1.2.2. PPE is put on in the following order:

1. Gown or suit first - if worn.
2. Mask or respirator - if worn.
3. Goggles or face shield - if worn.
4. Gloves.

1.2.3. PPE is removed in the following order:

1. Gloves.
2. Goggles or face shield - if worn.
3. Gown or suit - if worn.
4. Mask or respirator - if worn.

In highly contaminated situations you may want to wear two sets of gloves, remove the contaminated outer gloves first, then remove other PPE and then remove the inner set of gloves. This provides hand protection against contamination on other PPE during removal.

1.3. Consent and Legal

If an injured party is a conscious adult, you must obtain their consent before treating them. If the injured party is unconscious or a child, consent is implied - although with a child you should attempt to locate their parent(s) and get consent if it is reasonable to do so.

Samaritan laws will generally protect rescuers from legal consequences as long as you act in a manner consistent with what someone with the same level or training would be expected to do. Samaritan laws do not protect you if you commit negligence.

Elements of negligence:

- Duty to act - you generally do not have a duty to act unless you have a prior relationship or have made an offer to provide care.
- Breach of duty or standard of care - the care you provide must be consistent with your level or training, do not under treat but also do not provide treatments you are not competent to provide.
- Proximate cause - if your breach caused the injured parties condition to worsen.

Samaritan laws do not protect professional rescuers or rescue teams.

Once you begin treatment you are generally obligated to continue treatment until someone of equal or greater training takes over or it is no longer safe for you to continue (exhaustion from continuous CPR when help doesn't arrive is an example where continued treatment may not be safe).

Having a witness while providing treatment is always a good idea and particularly important with children or members of the opposite sex.

Documenting your treatment with a SOAP note (covered later) is also useful to help avoid later legal issues.

1.4. Primary Survey

The goal of the primary survey is to quickly identify and address immediate threats to life. As you go through the primary survey any immediate life threats you identify should be addressed before continuing on with the survey.

Depending on the type of Cardio Pulmonary Resuscitation (CPR) training you have received the order of the primary survey may be Airway-Breathing-Circulation (ABC) or Circulation-Airway-Breathing (CAB).

The injured party should be placed on their back on a firm surface for the procedures that follow.

1.4.1. A - Approach and Airway

Approach, talk to the injured party, if an injured party is conscious and speaking more than six words without distress their airway and breathing are both OK and you can move on to 1.4.3. Circulation and Chunk Check.

Airway:

1. If an injured party is unconscious or they are in distress you need to open their airway.
2. To open their airway perform the Jaw Thrust and then proceed to breathing.
3. If breathing is unsuccessful you need to then perform the Head Tilt - Chin Lift. Jaw Thrust is done first in case of a neck injury but if Jaw Thrust is unsuccessful, airway takes precedence over a neck

injury (even though a Head Tilt - Chin Lift can aggravate a neck injury).

1.4.2. B - Breathing and Breathing Quality

Look (to see if the chest is rising and falling), listen (for sounds of breathing) and feel (put your cheek near the injured persons mouth to feel) for breathing.

Although whether or not a person is breathing is the most important factor, the quality of breathing also matters. A lot of people having heart attacks have agonal breathing.

Breathing:

If the injured party isn't breathing you need to undertake rescue breathing.

- Rescue breathing can be mouth-to-mouth or mouth-to-nose if the mouth is seriously damaged.
- With the airway open, pinch the nose closed and give the first rescue breath, the breath should be a normal volume breath and you should see the injured parties chest rise. If the chest rises, give a second breath and then begin chest compressions.
- If the chest does not rise during the first rescue breath, go back and try to open the airway using the Head Tilt - Chin Lift method.

After two rescue breathes move on to 1.4.3 Circulation and Chunk Check. If you are unsuccessful establishing an airway after trying the Head Tilt - Chin Lift, proceed to 1.4.3 Circulation and Chunk check (chest compressions may open their airway and even if they don't open the airway give the injured party the best chance of survival).

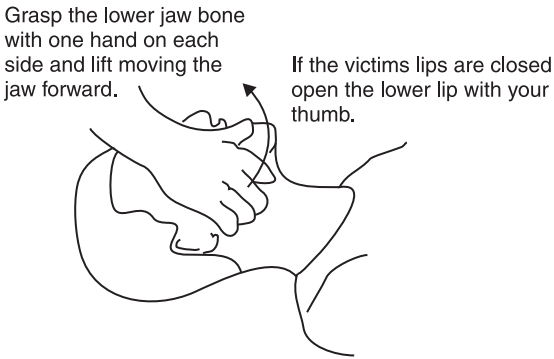


Figure 1.1. Jaw Thrust.

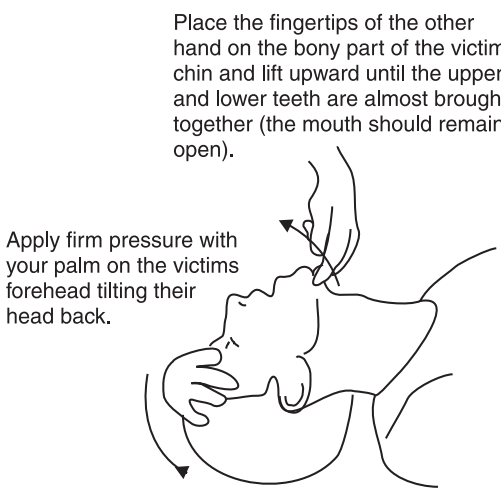


Figure 1.2. Head Tilt - Chin Lift.

1.4.3. C - Circulation and Chunk Check

Do a quick "Chunk Check" for severe bleeding. After donning gloves feel inside the injured parties clothes and under their body and look for blood. If they have a severe bleeding issue you should treat it before continuing (think spurting blood or blood rapidly running out of their body so bleeding to death is an immediate threat).

Circulation:

- Check for a pulse.
- If a pulse is absent, remove any clothing from the upper body (chest compressions must be skin to skin). Also, some women's bras may also include wires that can interfere with AEDs (see below).
- Kneel next to the injured parties head and shoulders.
- Place the heal of your hand in the center of the injured parties chest between their nipples with your other hand over the top of your first hand.
- Keeping your elbows straight press down on the persons chest to compress their chest approximately 2 inches.
- Push at a rate of 100 compressions per minute.
- Alternate 2 rescue breathes with 30 compressions.
- After 5 cycles of 2 breaths and 30 compressions, recheck for a pulse.
- If an Automatic External Defibrillator (AED) is available, turn the AED on and follow the prompts.
- In the wilderness without an AED and no hope of rescue, continue CPR until you are exhausted or it is no longer safe to continue.

1.4.4. D - Deformity and "Da Spine"

Check the injured person for deformities. In the wilderness any deformities are treated with traction in-line and splinting. Even if circulation appears to be intact in a limb it is unlikely to remain intact if the limb is deformed. In an urban environment as long as access to definitive care is available within a reasonable time frame immobilization is sufficient.

Da Spine:

Spinal injuries can lead to paralysis and the head and neck must be immobilized.

- Mechanism of injury (MOI) - if someone is unconscious assume a spinal injury.
- MOI for spinal - a fall 2 to 3 times their height, a fall where an axial load is applied to their body (head first fall onto a surface), or anything with sufficient velocity (car, motorcycle or bike accident), any fall that could hurt the head or neck.
- If MOI is present you must immobilize the head and neck and have the injured party lay still on their back until their spine is cleared (covered later).

1.4.5. Environment and Everyone Else

Get the injured person up onto a pad or blanket so they aren't lying on the cold ground. In the case of a MOI for a spinal you must immobilise their head and neck while moving them.

Keep the injured party warm and dry (winter) or cool and dry (summer). Keep them protected from wind, snow, sun or rain.

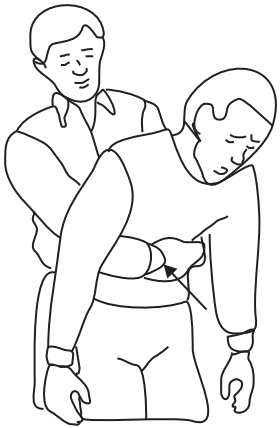
Look out for everyone else, is everyone staying safe, warm and dry (winter) or cool and dry (summer). Out of the sun etc.

1.5. Choking

Choking is really a subset of airway but deserved its own section because of the prevalence of choking in public places where the victim may still be conscious.

The recommended method for treating a conscious choking victim is five and five, five back blows followed by five abdominal thrusts known as the Heimlich maneuver:

- Stand behind the victim and wrap your arms around their waist.
- Tip the victim forward.
- Make a fist with one hand and position it slightly above the victims navel.
- Grasp you fist with your other hand and press hard into the victims abdomen with a quick upward thrust as if you are trying to lift them up.
- Do five upward compressions.
- If the victim is still choking repeat five back blows and five abdominal thrusts.
- If the victim become unconscious, lay them down on the floor and perform chest compressions.
- For obese of pregnant victims move the abdominal thrusts up to the bottom of the sternum.



- Stand behind the victim and wrap your arms around their waist.
- Tip them slightly forward.
- Make a fist with one hand and position it slightly above the victims navel.
- Grasp your fist with your other hand and pull your fist in with rapid upward thrusts as if trying to lift the person up.
- Perform five thrusts as needed.

Figure 1.3. Abdominal thrusts (Heimlich maneuver) to treat conscious choking victims.

2.0 Secondary Survey

Whereas the primary survey was concerned with immediate threats to life, the secondary survey is focused on finding and dealing with injuries that are not immediately life threatening. For that reason the entire secondary survey is typically performed and then a plan to treat the injuries that have been found is formulated. To insure that a consistent exam is performed and a complete picture of the injured person is developed, a single person should conduct the entire secondary survey.

2.1. History of Present Injury

If the injured person is conscious ask them what happened.

- Mechanism of Injury (MOI) - the circumstances in which the injury occurred, for example the injured party tripped and fell onto a rock.
- Nature of Injury or illness (NOI) - what is hurt, where does it hurt. Get as much information as possible about any pain, where does it hurt, describe the pain using the descriptive information outlined below. Also, at the time of the injury did the injured person hear or feel a pop or crack, and did they lose consciousness.

2.1.1. Describing pain

Use OPQRST:

- O - Onset - when and what started the pain.
- P - Palliate - what makes it feel better, what makes it feel worse.
- Q - Quality - sharp, dull, ache, etc.

- R - Region and Radiates - where is the pain and does it radiate to anywhere else.
- S - Severity - on a 1 to 10 scale how bad is the pain (0 is no pain, 10 is the worse pain possible).
- T - Time - is it getting better or worse, does it come and go.

2.2. Vital Signs

Take an initial set of vital signs and then repeat vital signs every 5 minutes for unconscious or unstable patients, or every 15 minutes for stable and conscious patients.

2.2.1. Level of consciousness

Level of consciousness is evaluated using the AVPU scale.

- A - Alert - a patient is alert and oriented times one (x1) if they know their name, times two (x2) if they know where they are and times three (x3) if they know the time.
- V - Verbal - the patient reacts to a verbal command or question but can't converse with you or answer questions.
- P - Pain - the patient responds to painful stimuli such as pinching them but not to your voice.
- U - Unresponsive - you get no response to verbal or painful stimuli.

A patient who is sliding down the AVPU scale becoming less alert and or responsive is having a serious medical emergency.

2.2.2. Heart rate

Heart rate is measured in beats per minutes, typically by measuring pulse at the wrist. A normal heart rate is 50 to 100 beats per minute. You should also note whether the rhythm is regular or irregular, and whether the quality is strong or weak.

2.2.3. Breathing

Breathing rate is measured in breaths per minutes. A normal breathing rate is 12 to 24 breathes per minute. Below 10 breathes per minute or above 30 breathes per minute you should rescue breathe for the injured person. You should also note whether rhythm is regular or irregular and whether the quality is, normal, gasping, or wheezing.

2.2.4. Pupils

Normal pupils are equal in size, round and reactive to light (contract when exposed to a bright light). This is referred to as PERRL (Pupils Equal Round Reactive to Light). Uneven pupil size or sluggish reaction to light may indicate a head injury.

2.2.5. Skin color, temperature and moisture

Normal skin is pink, warm and moist (for dark skinned people check inside their mucous membranes for color). Red, hot and dry indicates overheating, pale cool and clammy may indicate shock. Abbreviations are p/w/m for pink, warm and moist, r/h/d for red, hot and dry, p/c/c for pale cool and clammy.

2.3. Head to Toe Exam

The head to toe exam begins at the head and systematically evaluates the body working down to the toes. If the patient is conscious you should talk to them throughout the exam explaining what you are doing and asking them if anything hurts, if so ask them to describe the pain.

- Crepitus - a grating, popping or crackling feeling or sound when you push down on the patient due to the presence of air under the skin or in a joint. Indicates an injury.

Head to toe exam:

1. Check the head for any deformities, bleeding, crepitus or pain. Raccoon eyes or bruising behind the ears (Battle's sign) may indicate a head injury.
2. Check the neck and trachea. If the trachea is deviated to one side and neck veins are distended it indicates a lung injury on the side of the body opposite the direction of deviation.
3. Press on each shoulder with one hand over the shoulder and the other hand under the shoulder. Pain, excessive movement, or crepitus may indicate a shoulder injury.
4. Feel along each arm checking for deformity, pain or crepitus that may indicate a fracture.
5. Check each hand for circulation, sensation and motion (CSM). Touch the patients fingers and ask them which finger you are touching, have them also grip your fingers with their hand to test for movement and grip strength.

6. Press down on the clavicle (collar bone). Pain, crepitus or excessive movement may indicate a fractured clavicle.
7. Press inward on the ribs along the side of the body. Pain, crepitus or excessive movement may indicate a rib(s) fracture.
8. Press down on each of the four quadrants of the abdomen (see figure 2.1) looking for pain on initial pressure, guarding or rebound (pain when you release the pressure quickly) that may indicate an abdominal injury.
9. Push in and up on the hips and down on the pelvic bone. Pain, crepitus or excessive movement may indicate a hip or pelvic fracture.
10. Feel along each leg checking for deformity, pain or crepitus that may indicate a fracture.

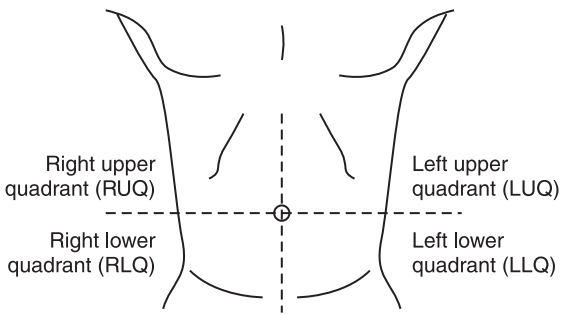


Figure 2.1. Abdominal quadrants.

11. Check each foot for circulation. sensation and motion (CSM). Check pedal pulse (or cap refill in a

toe by squeezing and releasing to see if the skin springs back and the toe pinks back up), ask the patient where you are touching them on the foot and have them "step on the gas" against your hand) to check motion and strength.

12. Check the spine feeling along each vertebrae checking for deformity, pain or crepitus that may indicate an injury. Check the entire back as well.

2.4. AMPLE Patient History

Patient history should be AMPLE:

- A - Allergies - is the patient allergic to any foods, medicines, insect stings, substances or other. Also, what happens, for example if a food gives someone a stomach ache it is less of a concern than if it makes them break out in hives.
- M - Medications - does the patient take any medications and if so when, why, how much, and where are they now.
- P - Past, Pertinent History - any prior medical history that is relevant to the current injury.
- L - Last Ins and Outs - when and what did they last eat, when did they last move their bowels and or urinate.
- E - Events - what happened.

2.5. Assessment

List out the injuries you have found in order of priority.

2.6. Plan

What are you going to do to address the injuries. The plan should be in the same order as the assessment.

2.7. SOAP Note

Subjective, Objective, Assessment and Plan note. A document that lists:

- S - Subjective information - what the patient told you.
- O - Objective information - what you measured and observed.
- A - Assessment - the injuries you found.
- P - Plan - what are you going to do.

You should send a copy of the SOAP note with the patient and keep a copy for your own records. This is an important document to protect you if anyone ever questions your treatment. A SOAP note may be considered a medical document and needs to be kept confidential.

The SOAP note that I recommend is posted at: http://www.georgetownfun.org/Miscellaneous/firstaid.html

There is also a simple SOAP note form on the back cover of this book.

3.0 Environmental Emergencies

Environmental emergencies are emergencies brought on by environmental conditions such as, altitude, animals, cold, heat, insects, and water.

3.1. Altitude

The density of air drops 17% to 20% for each 5,000 feet of altitude gained. The percentage of oxygen in the air stays the same at roughly 21%, but the less dense air means less oxygen molecules are available as altitude increases.

3.1.1. Acute Mountain Sickness (AMS)

AMS can begin to occur as low as 6,500 feet but generally isn't seen until above 8,000 feet.

AMS symptoms:

- Lack of appetite, nausea or vomiting.
- Fatigue or weakness.
- Dizziness or lightheadedness.
- Insomnia.
- Pins and needles feeling in extremities.
- Shortness of breath on exertion.
- Nose bleeds.
- Persistent rapid pulse.
- Drowsiness.
- Swelling of hands, feet and face.
- Diarrhea.

Treatment for AMS:

- The only reliable treatment for AMS is descent to a lower altitude.
- Oxygen may be used for mild to moderate AMS below 12,000 feet.

3.1.2. High Altitude Pulmonary Edema (HAPE) and High Altitude Cerebral Edema (HACE)

AMS can progress to HAPE or High Altitude Cerebral Edema (HACE) that are both life threatening emergencies.

Symptoms of HAPE

Symptoms, at least two present:

- Difficulty breathing at rest.
- Coughing.
- Weakness or decreased exercise performance.
- Chest tightness or congestion.

Signs, at least two present:

- Crackles or wheezing (while breathing) in at least one lung.
- Central cyanosis (blue skin color).
- Tachypnea (rapid shallow breathing).
- Tachycardia (rapid heart rate).

Symptoms of HACE

Common symptoms in order of appearance:

1. Confusion.
2. Changes in behavior.
3. Fatigue.
4. Ataxia (gross lack of coordination).

5. Difficulty speaking.
6. Vomiting.
7. Hallucinations.
8. Blindness.
9. Paralysis of a limb.
10. Seizures.
11. Unconsciousness.
12. Total paralysis.
13. Coma.

Treatment for HAPE or HACE

The treatment for HAPE and HACE is the same, descend at least 3,300 feet immediately.

3.2. Cold

Health issues caused by exposure to cold temperatures. Wet and windy conditions increase the effect of cold on the human body.

3.2.1. Cold water immersion

Immersion in cold water is a hazard for anyone who participates in recreational, commercial or military activities in the oceans, lakes, and streams in all but the tropical regions of the world.

- The temperature of thermally neutral water, in which heat loss balances heat production for a nude subject at rest (i.e., not shivering), is approximately 91-95^{o}F. Hypothermia eventually results from immersion in water below this temperature.
- For practical purposes, significant risk of immersion hypothermia usually begins in water colder than

77^{O}F which in North America is nearly universal during most of the year.

- Cold water immersion causes a cold shock response in the first 1 to 4 minutes of immersion.
- Cold shock leads to an immediate gasp response, inability to breath-hold and hyperventilation.
- The gasp response can cause drowning if the head is submerged.
- Hyperventilation can lead to decreased blood flow to the brain leading to disorientation and unconsciousness.
- Skin cooling can lead to increased loading on the heart causing irregular heart rate or cardiac arrest.
- After the initial cold shock response peripheral cooling can lead to loss of motor control and inability to self save.

Cold water safety:

- Try to enter the water without submersing the head.
- Escape out of the water as quickly as possible.
- Minimize exposure, get as much of your body out of the water as possible.
- Ensure flotation if you must remain in the water.
- Call for help.

Cold water immersion treatment:

- Remove the victim from the water slowly, rapid withdrawal can cause a sudden drop in blood pressure.
- Remove the victim from the water horizontally if possible and place them in a supine position.

- Moderate rewarming if practical.
- Minimize the victims activity to minimize afterdrop, a continued drop in temperature.
- Immediate evacuation.

3.2.2. Hypothermia

Lower than normal body temperatures caused by exposure to low temperatures. Hypothermia begins to develop when your body loses heat faster than it can generate heat. Wet conditions and wind increase the cooling effect of low temperatures. When you are wet you lose heat 26 times faster than when you are dry. Insulating the body reduces heat loss, activity, eating and drinking increase heat generation.

Stage 1 hypothermia symptoms:

- Body temperature 96.8 to 95.0^{o}F.
- Mild to strong shivering.
- Unable to perform complex tasks with hands, hands become numb.
- Goose bumps form.
- May be nauseous and tired.
- May start to experience a warm sensation, be unable to touch thumb to little finger and have trouble seeing as hypothermia progresses.

Stage 1 treatment:

- Remove wet clothing.
- Insulate with blankets, sleeping bags and warm clothing.
- Give warm liquids if tolerated.

- Do not put a second person in a sleeping bag with a hypothermic person to warm them, you can end up with two hypothermic people.
- Well hydrated and insulated the victim can walk out if necessary.

Stage 2 hypothermia symptoms:
- Body temperature 94.8 to 91.0^{o}F.
- Shivering becomes more violent.
- Lack of muscle coordination becomes apparent.
- Movements are slow and labored accompanied by stumbling pace and mild confusion although the person may appear alert.
- Surface blood vessels further constrict limiting heat to only critical organs. The victim becomes pale, fingers and toes may turn blue.

Stage 2 treatment:
- Gently remove wet clothing.
- Insulate with blankets, sleeping bags and warm clothing over and under the victim.
- Handle the victim very gently, no massaging. Rough treatment can lead to a heart attack.
- Keep the victim horizontal.
- Place hot water bottles or heat packs in the groin and neck areas but avoid thermal burns.

Stage 3 hypothermia symptoms:
- Body temperature <89.6^{o}F.
- Shivering usually stops.
- Difficulty speaking, sluggish thinking and amnesia.

- Inability to use hands and stumbling.
- Cellular processes shut down.
- The victims body releases warm fluids from the core back out to the extremities. The victim may then feel warm and start taking off their clothes and cooling themselves further.
- Below 86^{o}F exposed skin becomes blue and puffy, coordination is very poor, incoherent/irrational.

Stage 3 treatment:
- Check for carotid pulse for 1 minute, unnecessary CPR can cause a heart attack.
- Look, listen and feel for breathing, chest movement may not be apparent.
- If needed, CPR and warming should be continued until the victim reaches the hospital or you can no longer safely perform it.

3.2.3. Frost Bite

An injury caused by freezing of the skin and underlying tissue.

1st degree frostbite symptoms:
- Localized reduction of blood flow but no ice crystal formation.
- The affected area is cold numb and pale but still soft and pliable to the touch.

1st degree frostbite treatment:
- Re-warm the area with skin to skin contact.
- Determine why the area got cold and address the problem.

2nd degree frostbite symptoms:

- Localized reduction of blood flow and ice crystal formation.
- The affected area appears the same as 1st degree frostbite except there is pain on thawing and the formation of clear or blood filled blisters.

2nd degree frostbite treatment:

- Re-warm skin to skin.
- If blisters form, evacuate immediately.
- Beware of refreezing that can occur quickly.

3rd degree frostbite symptoms (full thickness):

- The affected areas is frozen and numb, cold, white and waxy to the touch.

3rd degree frostbite treatment:

- Do not re-warm in the field, it will be extremely painful and requires a hospital.
- Insulate the area to prevent further freezing and evacuate.

3.3. Heat

Health issues caused by exposure to high temperatures.

3.3.1. Dehydration

Dehydration is when the body has less fluid than it needs for normal metabolic function.

Dehydration can result from insufficient fluid intake and or excess fluid loss due to sweating, vomiting or diarrhea.

Symptoms of dehydration:

- Dry or sticky mouth.
- Loss of consciousness (severe).
- No tears or sunken eyes.
- Low blood pressure or drop in blood pressure when you go from lying down to standing up.
- Delayed capillary refill or inelastic skin.
- Low or no urine output or dark urine.

Light colored to clear urine. Well hydrated, drink water normally.

Slight yellowish color urine. Hydration level OK, drink a small glass of water.

Yellow/gold colored urine. Hydration level lower than normal. Drink 1/4 liter of water or a 1/2 liter if you are outside or sweating.

Brownish/gold colored urine. Dehydrated. Drink ½ liter of water right away or 1 liter if outside or sweating.

Brownish colored urine. Dehydrated. Drink 2 liters of water right away. If your urine is darker than this or red brown you may have other problems.

Figure 3.1. Urine color and dehydration.

In high fluid loss situations an oral rehydration mixture should be used to insure electrolytes are being replenished along with fluids. Either a dilute sport drink can be used or water with 2 tablespoons of sugar and 1/2 teaspoon of salt per liter should be used. If electrolytes are being rapidly lost, for example through profuse sweating, and large volumes of water are consumed, water intoxica-

tion (water poisoning) can occur, a potentially fatal condition.

3.3.2. Heat exhaustion

Heat exhaustion is caused by overexertion in a hot and humid environment causing fluid loss, dehydration and overheating. In high humidity, sweating does not cool the body as effectively as in dry conditions.

Heat exhaustion symptoms:

- Often pale with cool moist skin.
- Sweating profusely.
- Muscle cramps or pain.
- Feeling faint or dizzy.
- May complain of a headache, weakness, thirst, nausea.
- Core (rectal) temperature >100^{o}F and increased pulse.

Heat exhaustion treatment:

- Rest in a cool shaded place.
- Give cool fluids and salty snacks, no caffeine.
- Loosen or remove clothing.
- Apply cool water to skin, not rubbing alcohol.
- Avoid heat or strenuous activity for several days.

3.3.3. Heat stroke

If heat exhaustion is not addressed, heat exhaustion can progress to heat stroke, a life threatening emergency.

Heat stroke symptoms:

- Unconscious or altered mental state.
- Flushed hot and dry skin (may be moist from previous sweating or attempts to cool the victim).
- May have initially high blood pressure that falls later.
- May be hyperventilating.
- Core (rectal) temperature >105^{o}F. The maximum survivable temperature is 107^{o}F.

Heat stroke treatment:

- Heat stroke is a life threatening emergency, evacuate immediately.
- Move the victim to a cool shaded place.
- Moisten skin with luke warm water and fan them.
- Cold packs may be placed in the arm pits and groin.
- You want to cool the victim quickly but do not over cool leading to shivering, shivering generates 5x the heat while using 10x the energy.
- Give fluids if the victim is conscious.

3.4. Insect Bites and Stings

3.4.1. Bee and wasp stings

Many people lump bees and wasps together but bees and wasps inject different venoms and the most effective treatments are different.

- Bumble bee - Size 1-1/16”, large hairy bees that collect and carry pollen back to the hive.
- Honey bee - 5/8”, brown or black with yellow-striped abdomens.

- Yellow Jacket (also known as a hornet or wasp) - Size: 5/8” to 1”, Color: Black and yellow or black and white, They have a thin waist.
- Hornet - the largest of the wasp family can reach up to 2.2" in length, they have a narrow waist.
- Wasp - size 3/4” to 1" long, shiny body, narrow waist.

Figure 3.2. Bees - bumble bee (left side), honey bee (right side).

Figure 3.3. Wasps - yellow jacket (left side), wasp (center), hornet (right side).

Bee sting treatment:

- Remove the stinger by scrapping a plastic credit card across the sting (bumble bees only, honey bees do not leave a stinger behind). Don’t use tweezers, you will likely collapse the venom sack spreading the venom under the skin.
- Bees inject an acid venom, After Bite is an ammonia based treatment that helps to neutralise the acid.

- Apply ice.
- Give diphenhydramine to reduce swelling.
- If the bite victim develops severe swelling of the face, tongue and lips, weakness, dizziness or has trouble breathing or swallowing they are having an anaphylaxic reaction and need an Epi pen followed by diphenhydramine and hospitalization.

Wasp sting treatment (includes yellow jackets and hornets):

- No stinger is left behind.
- Wasps inject an alkali venom, apply lemon juice or vinegar to neutralize the alkali.
- Apply ice.
- Give diphenhydramine for swelling.
- If the bite victim develops severe swelling of the face, tongue and lips, weakness, dizziness or has trouble breathing or swallowing they are having an anaphylaxic reaction and need an Epi pen followed by diphenhydramine and hospitalization.

3.4.2. Mosquitoes

In North America the primary mosquito born diseases are West Nile Virus and Eastern Equine Encephalitis (EEE).

West Nile Virus

Roughly 80% of people infected with West Nile have no symptoms. Most symptomatic cases have no neurological involvement and develop fever, headache, muscle pain aches, nausea vomiting and rash 2 to 15 days after being bitten. In approximately 1% of cases severe neurological disease results, typically in the very young, very old or

people with suppressed immune systems. There is no specific treatment although supportive measures are helpful. Recovery can take 60 to 90 days, or over a year if there is neurological involvement.

Eastern Equine Encephalitis (EEE)
Only approximately 4% of humans infected with EEE develop symptoms with approximately one third of symptomatic individuals developing severe brain damage. Symptoms are high fever, muscle pain, altered mental status, headache, sensitivity to light and seizures. Symptoms occur in 3 to 10 days and there is no cure.

Prevention:
For both West Nile and EEE the key is to avoid being bitten by infected mosquitoes:

- Minimize exposed skin.
- Use insect repellents and nets.
- Avoid standing water outside your house.
- Avoid going outside around dusk and dawn when mosquitoes are most active.

3.4.3. Spider bites

Poisonous spiders found in North America include the black widow and brown recluse. Found primarily in the South West they are sometimes found in other regions after being accidentally transported inside various items.

- Black widows are black with a red spot or hour glass mask.
- Brown recluses are golden brown with a dark brown or black fiddle shaped mark.

Figure 3.4. Spiders - black widow (left side), brown recluse (right side).

Black widow bite symptoms:

- Local pain followed by local or general muscle cramps, abdominal pain, weakness or tremor.

Black widow bite treatment:

- Apply cold compresses.
- Treatment for a serious reaction requires narcotics and antivenom in a hospital setting.

Brown recluse bite symptoms:

- May not hurt initially or may feel like a bee sting.
- Severe pain at the site of the bite after about 4 hours.
- Severe itching.
- Nausea.
- Vomiting.
- Fever.
- Muscle pain

Brown recluse bite treatment:

- Apply cold compresses.
- Elevate the bite above the heart.
- Wash the area with cool water and soap.

- Avoid strenuous activity.
- See a doctor right away.

Prevention

Both spiders are shy and avoid humans. Black widows tend to be found around wood piles, outdoor toilets, meter boxes and other undistributed places. Black widows will bite if touched or pressed. Brown Recluse spiders tend to be found basements and garages hiding behind boards and boxes or even in clothes or towels. They bite only when threatened.

3.4.4. Ticks

Tick bites can transmit a number of different illnesses including, lyme disease, babesiosis and anaplasmosis (most common) and human granulocytic anaplasmosis, tularemia and rocky mountain spotted fever (less common).

Anaplasmosis

- Caused by a parasite.
- Severe anemia may develop and result in cardiovascular changes such as an increase in heart rate.
- Haematuria may occur due to the lysis of red blood cells.
- General systemic signs such as diarrhea, anorexia and weight loss may also be present.
- Treatment usually involves a prescription of doxycycline or a similar class of antibiotics.

Babesiosis

- Babesiosis is caused by a parasite.

- Most cases of Babesia infection are asymptomatic, but can include mild fevers and diarrhea.
- The symptoms are often unnoticed or unexplained.
- In more severe cases, there are symptoms similar to malaria, with fevers up to 105°F, shaking chills, and severe anemia (hemolytic anemia). Organ failure may follow, including adult respiratory distress syndrome.
- Severe cases occur mostly in people who have had their spleen removed surgically. Severe cases are also more likely to occur in the very young, very old, and persons with immunodeficiency, such as HIV/AIDS patients.
- For ill patients, treatment is usually a two-drug regimen, quinine and clindamycin (often poorly tolerated) or atovaquone and azithromycin. In life-threatening cases, exchange transfusion is performed. In this procedure, the infected red blood cells are removed and replaced with uninflected ones.

Lyme Disease

- Lyme disease is a bacterial infection.
- Three to thirty days after a tick bite a red ring or expanding rash may be seen around the bite site (80% of infected patients).
- Flu like symptoms may occur such as headache, fatigue, headache, fever and chills.
- Longer term symptoms can include continuing fatigue, joint stiffness and pain, neurological symptoms including loss of facial muscle tone, loss of

memory, sleeplessness and mood changes. Severe and chronic symptoms can occur in untreated patients.

- Lyme disease is typically treated with antibiotics for 10 to 28 days such as doxycycline in adults, amoxicillin for children and erythromycin for pregnant women.

3.5. Lightning

- The difference in time between seeing lighting and hearing thunder is 5 secs/mile.
- Storms typically travel 30 to 35 miles per hour.
- Be prepared for high winds, heavy rain and hail.
- Spread out groups, 30’ to 50’ apart.

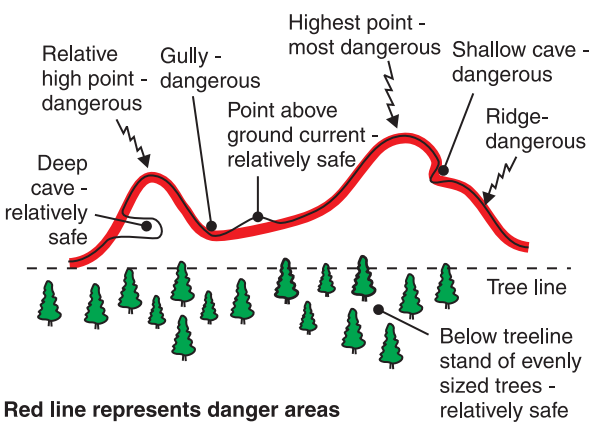


Figure 3.5. Lightning safety.

Lightning avoidance:

- Wooded areas are good.
- Exposed areas and high points are bad.
- Stay away from water.
- Deep caves are OK as long as they aren't damp, shallow caves are not OK.

Symptoms of lightning injury:

- Lack of coordination.
- Burns.
- Cardiac problems.
- Can be injured by direct hit, splash effect or ground current.

Treatment for lightning injuries

- Emergency medical assistance should be called for any person who has more than a minor injury. Because the extent of an electrical burn may be deceptive, medical assistance should be sought if any doubt exists regarding severity.
- The victim should be checked for abnormal heart rhythms, fractures, dislocations, and spinal cord or
- other injuries.
- CPR and life support as needed
- Monitor for signs of heart problems.
- Treat any burns (see section 6.5).
- Treat any trauma injuries.

3.6. Poison Ivy, Oak and Sumac

Poison ivy and oak leaves come in clusters of three, sumac has a row of paired leaves with one leaf at the end.

All three grow as shrubs, ivy and oak can be vines as well.

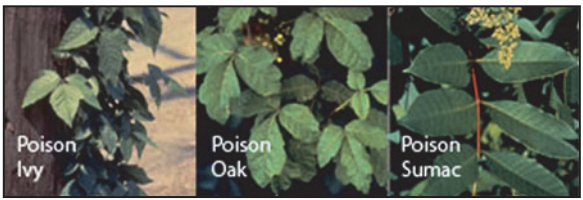


Figure 3.6. Poison ivy, oak and sumac.

Poison ivy, oak and sumac facts:

- Poison ivy, oak and sumac all contain urushiol oil.
- Urushiol is present in the leaves, vines and roots (even in winter).
- Contact with urushiol may cause itching and rash.
- The oil is difficult to remove and can persist on clothes, gloves and tools for years.

Poison ivy, oak and sumac prevention and treatment:

- Recognize and avoid the plants.
- Wear long pants, shirts, gloves and boots.
- Use products that contain bentoquatam to block the oil.
- Special soaps such as Technu can remove the oil but must be used within 20 minutes of exposure to prevent reactions.
- Hydrocortisone cream, calamine lotion and oatmeal baths can help with itching.

- Oral antihistamines such as diphenhydramine can help with the itching.
- Prescription strength hydrocortisone and in severe cases oral steroids may be needed to clear up the rash.

3.7. Snake Bites

There are roughly 45,000 snake bites per year in the US of which approximately 8,000 are venomous. The 8,000 venomous bites result in roughly 6 deaths per year.

In the united States there are two main classes of poisonous snakes:

- Pit Vipers - rattlesnakes, copperheads, cottonmouths (water moccasins). Pit vipers have a characteristic pit between the eyes, triangular heads and elliptical pupils. Found in most states expect Maine and Alaska. Pit vipers bite with two fangs that leave one, two or even three puncture marks. 25% to 30% of pit viper bites are dry and inject no venom. Rattlesnakes without rattles are becoming common. Pit viper venom is a hemotoxin that also destroys local tissue.
- Elapidae - two specie of coral snakes. Coral snakes have red, black and yellow or white bands. Found primarily in the south. Elapidae have short fangs and bite by chewing. Coral snakes inject a neurotoxin that does not destroy tissue locally.

Most adults can survive a rattlesnake bite, in children it is often fatal.

Treatment for bites:

- Keep the victim calm and minimize movement.
- Identify the snake if it is safe to do so.
- Venom travels through the lymphatic system.
- For a coral snake bite wrap elastic bandages around the limb above and below the bite as a lymph constrictor (not a tourniquet). Do not do this for pit viper bites unless a hospital is more than a few hour away. Locally restricting pit viper venom increases tissue destruction.
- For pit viper bites to the arm, sling and swath the arm.
- Evacuate immediately. For children carry them out immediately.
- Sucking out the venom by mouth or with a suction device such as a Sawyer Extractor is no longer recommended by experts.

4.0 Medical Emergencies

Medical emergencies are body wide systemic problems that can be life threatening.

4.1. Allergic Reactions

Overreactions to stimuli by the immune system.

4.1.1. Common allergic triggers

- Insect stings - bees, wasps and fire ants.
- Foods - the eight most common food allergies are: eggs, dairy, wheat, soy, tree nuts, peanuts, fish, shell fish (crustaceans).
- Medications - antibiotics (penicillin, amoxicillin, etc.), aspirin and ibuprofen, iodine, anesthetics (local or general).
- Others - latex, dust, pollen, mold, animal dander, poison ivy, oak or sumac, detergent, hair dyes, tattoo ink.

4.1.2. Minor allergic reactions

Most reactions are minor with rashes and sneezing the most common. Rashes can be treated with hydrocortisone and sneezing by antihistamines such as loratadine (brand name Claritin or Alavert).

4.1.3. Anaphylaxis

Anaphylaxis is a massive overreaction by the immune system triggered by histamines. Anaphylaxis is a life threatening emergency.

Symptoms of anaphylaxis:

- Hives, skin redness, swelling.
- Wheezing, coughing, chest tightness, hoarseness, shortness of breath.
- Difficulty swallowing, nausea, vomiting, diarrhea, abdominal pain.
- Low blood pressure, seizures.
- Shock.
- Fluid build up in the face, lips, tongue and larynx (can block the airway).
- The faster the reaction develops, the more severe it is.

Treatment for anaphylaxis:

- Obtain and maintain an airway.
- Administer epinephrine (many allergic people carry Epi pens).
- If the victim is conscious administer diphenhydramine.
- Treat wheezing with albuterol if available.
- Transport to the hospital as soon as possible even if the symptoms appear to have resolved with treatment.

4.2. Asthma Attack

Asthma is a chronic inflammatory disease of the airways characterized by variable and recurrent symptoms such as reversible airway obstruction and broncospasm.

4.2.1. Asthma triggers and symptoms

- Triggers for an asthma attack include various illnesses, environmental factors such as allergens or cold air, stress and exercise.
- Symptoms include wheezing, shortness of breath, chest tightness and coughing.
- Word dyspnea - unable to count to ten on one breath.
- Most people who have asthma are aware they have it.

4.2.2. Treatment

- Most people with Asthma will have an albuterol rescue inhaler to take in the event of an asthma attack.
- Keep the victim calm.
- Encourage pursed-lip breathing.
- Consider evacuation.

4.3. Cardiac Emergency

A heart attack or myocardial infarction is a partial or complete blockage of an area of a coronary artery resulting in death of part of the heart muscle.

4.3.1. Heart attack symptoms

- Substernal chest pain that may radiate to the jaw, arms or back.
- Shortness of breath (gets worse with exertion).
- Sense of impending doom.
- Low blood pressure (hypotension).
- Nausea.
- Skin is pale, cool and clammy.
- Cardiogenic shock.

4.3.2. Heart attack treatment

- Calm the patient down and have them rest.
- Place them in a position of comfort (typically sitting up).
- If conscious administer 4 - 81mg chewable aspirin (check for aspirin allergy first).
- Give oxygen if available.
- Evacuate immediately.

4.4. Diabetic Emergency

Diabetic emergencies can be either hyperglycemia or hypoglycemia:

- Hyperglycemia - too much blood sugar, >140 mg/dl.
- Hypoglycemia - too little blood sugar, <80 mg/dl.

There are two types of diabetes:

- Type 1 diabetes - insulin dependent, requires regular injections of insulin.
- Type 2 diabetes - cells resist insulin or too little insulin is produced. Control with diet, exercise and oral medication.

4.4.1. Hyperglycemia symptoms:

- Lack of hunger.
- Excessive thirst.
- Nausea and vomiting.
- Abdominal pain.
- Irritability, restlessness, “drunken” behavior.
- Skin tenting.
- Warn, dry or pale skin.
- Rapid, thready pulse.
- Kussmaul’s breathing - deep and labored.

- Acetone breath.
- Low blood pressure.

4.4.2. Hyperglycemia treatment:

- If unconscious and you are not sure whether it is hyper or hypo glycemia, rub glucose or cake frosting onto the gums. If hypo they will wake right up, if hyper the sugar isn't enough to matter.
- Evacuate.

4.4.3. Hypoglycemia symptoms:

- Hunger.
- No thirst.
- Headache.
- Dilated pupils.
- Dizziness.
- Confusion, stupor or unconscious.
- Skin is pale, cool and clammy.
- Rapid, full pulse.
- Normal blood pressure.
- Breathing normal to shallow.

4.4.4. Hypoglycemia treatment:

- If conscious give simple sugars.
- If unconscious rub glucose or cake frosting into the gums.
- Evacuate.

4.5. Shock

Shock is when blood is not profusing throughout the body properly.

4.5.1. Three types of shock:

1. Cardiogenic - heart issues resulting in a low flow of blood. Heart attack, electrocution, insult/injury to the heart.
2. Hypovolemic - not enough blood volume. Caused by bleeding or dehydration.
3. Neurogenic - low blood pressure due to injuries to the spine. Everything distal to the spinal injury isn't getting signals from the brain, the blood vessels dilate dropping the blood pressure.

4.5.2. Three levels of shock and symptoms:

The type of shock is not as important as the level of shock. Treat shock early so it doesn't progress.

1. Compensated shock - pulse increases and becomes weak over time, rapid shallow breathing, initially normal skin becomes pale, cool and clammy over time, very anxious initially, becomes disoriented and combative. Treat compensated shock early to prevent progression to uncompensated shock. If untreated adults progress gradually to uncompensated shock, children progress to uncompensated shock very quickly.
2. Uncompensated shock - pulse drops, breathing drops, blood pressure drops, skin is pale, cool and clammy, level of consciousness drops through the AVPU scale.
3. Irreversible shock - death.

4.5.3. Treatment for shock

Cardiogenic shock treatment:
- Give chewable aspirin as long as the victim is not allergic to aspirin.
- Rest, have them lie down, calm them down.
- Help them with heart medication if they have any.
- Evacuate.

Hypovolemic shock treatment:
- Calm down the victim.
- Give fluids.
- Gently lift the feet.

Neurogenic shock treatment:
- Can be caused by hypothermia and certain illnesses such as diabetes, anaphylaxis, sepsis, spinal cord injury and drugs.
- Treat underlying cause.

4.6. Stroke

A stroke is an interruption of blood flow to part of the brain.

4.6.1. Two types of stroke:

- Ischemic stroke - a blockage in a blood vessel that supplies the brain.
- Hemorrhagic stroke - a blood vessel that supplies the brain bursts open allowing blood to leak into the cranium.

4.6.2. Stroke recognitions

STR - Smile, Talk, Raise:

- S - Smile - ask the person to smile, is it symmetric?
- T - Talk - ask the person to say a simple sentence. Is it clearly stated and coherent?
- R - Raise - ask them to raise both arms, can they raise both arms equally?

4.6.3. Stroke treatment:

- Keep the patient quiet and comfortable.
- Evacuate immediately.

5.0 Orthopedic Injuries

Injuries to the musculoskeletal system. The musculoskeletal system provides the body with structure and the ability to move.

5.1. Orthopedic Definitions

- Bones - the dense semi rigid tissue that makes up the skeleton.
- Cartilage - flexible connective tissue found in the joints and ribs.
- Ligament - fibrous tissue that connects bones to other bones.
- Muscle - a type of tissue that contracts when activated by nerve fibers. Muscles move the bones.
- Tendon - a fibrous tissue that connects muscles to bones.

5.2. Dislocations

A separation of two bones from each other at a joint where the bones normally meet.

5.2.1. Dislocation symptoms

You should see an obvious deformity at the joint. Dislocations are typically very painful.

5.2.2. Dislocation treatment:

- Check circulation, sensation and motion (CSM) distal to the injury. Even if you have good CSMs initially you will likely lose them eventually.
- If you are more than one hour from definitive care try to reposition the injury back into place (see figure 5.1).

- Always evacuate even is repositioning is successful.

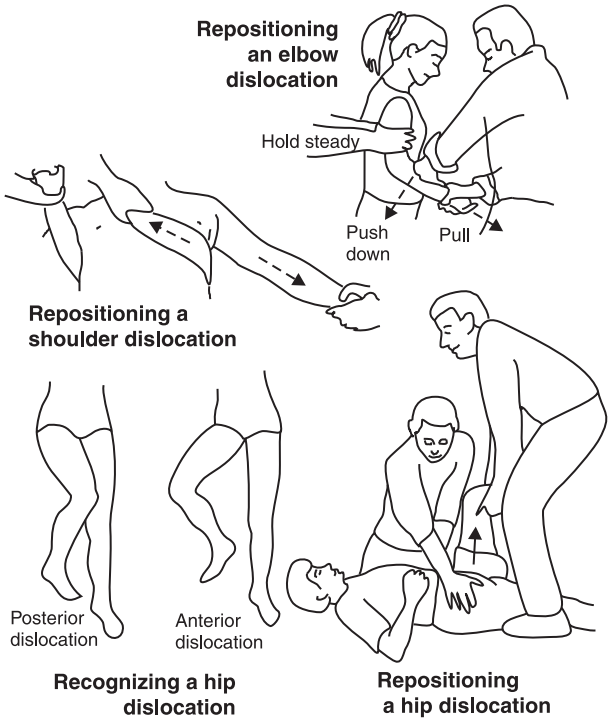


Figure 5.1. Recognition and treatment of dislocations.

- After repositioning splint the injury immobilizing the joint and the bones above and below the joint.
- Always recheck CSMs after splinting.

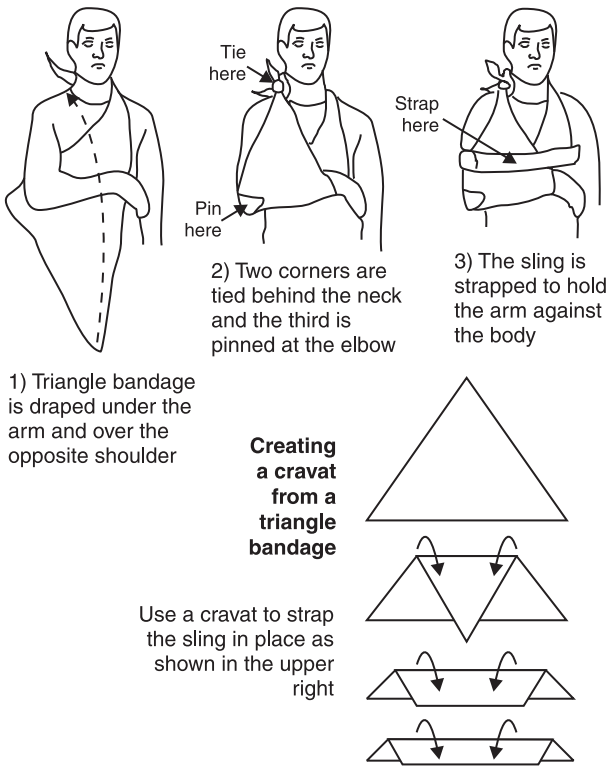


Figure 5.2. Triangle bandage use as a sling and as a cravat.

5.3. Fractures

Fractures are breaks in the bones.

5.3.1. Two types of fractures:

- Closed fracture - the fracture doesn't penetrate the skin.
- Open fracture - the end of the broken bone sticks out through the skin.

5.3.2. Symptoms of fractures:

- Localized pain (as opposed to sprains and strains that have diffuse pain).
- Swelling.
- The victim may have heard the bone break.
- If the break is angulated you will see a deformity.

5.3.3. Fracture treatment

- Check circulation, sensation and motion (CSM) distal to the injury.
- If CSM is decreased pull traction in-line.
- If the fracture is angulated and you are more than one hour from definitive care, use traction in-line to reposition.
- If an open fracture is present and you are more than six hours from definitive care, rinse with one liter of clean water, apply povodine iodine and cover with a sterile dressing.
- Splint to immobilise the break and the joint above and below the break.
- If the femur is fractured and angulated the muscles are so strong that continuous traction is required.
- Traction in-line should reduce pain, not increase it.

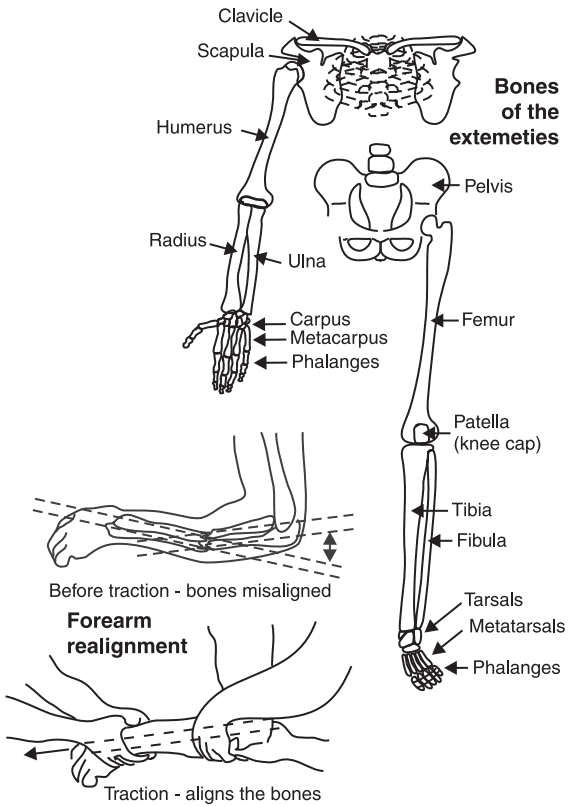


Figure 5.3. Bones of the extremities and forearm realignment.

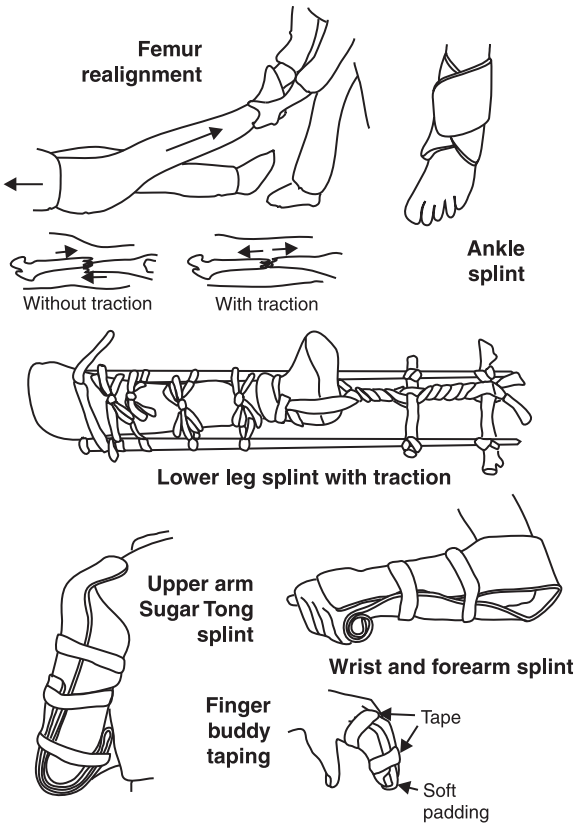


Figure 5.4. Realignment and splinting.

5.4. Spinal Injuries

For any mechanism of injury for a spinal (see section 1.4.4) the head and neck should be immobilised and the victim should lie on their back until the spine is cleared (although research has shown the initial injury does the damage and secondary injury is rare).

5.4.1. To clear a spine

1. The patient must be sober, conscious and alert, AOx3.
2. No painful distracting injuries, although if you can treat the distracting injury so it is no longer distracting you can continue.
3. No pain in the back.
4. No radiating pain, tingling or numbness.
5. Intact CSMs in all four extremities.
6. No pain on spinal check.
7. Without assistance the patient is able to flex, extend, rotate upper and lower back without pain. The motion should be symmetrical, no locking sensation or limited range of motion.
8. If neck or spinal pain comes on later you need to immobilise.

5.5. Sprains and Strains

- Sprains - pulls in the tendon or ligament around the joint.
- Strains - tears in the muscles, usually near a tendon.

5.5.1. Symptoms of sprains and strains:

- Diffuse pain around the joint for a sprain, diffuse pain in the muscle for a strain.

- Throbbing.
- Tender.
- Swelling.
- Bruising.
- Decreased range of motion and weight bearing for a sprain, tight and tense for a strain.

5.5.2. Treatment for sprains and strains

Treatment is identical for sprains and strains. The standard is RICE:

- R - Rest - rest the injury.
- I - Ice - wet + fan if no ice is available, cold dirt or moss. Ice, 20 minutes on and 20 minutes off for the first hour, then 20 minutes per hour. Every one hour delay before icing adds a day to the recovery.
- C - Compression - wrap with an elastic bandage.
- E - Elevation - elevate the injured area.

6.0 Soft Tissue Injuries

Soft tissue injuries include blisters, burns, bruises and bleeding injuries.

6.1. General Characteristics

- Frequently bleed, be aware of the need for body substance isolation.
- Arteries are the blood vessels carrying oxygenated blood from the heart out to the body and have relatively high pressure (100 to 120 mm Hg).
- Veins are the blood vessels that return blood to the heart and have relatively lower pressure (10 to 20 mm Hg).
- Elevation and pressure will control bleeding in almost all wounds. The exception are severed arteries or if the injured party is on certain medications.

6.2. Abrasions

Abrasions involve only the very surface of the skin and typically do not bleed much, for example skinned knees and elbows. Abrasions should be scrubbed thoroughly to clean them, air dried, and then a thin layer of anti biotic ointment should be applied and the abrasion covered with a sterile dressing.

6.3. Amputation

Amputations may include severing of a major artery such as in the arm or the leg. Severed arteries tend to retract making them difficult to locate and pinch off. In the case of a limb amputation a tourniquet placed approximately 2 inches proximally to the amputation may be required. The

tourniquet should be approximately 1 inch wide and tightened until bleeding stops. Do not place a tourniquet directly on a joint. The tourniquet should not be removed until a hospital is reached or if evacuation is not possible you will have to make a decision on when to try loosening it. The site of the amputation should be covered with a moist dressing and the amputated limb or digit should be placed in a water tight bag and placed on ice.

6.4. Blisters

The best treatment for blisters is not to get them in the first place. Clean dry socks that wick moisture and properly fitting well broken in shoes will prevent most blisters. If you feel a blister starting to develop cover the "hot spot" with mole skin or medical tape to prevent friction and further damages.

6.4.1. Blister treatment

- Closed blister, < 1 inch - protect the blister with a small donut of mole foam.
- Closed blister >= 1 inch - drain the blister with a sterile needle. Apply antibiotic ointment and a sterile bandage.
- Open blister - cover with a moist sterile dressing such as a Spenco blister pad.

6.5. Burns

Burns present multiple issues, one is the high risk of infection and the second is fluid loss. Burns that are severe and or large area can be life threatening. Burning also continues for some time in the deep layers of skin and burn cooling is essential.

6.5.1. Burn classification

- Superficial - typically caused by sun light (sun burn) or very short flame exposure. Superficial burns are dry and red, blanches (turn white with light pressure) and are painful.
- Superficial - partial-thickness - typically caused by a scald or short flame exposure. Superficial - partial-thickness burns form blisters, are red and weeping, blanches, are painful to air and temperature.
- Deep - partial-thickness - typically caused by a scald, oil or grease. Deep - partial-thickness burns are wet or waxy dry, variable color, do not blanch and only feel pressure.
- Full thickness - typically caused by an immersion scald, flame, steam, oil, grease, chemicals, or high voltage. Full-thickness burns are waxy white to leathery gray to charred and black, dry inelastic, do not blanch and feel deep pressure only.

6.5.2. Total body surface area (TBSA)

TBSA may be estimated by the rule of nines (see figure 6.1)

6.5.3. Burn criteria

- Minor - <10% of TBSA adult, <5% TBSA in the young or old, <2% TBSA full thickness burn. May be treated on an outpatient basis.
- Moderate - 10% to 20% of TBSA adult, 5% to 10% TBSA young or old, 2% to 5% full thickness, circumferential, inhalation or other medical issues. Requires hospitalization.

- Major - >20% TBSA adult, >10% TBSA young or old, >5% TBSA full thickness, known inhalation, any significant burn to the face, eyes, ears, genitalia or joint, other associated major trauma. requires burn center treatment.

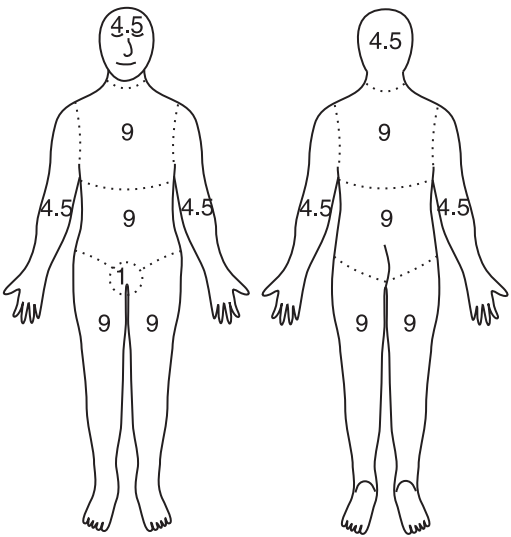


Figure 6.1. Rules of nines for estimating TBSA.

6.5.4. Burn treatment

- Superficial - soak in cool water or water-milk mix. Apply aloe vera (avoid aloe vera with anesthetic as it can cause sensitivity). Take ibuprofen for pain.
- Superficial partial-thickness or deep partial thickness - remove hot or burned clothing, if clothing adheres

to the burns cut away around the adhered area, soak in cool water for 15 minutes. Apply antibiotic ointment and cover with a non-adherent dressing. Wash with mild soap daily, reapply antibiotic ointment and cover with a fresh dressing.

- Full-thickness - remove hot, burned or chemically contaminated clothing, if clothing adheres to the burns cut away around the adhered area. Chemical burns should be flushed with clean cool water for 15 minutes. Apply a moist dressing and seek immediate medical attention. If the patient is conscious give ibuprofen for pain and push fluids. The ideal fluid for burn victims is 1/2 tsp each of salt and bicarbonate of soda and 2 tbs of sugar per liter. Large burns push until frequent urination results followed by 4 liters per day.

6.5.5. Smoke inhalation

Coughing, nausea, vomiting, sleepiness and confusion, burns to the nose. mouth or face, singed nostril hair and difficulty breathing, carbonaceous sputum are all signs of smoke inhalation. Administer oxygen if available and transport to the hospital immediately.

6.6. Contusions

Typically bruising with mild swelling is seen. The treatment is RICE (see section 5.5.2.).

6.7. Flap Avulsion

A flap avulsion is a flap of skin that is cut loose and only partially attached. Wash the flap avulsion and hold it in place with a sterile dressing.

6.8. Impalement

Impaled objects should be removed if it is easily removed and:

- Is impaling an extremity.
- Is in a cheek or buttock.
- It is metal and is cold.
- It is too large or hard to cut off.

Any object preventing CPR or blocking an airway must be removed.

Do not remove the object if it is in the skull, neck, chest or abdomen.

After removing the object, apply direct pressure to control bleeding.

6.9. Laceration/Incision

Apply direct pressure to control bleeding. Typically lacerations (jagged cuts)/incisions (sharp cuts) will have stopped bleeding within 20 to 30 minutes. Lacerations/incisions need copious irrigation to clean them out and prevent infection.

6.10. Punctures

Punctures typically do not bleed a lot and should be flushed well to clean them.

6.11. Wound Cleaning

- Mix povodine iodine (10%) with water, 10 parts water to 1 part povodine iodine to create a 1% povodine iodine solution.
- Fill an irrigation syringe (18 gauge needle) with solution by drawing solution into the syringe.
- Hold the tip of the syringe 2” above the wound perpendicular to surface of the skin.
- Hold the wound open with your fingers and forcefully depress the syringe plunger spraying solution into the wound (see figure 6.2).
- Repeat until 200ml of solution has been sprayed (10 - 20ml, 13 - 15ml, or 20 - 10ml syringes).
- Remove any residual debris with forceps.
- Remove any macerated, crushed or necrotic tissue with a scalpel.

1) Hold the wound open with your fingers

2) Forcefully squirt solution into the wound

3) Refill the syringe and repeat until 200ml of solution has been sprayed

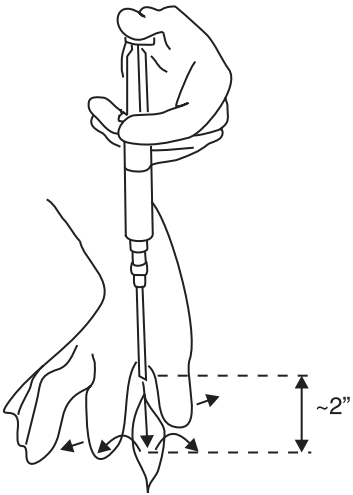


Figure 6.2. Wound irrigation.

7.0 Traumatic Injuries

Trauma is an injury to the body caused by an external force.

7.1. Abdominal Injuries

Figure 7.1 illustrates the position of the major organs of the abdomen.

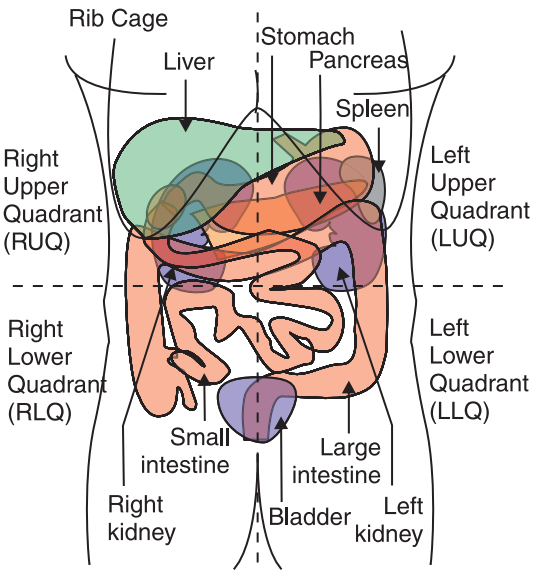


Figure 7.1. Abdominal organs.

Table 7.1 presents some general characteristics of the abdominal organs.

Table 7.1. Abdominal organs

Organ	Type	Location	Function
Bladder	Hollow	RLQ, LLQ	Stores urine from kidneys
Kidney	Solid	Flanks	Filters blood, maintains fluid balance
Large intestine	Hollow	All quadrants	Absorbs water, passes solid waste
Liver	Solid	RUQ	Chemical synthesis and filter
Pancreas	Solid	LUQ	Aids digestion
Small intestine	Solid	All quadrants	Food digestion and absorption
Spleen	Solid	LUQ	Filters worn out blood cells
Stomach	Hollow	RUQ, LUQ	Food digestion, some absorption
Uterus	Hollow	RLQ, LLQ	Reproduction

Solid organs are more likely to be injured by blunt trauma then hollow organs. Both types of organs are susceptible to penetrating injuries.

7.1.1. Treatment of abdominal injuries

- Determining the exact organ(s) injured in the abdomen is very difficult in the field. Generally you will only know the quadrant.
- Keep the patient quiet and calm.
- Blunt trauma to the abdomen will likely swell due to fluid build up. Minimize swelling by icing the area and wrapping the abdomen with a 6” wide band to

provide gentle pressure. Tie the band on the side, not over the injury. The band will minimize space for fluid build up.
- Minimize food and water.
- Immobilise any penetrating injuries.
- Evacuate as soon as possible.

7.2. Chest Injuries

Figure 7.2 illustrates the organs in the chest cavity.

The lungs expand to pull in air and contract to push out air. The lungs are expanded by a vacuum created in the chest cavity between the lungs and the rib cage by the movement of the diaphragm. In order to breath the chest cavity must be air tight and the rib cage largely intact.

7.2.1. Broken ribs

- Shallow-painful breathing.
- Point tenderness and bruising at the site of the break.
- No specific treatment other than rest.
- Watch for signs of internal injuries.

7.2.2. Flail chest

- Multiple fractures in two or more ribs creates a floating segment of ribs.
- Segment motion is opposite to the rest of the chest.
- A flail chest makes breathing extremely difficult because it collapses in when a vacuum is pulled in the chest cavity reducing the expansion of the lungs. The victim will likely tire over time and eventually be unable to continue breathing.

- Use rescue breathing to help the victim breath and evacuate immediately.

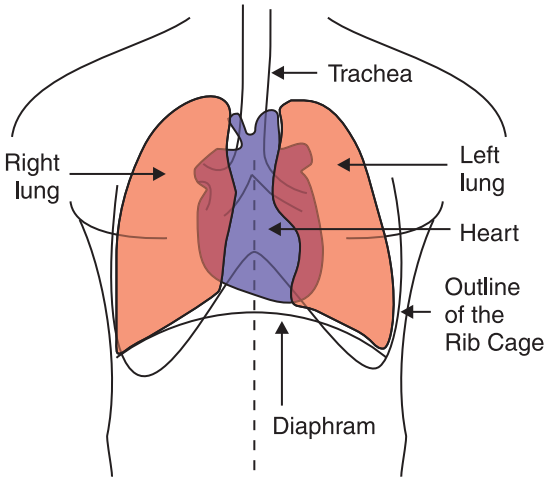


Figure 7.2. Organs of the chest cavity.

7.2.3. Sucking chest wound

A wound that penetrates into the chest cavity can allow air into the cavity preventing the formation of the chest cavity vacuum and collapsing a lung. The wound will likely bubble and or make sucking noises.

In order to allow air to escape the cavity reinflating the lung while also preventing more air from entering, a one way "flutter" valve must be placed over any "sucking" chest wound.

Figure 7.3 illustrates a flutter valve.

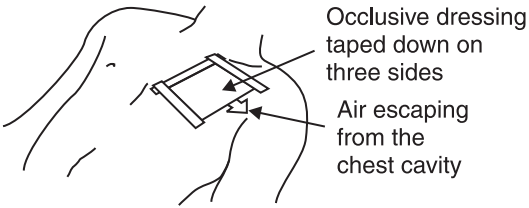


Figure 7.3. Flutter valve.

The key to a flutter valve is to place an occlusive dressing over the wound with a 4" x 4" gauze pad over the occlusive dressing and then tape it down on three sides.

If there is an exit wound such as from a gun shot, the exit wound must also be covered by an occlusive dressing except that the second dressing is taped down on all four sides to create an air tight seal.

7.3. Head Injuries

The effect and seriousness of a head injury may be immediate or may take time to develop. Careful and continual observation is key.

7.3.1. Types of head injuries

- Fractured skull - there may be an indentation or pooling of blood under the eyes or behind the ears (Battle's sign).
- Trauma with no fracture - can lead to increased inter cranial pressure. The brain is surrounded by bone,

there is nowhere for swelling to go. Surgery may be required to relieve the pressure.

- Concussion - signs and symptoms may not be immediate, it takes time for swelling to develop.

In general head injuries tend to get worse with time.

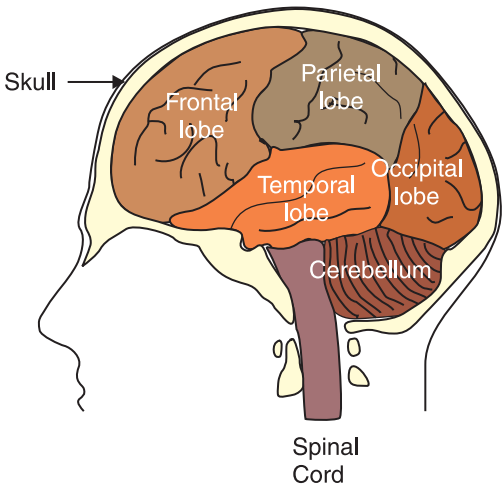


Figure 7.4. Anatomy of the brain and skull.

7.3.2. Symptoms of head injuries

- Pupils will become uneven (late developing sign).
- Clear fluid in the nose and ears.
- Nausea or vomiting - if vomiting is projectile or constant that is a more serious sign.

- Sleepiness, keep them awake by talking to them if possible.
- Headache.
- Vision problems, for example can't follow your finger with their eyes.
- Sliding down the AVPU scale as swelling increases.
- Irritable or combative.
- Slow, bounding heart rate.
- Irregular breathing, Kussmaul's breathing (heavy and labored) or Cheyenne Stoke (a pattern of breaths, then a pause, then the pattern again).
- Skin can be anything, pink/warm/moist, pale/cool/clammy, red/warm/moist.
- The systolic blood pressure will rise faster than the diastolic.

7.3.3. Head injury treatment

- Keep the victim quiet and calm.
- Try to keep the victim awake.
- Monitor vital signs every five minutes if unconscious or unstable or every fifteen minute if conscious and stable.
- Immobilize the spine if possible mechanism of injury for the spine or if the victim is unconscious.
- Evacuate as soon as possible.

Summary of Basic Life Support			
Component	Adult	Child	Infant
Recognition	Unresponsive		
	No breathing or gasping		
CPR sequence	Compression-Airway-Breathing		
Compression rate	At least 100/minute		
Compression depth	At least 2”	About 2”	About 1-1/2”
Chest wall recoil	Allow complete recoil between compressions		
Compressions	Minimize interruptions		
Interruptions	Limit to less than 10 seconds		
Airway	Head tilt - chin lift (Jaw thrust if trauma)		
Compressions to ventilations	30:2	30:2	30:3
Ventilation if not proficient	Compression only		
Defibrillation	Attach and use AED as soon as available. Minimize interruptions in chest compressions before and after shock, resume CPR with compressions immediately after each shock.		

SOAP Note

Subjective (age, sex, MOI, chief complaint):

_____

_____

_____

Objective (vital signs, exam, AMPLE history):

Time				
LOC				
RR				
HR				
Skin				

Allergies: _____

Medications: _____

Past, pertinent medical history:

_____

Last ins and outs: _____

Events: _____

Exam:

_____

_____

_____

Assessment (problem list):

_____

_____

Plan:

_____

_____