

*the*  
***Wilderness  
Medicine  
Handbook***

*Second Edition*



*by Paul Nicolazzo*  
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This handbook is intended to help you make decisions in a remote pre-hospital setting. It cannot replace training and experience. You are encouraged to confirm the information herein with other reliable sources and to solicit the advice of professional medical and rescue personnel where necessary. Neither the author, editors, or publisher assume any liability for any injury and/or damage to persons or property arising from the use, misuse, or ongoing accuracy of the information contained in this handbook. *Always act within your level of training, certification, and protocols.*

The emergency phone numbers for the Arizona Poison Control Center (page 54), Diving Alert Network (pages 70, 72), and the Centers for Disease Control, Department of State, and the International Association of Medical Assistance to Travelers (page 120) are intentionally left blank because they occasionally change. Please visit the “News” page on our web site for updated emergency phone numbers, medical information, and links; check the page prior to a trip and verify the numbers before entering them into your handbook.

This handbook utilizes a form of differential diagnosis based on the patient’s mechanism of injury/illness (MOI). The evaluation process is facilitated by the layout of the book. Use the Patient Assessment System and refer to the index preceding each of the three sections (Trauma, Environmental, & Medical) for diagnostic assistance. Rule out traumatic and environmental MOIs before searching for a medical one. When the signs and symptoms of one of the possible problems match those of your patient, consider treating that problem. Remember to thoroughly document all your thoughts, actions, and patient information; use the SOAP format.

Detailed information on the topics covered in this handbook can be found in its parent text: *the Art & Technique of Wilderness Medicine, Second Edition*. Please visit our web site for weatherproof patient SOAP notes, other publications, packs, medical supplies, and practical courses in wilderness medicine.

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*Published by:*  
the Wilderness Medicine Training Center  
Winthrop, WA 98862

*Printed in China*

Waterproof / Tearproof Edition  
ISBN 978-0-9670228-7-1  
[www.WildMedCenter.com](http://www.WildMedCenter.com)  
509-996-2502

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**Medical Abbreviations & Symbols inside back cover**

# Patient Assessment System (PAS)

## Size-up

Call for help prn

### MOI

- Major / Minor Trauma
- Environmental Emergency
- Medical Emergency

1

### Safety/Danger

- Move / Rescue Pt
- Body Substance Isolation
- Heat / Cold Exposure

### Resources

- # Pts
- # Trained Personnel
- Equipment

## Stabilize

Call for help prn

### Respiratory

- Air in & out / Rescue Breathing
- Adequate / Assist Breathing

2

### Circulatory

- Carotid Pulse / CPR
- Stop Severe Bleeding

### Nervous

- AVPU
- Protect Spine / C-collar



& Think

Awake: continue with  
3rd Survey

V P U: evacuate NOW

then Write

## SOAP

### Physical Exam

3

- 4 Assess & attempt to rule out any spine injury if pt is reliable
- 5 Evaluate Pt Information
- 6 Prioritize
- 7 Treat & Evacuate prn
- 8 Monitor

History

Vital Signs

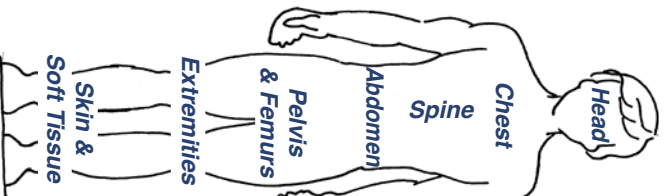
**Body Part**

**System**

**Component**

**Possible Pxs**

**Page**



System	Component	Possible Pxs	Page
Nervous	Brain	Concussion	3
	Spinal Cord	Increased ICP Cut or Pressure	3 5
Circulatory	Blood	Volume Shock	4
	Lungs & Pleura	Respiratory Distress	4
Respiratory	Lungs & Pleura	Respiratory Distress	4
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**Indicate Trauma to that area**

# Concussion

A **Concussion** is a minor brain injury. Trauma disrupts the brain's normal electrical patterns leading to a temporary change in AVPU. Significant damage to brain tissue 2° to bleeding or edema inside the skull may lead to ↑ ICP during the next 24 hrs or a subdural hematoma anytime up to 7-10 days.

## Concussion S/Sx:

- Awake NOW with no S/Sx of ↑ ICP.
- Pt will not remember the traumatic event, may be unable to recall pre-existing memories, and/or suffer episodes of short term memory loss.
- ± Head wound, bruising, swelling, localized pain & tenderness.
- May be nauseous 2° ↓ ASR.
- May show other neurological S/Sx (headache, dizziness, blurred vision, ataxia).

## Concussion Tx

- Monitor for S/Sx of early ↑ ICP for 24 hrs and, if neurological S/Sx don't resolve, continue monitoring 7-10 days for a subdural hematoma.
- Rest & sleep (waken prn to evaluate).
- Begin a Level 3 Evacuation **UNLESS** pt develops ↑ headache and becomes ↑ tired or ↑ irritable **THEN evacuate at Level 2.**

# ↑ ICP

↑ **ICP** is a severe brain injury where bleeding from broken blood vessels or edema leads to progressive swelling and pressure inside the skull. Pt may present with late S/Sx on arrival.

## ↑ ICP Early S/Sx

- Awake & ↑ tired, ↑ irritable, or combative.
- Persistent vomiting.
- Severe headache.

## ↑ ICP Late S/Sx

- V P U.
- Seizure(s).
- Death.

## ↑ ICP Tx

- Maintain & protect pt's airway.
- Consider side packaging if a spine injury is suspected.
- Position & transport pt with head slightly elevated.
- Rescue breathing (PPV) & O<sub>2</sub> if respirations are slow or absent.
- **Begin a Level 1 Evacuation with ALS.**
- Cardiac Arrest = Death; CPR is not indicated.

# Volume Shock

**Volume Shock** is 2° to internal or external bleeding. Surgery is the definitive Tx for most internal bleeding. Pts may present with late S/Sx on arrival or S/Sx may develop over time; typically within six hrs.

## **Volume Shock Early S/Sx**

- Initially awake & alert then anxious.
- ↑ Pulse & Respirations.
- Normal Blood Pressure.
- Pale to cyanotic skin.
- Pain & tenderness at injury site.

## **Volume Shock Late S/Sx**

- V P U.
- ↑↑↑ Pulse & Respirations.
- ↓ Blood Pressure.
- Severe cyanosis.
- Cardiac Arrest.

## **Volume Shock Tx**

- Handle pt gently; **NO EXERCISE**.
- Position on back ± legs slightly raised.
- *Begin a Level 1 Evacuation with O<sub>2</sub> & ALS.*
- Cardiac Arrest = Death; CPR is not indicated.

# Respiratory Distress

**Respiratory Distress** is 2° to bruised lung tissue and/or a pleural delamination; both present with the same S/Sx. Simple rib Fx also presents with similar S/Sx; however, as the pt relaxes and begins to breathe with their diaphragm, the respiratory distress disappears. Multiple rib Fx (flail chest) often cause pleural delamination (pneumothorax, hemothorax, hemopneumothorax, or tension pneumothorax). Late S/Sx indicate damage to both lungs. In most cases it is difficult to RO internal bleeding in the field if pt shows S/Sx of respiratory distress. Pt may present with early or late S/Sx of respiratory distress on arrival; mild S/Sx may only show with exercise.

## **Resp Distress Early S/Sx**

- Awake & anxious.
- ↑ Respirations.
- Pain & tenderness at injury site.
- Seeks sitting or tripod position.
- Cannot breathe & talk concurrently.
- May c/o of a “ball” in damaged lung.
- May appear with mild-mod exercise.

## **Resp Distress Late S/Sx**

- V P U.
- ↑↑↑ Respirations.
- S/Sx are present at rest.
- No lung sounds on injured side.
- Severe cyanosis (blue skin).
- Respiratory Arrest & Death.

### **Respiratory Distress Tx**

- Position pt in position of comfort sitting or lying on injured side.
- Reassure pt and coach them into slowing their respiratory rate.
- O<sub>2</sub> & rescue breathing (PPV) prn.
- Cover open chest wounds with occlusive dressing & monitor.
- Begin a Level 3 Evacuation if S/Sx are not initially present but appear with exercise. Most pts can self-evac; minimize work load (no or light pack).
- *Begin a Level 2 Evacuation if S/Sx ↑↑↑ with exercise; carry pt.*
- *Begin a Level 1 Evacuation if S/Sx appear at rest, involve or appear to involve both lungs. If tension pneumothorax is present pt will die without rapid pleural decompression.*
- Cardiac arrest = Death; CPR is not indicated.

## **Unstable Spine**

Assume an **Unstable Spine** when the MOI is Trauma or Unknown and immobilize the pt's spine during BLS. Begin the focused spine assessment (page 9) only after you have completed all three surveys to ensure pt is reliable. Spine pain or tenderness indicates potential instability at that site. Decreased motor and/or sensory function indicates cord damage.

### **Lifting & Moving Guidelines**

- Slow movement to anatomical position is safe; **STOP** if pt c/o of pain or you encounter physical resistance.
- Use small increments; **avoid large unsupported movements.**
- Light axial traction, axial pulling, and axial loading onto a litter are safe; if possible, avoid horizontal movement.
- Rolling is safe. Roll pts onto a board/litter if they present on their stomach.
- Attach a C-collar ASAP if a cervical injury is suspected; improvise with SAM splint. Maintain hand stabilization after the C-collar is in place.
- Firmly control the pt's weight centers (head, shoulders, & hips) at all times. Move & align one weight center at a time while supporting the others.
- Bring the backboard/litter as close to the pt as possible; use it to create a working platform. **Avoid carrying a spine injured pt unsupported.**
- If the pt has failed the focused spine assessment, prioritize areas with pain & tenderness; otherwise prioritize: 1) C-spine, 2) T-spine, then 3) L-spine.
- If the injury can be localized to the cervical spine during the focused spine

assessment, the pt's legs may be extended or flexed safely; avoid lateral movement. If the injury can be localized to L-4 or below (lower lumbar region & pelvis), the pt's head and neck do not need to be immobilized.



Lift then axially slide board/litter under pt.

Roll pts presenting on their stomach  
onto litter; keep weight centers aligned.

### **Packaging Guidelines**

- Use rolled and tied-off sleeping bags to pad the pt's sides and prevent horizontal sliding. Use shoulder straps to prevent axial sliding towards the top of the backboard or litter. Slightly flex and pad under pt's knees.
- Position sleeping pad(s) under the pt; self inflating pads work extremely well (do not over inflate). Extend both the bags & pads beyond the pt's head to secure their head and neck using "go beyond principle." **Leave space between the pt's head and the top of the litter to avoid cervical compression.**
- Securely attach the pt's body before attaching their head. Use either individual straps or a rope to build an "X" or "Shoelace" system.
- Consider diapering pts in preparation for waste elimination; urinary catheters are helpful in long evacuations.
- Consider a hypothermia package. Build, roll, & secure it prior to lifting pt.
- To help avoid bed sores, venous clots, & pulmonary embolisms, unstrap pt every few hrs. Then, while keeping spine immobilization, roll pt onto their side and massage back & limbs; gently flex & extend uninjured extremities.



Shoe Lace System on a Stokes litter using a climbing rope and the “Go Beyond” principle to secure the pt’s head (above). Extra rope is coiled tied on top of the pt’s legs.



✕ System on a wooden backboard (above) using commercial straps and the “Go Beyond” principle to secure the pt’s head . The pad helps hold the sleeping bag rolls in place.

## “Daisy-chain” Rope Litter

The **Daisy-chain Rope Litter** is best suited to mountaineering situations where the pt needs to be transported in a hypothermia package. You will need at least 100’ of rope for a normal sized person. A bivy sack with a full length zipper works well for the external vapor barrier.

Axially load pt into a hypothermia package. For C-spine immobilization, extend the sleeping pads in the hypothermia package beyond the pt's head. Use a SAM splint to improvise a C-collar. Lay the rope out as shown below; tie a loop in one end. Remove shoulder straps from an internal frame pack and lay the pack on top of the rope. Place ski or tent poles inside the pack for spine stability. Next, carry pt in a hypothermia package to the litter. Arrange their forehead so that it is between the pads of the hip belt. Start at the pt's shoulders and begin daisy chaining the loops. Keep rope snug and the loops close together. Finish with two half-hitches at the pt's feet. Clip the hip belt around the pt's head. Extra rope is coiled and slid under the lower leg straps. The completed litter may be carried, slid on snow, or used in a technical evacuation.

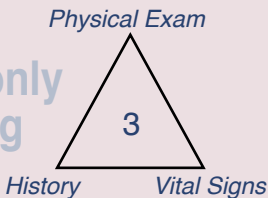


The white cloth strap attached to the poles helps stabilize the poles during packaging.



## Focused Spine Assessment

Begin only  
after completing



### RELIABLE PT

- Awake & cooperative with a normal pain response (NO distracting pain or altered mental status).

### NO SPINE PAIN

- Focus the pt's attention on the center of their spine.

### NO SPINE TENDERNESS

- Palpate the spinal process on each vertebra. Go skin to skin, begin at C-1 or sacrum and move down or up respectively.



Use one finger to mark the previous vertebra as you move on to the next.

### NORMAL MOTOR EXAMS Hands Motor Exam 1

- Compare strength in both hands and feet. Resistance should feel "springy" with no obvious weakness. Exam may be adjusted in the presence of a local injury as shown.



Pt resists as you squeeze their fingers together.

## Hands Motor Exam 2



Pt resists as you apply downward pressure.

## Feet Motor Exam 1



## Feet Motor Exam 2



Pt pushes down against your hand/fingers.

Pt pulls up against your hand/fingers.

## NORMAL SENSORY EXAMS

- Pt should be able to distinguish between "pin-prick" pain and a light touch on back of each hand & front of each lower leg (the top of the foot may be used in place of the lower leg for testing).



## NO SHOOTING, TINGLING, OR ELECTRIC "PAIN"

- No radiating pain into the arms or legs from the spinal cord.

# Musculoskeletal Injuries

**Musculoskeletal Injuries** to the pt's head, chest, abdomen, hips, pelvis, and upper leg may indicate severe underlying problems (see Trauma Index on page 2). Extremity injuries are classified as Stable or Unstable and treated accordingly. Ligament repair may be done at any time, tendon repair is best done within 5-10 days, and muscle repair is best done within 6 hrs or 4-5 days later after inflammation has subsided.

## Stable Injuries

### Stable Injuries S/Sx

- ROM & CSM are intact.
- Near normal strength (pt can bear weight or use).
- Mild to moderate pain & tenderness.
- Mild swelling early; severe swelling late 2° to inflammatory response.



### Stable Injuries Tx

- Rest = **DON'T USE** (splint if the pt must use the limb).
- Ice: 20-30 min on 90 min off (to permit reperfusion).
- Compression: compress limb with snug, stretchy clothing to ↑ venous return.
- Elevation: above heart to ↑ venous return.
- Pain & anti-inflammatory drugs & herbs.

### After swelling goes down:

- Discontinue pain & anti-inflammatory drugs & herbs.
- Begin Pain Free Activity (swelling after use indicates reinjury).

## Unstable Injuries

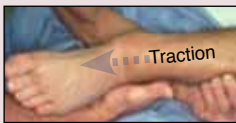
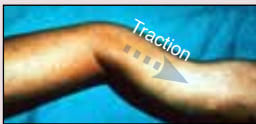
### Unstable Injuries S/Sx

- Noticeable weakness (pt cannot bear weight or use).
- ROM is significantly decreased & CSM may be impaired.
- Pt may report hearing or feeling a snap or pop.
- Crepitus may be present; the limb may be deformed.
- Moderate to severe pain & tenderness with severe swelling early.
- Extreme swelling may lead to loss of distal CSM & compartment syndrome.



## Unstable Injuries Tx

- Traction deformed long bones into anatomical position (TIP).
- Traction deformed joints into mid-range position (TIP) IF ↓ CSM or the injury cannot be safely splinted for transport.
- **STOP TIP** if you encounter physical resistance in the bone or joint or the pt's pain ↑↑↑.
- Support the injured limb during splinting.
- **Check & monitor distal CSM.**
- Pain & anti-inflammatory drugs & herbs; Rx pain meds may be required.
- Evacuate at Level 3. *Evacuate at Level 2* if a deep wound is present or compartment syndrome is suspecte.



# Dislocations

All indirect traumatic dislocations of the shoulder, patella, & digits and non-traumatic dislocations of the jaw should be reduced ASAP in the field. If reduction is successful ROM should be near normal. Splint the joint in mid-range position of function for 7-10 days and then Tx as a stable injury; consider a Level 3 evacuation. All other dislocations should be treated as unstable joint injuries (page 11); Fx are likely. *Begin a Level 2 Evacuation for pts with a suspected hip dislocation; death of the femoral head and permanent nerve damage may occur anytime within the following 24 hrs without reduction.*

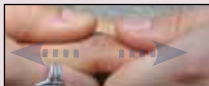
## Digit Dislocation S/Sx

- Pt presents with an angulated finger or toe at joint.
- Compare the with the same digit on the opposite limb.



## Digit Dislocation Tx

- Isolate the injured joint and traction into anatomical position. Splint.



## Jaw Dislocation S/Sx

- MOI is typically 2° to extreme mouth opening while yawning, vomiting, or during a seizure.
- Pt c/o pain and difficulty opening mouth.
- Unilateral dislocation: pt's the jaw moves away from midline. Bilateral dislocation pt presents with an underbite.



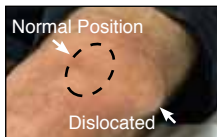
## Jaw Dislocation Tx

- Tape padding onto your thumbs.
- Place gloved & padded thumbs on both the pt's lower molars, as far back as possible. Curve fingers around pt's jaw.
- Use thumbs to press firmly down and back on the molars with the mouth slightly open until jaw relocates.



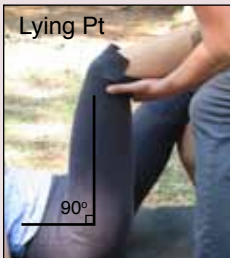
## Patella Dislocation S/Sx

- Pt commonly presents on side or back holding the injured knee; the knee is bent slightly and the patella displaced laterally.



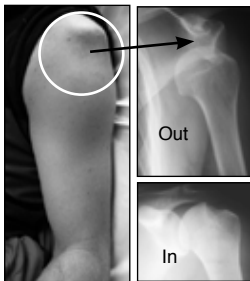
## Patella Dislocation Tx

- During the relocation process maintain a right angle (90°) between the pt's thigh & their hip/pelvis.
- Support the injured leg at the knee and ankle. Encourage the pt to breathe deeply and RELAX.
- Straighten the injured knee and *guide* the patella into anatomical position with your thumb. Splint.



## Shoulder Dislocation S/Sx

- Pt usually presents sitting with the injured “arm/elbow” held away from their body.
- Pt often supports the arm on their injured side with self-traction to relieve pain.
- Pt is unable to touch opposite shoulder with the hand on the injured side
- In most cases the shoulder will appear “square” with an obvious step-off.



## Shoulder Dislocation Tx: “Baseball” Method

- Assist pt in moving to a flat padded area.
- Check distal CSM in the hand on the injured side.
- Check sensation of the axillary nerve by pinching the deltoid muscle on the pt’s injured arm.
- Help position pt on their back.
- Apply traction at elbow to relax the shoulder muscles and relieve pain. Maintain traction throughout the Tx process until the reduction is successful or the unstable shoulder splinted. Use one of the hand positions shown below.



Hand Position 1



Hand Position 2



Hand Position 3

Baseball position (above) is: shoulder, shoulder, elbow. High baseball position (below) is: ear, ear, elbow.



- If the pt is on a slippery surface (snow, wet leaves, etc.) and likely to slide when traction is applied have an assistant hold onto their jacket (or wrap a tarp, blanket, sleeping bag, etc. around their chest and hold onto that).
- If the pt is lying at waist height (to the rescuer), tie a piece of cloth or clothing (jacket, sweater, etc.)



around your hips and slide the pt's injured arm through the loop up to their elbow. Hold their wrist and rock back on your heels to provide traction. Use your "extra" hand to palpate their shoulder and assist in the reduction.

- Maintain traction, rotate the injured arm to "baseball" position and **WAIT**. If during this process, the pt complains of severe pain and/or tenses their shoulder muscles, **STOP** the rotation, maintain traction, and wait for them to relax again. Once relaxed, maintain traction and resume rotation until pt's arm is in "baseball" position. If reduction does not occur within five min of traction in "baseball" position, move the arm to "high baseball" position.



- Continue to maintain traction. **WAIT** for the pt's shoulder muscles to relax and the shoulder to relocate (reduce). If you are able to get the pt to relax, most shoulders will reduce within 5 min. When the shoulder relocates you will feel a bump (or series of bumps) and the pt will probably smile when the pain disappears. *If the pt's shoulder does not reduce within 30 min, try the "Hanging Traction" method below or splint the shoulder in position and begin a Level 2 Evacuation.*
- If the pt's shoulder has relocated they will feel no pain as you **SLOWLY** release the traction. If pain is present, resume traction and wait for the shoulder to relocate. If the pt does not complain of pain as you release the traction, assist them in moving the arm to their side; the elbow should rest comfortably against the pt's body.
- Recheck distal and axillary CSM. Splint.

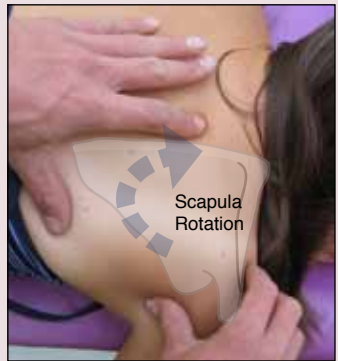
### **Shoulder Dislocation Tx: "Hanging Traction" Method**

- Check distal and axillary CSM as discussed on page 14.
- Assist pt to an padded "platform" tall and flat enough to permit their arm

and a suspended weight to hang freely (a large rock or cooler, table, etc.). Place pt face down on the platform with their injured arm hanging down.

- Attach duct tape to the skin of the injured arm to create an eye hook big enough for a carabiner or rope to pass through easily. Lightly wrap the taped arm with an elastic bandage to increase the pt's venous return.
- Using a carabiner or rope, attach a slightly weighted container (stuff sack with rocks, water bottle(s), etc.) through the taped eye hook. Add weight (rocks, water, etc.) until the pt's pain is relieved. Use the smallest amount of weight possible to maintain pain free traction.
- As traction is maintained by the hanging weight, frame the pt's shoulder blade (scapula) with the fingers of both hands and gently rotate it medially. If an assistant is available, they can apply external rotation to the humerus until the shoulder reduces.
- If shoulder reduces (usually within one hour) continue Tx as discussed above.

*If the pt's shoulder does not reduce, splint it in position, & evacuate at Level 2.*



## Extremity Splints

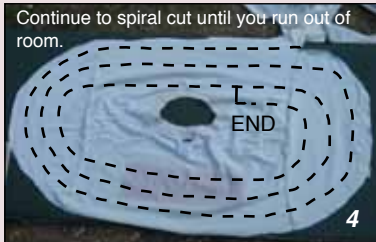
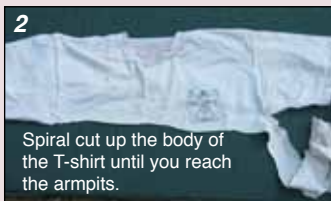
**Extremity Splints** should be simple, well padded, easy to adjust, light weight, and strong. Extend the splint past the injured bone or joint to completely immobilize it (Go Beyond Principle). Remove all rings, watches, bracelets, etc. before splinting. There are five concepts central to improvising effective splints: casts, jelly rolls, sandwiches, buddy, and traction splints.

- Use a **Cast** for forearm, wrist, digit, knee, & ankle injuries.
- Use a **Jelly Roll** for unstable ankle & knee injuries.
- Use a **Sandwich Splint** for in-line femur Fx and tib/fib Fx.
- Use a **Buddy Splint** when the pt requires a Level 1 or 2 evacuation, supplies are limited, and transportation is immediately available.
- Use a **Traction Splint** for angulated mid-shaft femur Fx with evac time < 6 hrs.

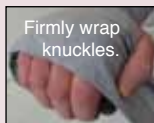
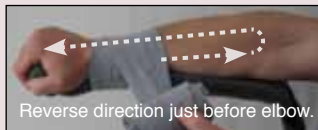
### **Cast Splint:** *Digits, Forearms, Wrists, Ankles, & Knees*

Carefully mold, pad, and attach a SAM splint to the injured limb with a cloth roll OR a conforming bandage (Coban® or vet wrap). When forming the splint remove all pressure points. Too much pressure causes CSM problems while not enough permits unwanted movement; avoid elastic bandages. Use the pt's heavy pile sleeve, thick hiking sock, etc. for padding. Use a heavy foil windscreen or a piece of bark to improvise a SAM splint. Cut a cloth roll from any pull-over shirt or pants with no buttons or zippers (T-shirts, long underwear tops & bottoms, and sweat shirts & bottoms). Spiral cutting a T-shirt is shown below.

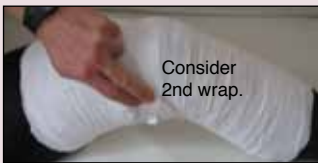
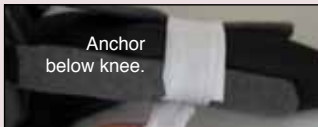
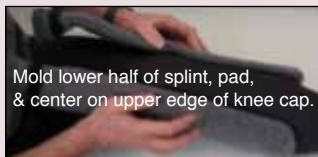
#### Spiral Cutting a T-shirt



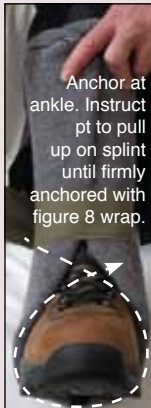
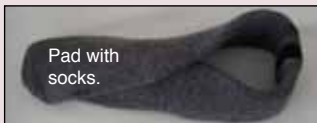
## Wrist & Forearm Cast



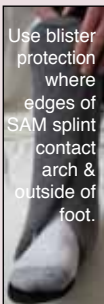
## Knee Cast



## Unstable Ankle Cast



## Stable Ankle Cast



Mold & pad stirrup, place around insole & foot, then replace boot. Begin wrapping at ankle.

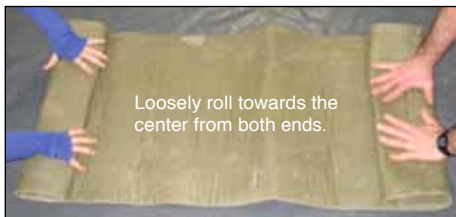
## Finger Cast



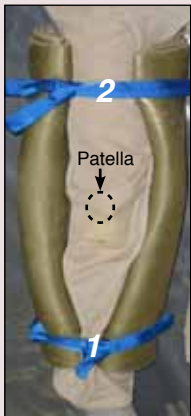
Cut & mold to two fingers; padding is usually unnecessary. Anchor at base of fingers and wrap firmly. Split end & tie.

## **Jelly Roll:** *Unstable Ankle & Knee*

Use a long FIRM sleeping pad, ± additional padding, to build a jelly roll splint. If additional padding is required, roll the padding into the pad from both ends. Hold each side to prevent the Jelly Roll from unrolling as it is tied.



## Knee Jelly Roll

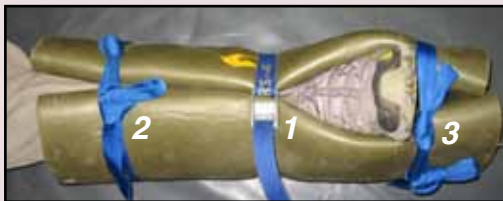


Keep the center of the rolls close together and strap the ankle first. Then spread the top of the roll wide to fit the upper leg and secure the second strap. The order of the center straps doesn't matter; avoid placing a strap over the knee cap. The rolls should conform to the leg.

## Ankle Jelly Roll



Keep the center of the rolls close together and place the lower leg into the fold. The splint should “Go Beyond” the boot by 8-10 inches. Pinch the upper edge, and strap the ankle.



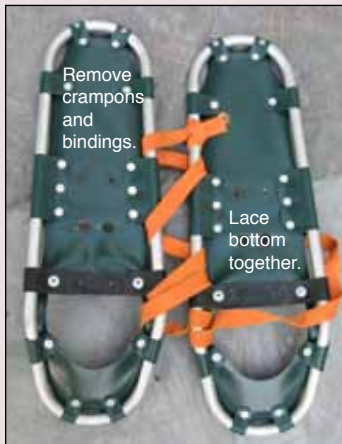
Secure the second strap on the upper part of the splint. Cinch the third strap tightly around the “Go Beyond”. The sides of the rolls should completely cover the ankle.



### ***Sandwich Splint: Knee, In-line Femur, & Tib/Fib***

Sandwich Splints have a rigid “board” on the outside, thick padding on the inside, and are held in place with straps. When completed, the two “boards” are parallel and distribute the compression forces evenly. A “board” may be a real board, snowshoe, etc. or one constructed with finger thick poles (tent poles, ski poles, green sticks, internal pack stays, etc.) taped together. Suitable strap material can be webbing, cam straps, strips of strong cloth, rope, etc. Thick padding can be made from carefully folded clothing, sleeping pads, sleeping bags, etc. Effective padding may also be made by filling stuff sacks with soft objects. Sandwich splints may utilize the Go Beyond principle when splinting an ankle. Use a sock roll or knit hat to pad under the knee.

#### **Knee Sandwich Splint**



## Femur & Tib/Fib Sandwich Splint



Fold a sleeping bag and pad in half lengthwise and place under the injured leg; "Go Beyond" the boot. Support the knee with a sock roll or knit hat .



Place two taped poles on the outside of the pad on either side of the injured leg. "Go Beyond" the boot 8-10 inches. Secure the top of the splint first, then the ankle.



Take a full turn around both sets of poles at both ends of the splint before tying. Secure the center straps next; avoid placing a strap directly over the knee cap. Cinch the "Go Beyond" section last.

### **Buddy Splint:** *Upper & Lower Extremities*

A Buddy Splint is simple and fast. The injured limb is simply splinted against another part of the body. Use for a stable or unstable injury when there is no or minimal deformity, when splinting materials are unavailable, or when an urgent evacuation is required and transportation is readily available.

#### Upper Extremity Buddy Splint

Pull hem of shirt up over the pt's forearm.



Cut the back of the shirt on the side of the elbow & tie.



- If you are using a button-down shirt there is no need to cut the back; unbutton the bottom buttons and tie the tails together in the front.
- Consider putting a second, tighter/smaller shirt, shirt, jacket, or vest over the first for more support. No need to cut the second support layer. Zip all zippers.

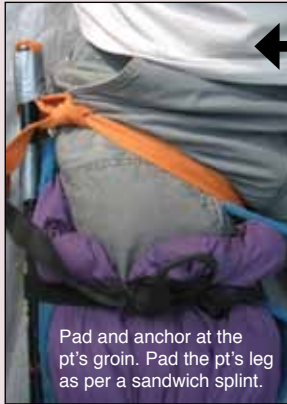
#### Lower Extremity Buddy Splint



- Loosely roll a sleeping pad and place it between the pt's lower legs. Fold a second sleeping pad in half lengthwise and place under both legs. Secure with numerous cloth ties.

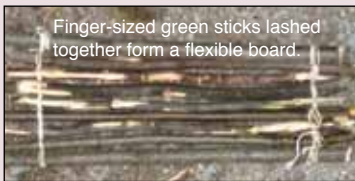
## ***Mid-shaft Femur Traction Splint***

Tape poles together to form a "board". Fold an overhand knot with a long loop over the ends and tape to create anchor points for the groin strap and traction system. Thread the strap through the webbing at the bottom of the pt's foot and back through the loop. Pull and tie.



## ***Alternate Splints***

The five splinting concepts may also be used to improvise splints from natural materials. Below are a few ideas: small diameter sticks (ideally green) can be lashed or taped together to create a “board,” slightly molded, padded, and secured as per the sandwich splint or cast concepts. Sections of old or green bark may be used in a similar fashion. Light hanging moss (Usnea, aka: Old Man’s Beard) can be used as padding. Mold and lace wet rawhide around an injured limb; loosen the lacing as the rawhide dries to prevent CSM problems. When dry, the rawhide stiffens and acts like a cast.



Finger-sized green sticks lashed together form a flexible board.



Straps were cut from clothing.

## ***Improvised Carries***

A “backpack” carry is typically your best choice for a narrow trail. If you have a wide or open area (beach, dry wash, Forest Service road, etc.) and only need to transport someone a short distance, consider a two person carry.

### **The TRUE Backpack Carry**

Cut the bottom side seams of your expedition pack and have the pt pull it on like a pair of pants; pad the groin area. Cut the seams carefully and they can be easily repaired later. If your carry-out is long it is worth the extra time to get out your sewing kit and bar-tack the seams so they don't tear further during use. While the pt may sit facing forward or backward, most pts and rescuers prefer



to have the pt face forwards. A forward facing position provides better balance for the rescuer and allows the rescuer to support the pt's legs behind the knees when terrain permits, similar to a piggyback ride. It's nice to have a padded hip belt and shoulder straps for a long evacuation.

### Standard Split Coil Carry

Coil a climbing rope into a single coil (not a butterfly coil) and finish by wrapping one end around and through a bight of rope from the other end then carefully split the coil and place the two loops on the ground. *For a single*



*rescuer carry:* help the pt put a leg through each coil and slide the knot into the small of their back. With the pt facing forwards, put your arms through the rope coils in the same manner you would put on a backpack; make sure the weight is distributed evenly across the coils before lifting. A properly sized coil will hold the pt above your hips similar to a properly adjusted backpack. Use a bandana or a piece of webbing to improvise a sternum strap to help keep the weight on your shoulders; pad the rope coils for increased comfort. *For*

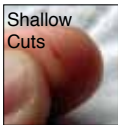
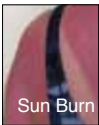


*a two person carry:* split the coils between two rescuers and place the pt in the center. *Use a tarp, tent fly, strong sleeping pads (quite comfortable), two pair of long pants, etc. if a rope is not available.* Pattern the improvised carry after the two loops of the split coil carry; remember to tie/fix the loops together if using a long tarp in a figure-8 pattern. Try on an uninjured member of your party before asking a pt to step aboard.



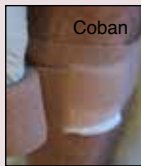
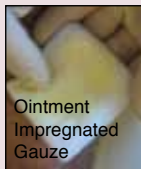
# Wounds

## Superficial & Partial Thickness Wounds



### Superficial & Partial Thickness Wound Tx

- Use aloe vera & vitamin E gel on damaged but intact skin.
- Wash partial thickness wounds and the surrounding skin with soap and clean water. Remove all foreign debris by gentle scrubbing and/or by careful picking with a tweezers. Vigorous scrubbing may cause minor bleeding and should be avoided if possible. Consider opening large closed blisters and remove dead skin prior to cleansing. Pat or air dry.
- KEEP MOIST with a micro-thin film or hydrogel dressing. Do not use ointment under the dressing. Leave dressing in place until healing has occurred. Monitor for infection through the dressing. Do not use over joints.
- If a micro thin film dressing is not available, use white/light petroleum jelly (Vaseline®) or a water/petroleum-based abx ointment (silver sulfadiazine (Rx), Triple Antibiotic®, Bacitracin, etc.) and a thick gauze dressing; bandage with vet wrap, Coban® or a cloth roll. Re-clean twice a day.
- Glue shallow cuts—often caused by excessive exposure to wind, dry air and cold water—together with super glue BEFORE they begin to bleed.



### Friction Blisters

Friction and pressure combine to create shear forces that if not treated create a “hot spot” and later, a blister. ↑↑↑ pressure—2° to a heavy pack or persistent downhill hiking—will cause deeper damage and a more painful blister. Both the prevention and Tx focus on ↓↓↓ shear forces within the skin layers.

### Friction Blisters Prevention

- Wash skin, socks, etc. on a regular basis. Wear gaiters over boot tops and laces to keep dust & dirt out.

- Keep skin, socks, gloves etc. dry. Change socks regularly. Sleep in clean, dry socks. An antiperspirant may help keep feet dry.
- ↑↑↑ pack weight and distance slowly to allow the skin to adapt to new forces. Avoid continuous downhill hiking until skin has had time to strengthen.
- Make sure footwear, gloves, and clothing fit well.
- Anticipate blisters: Tx hot spots immediately BEFORE they become blisters. Use tincture of Benzoin & tape to create a sliding layer between the skin and the inner sock. Add a friction patch (ENGO®) to footwear to create a sliding layer between the outer sock and footwear.

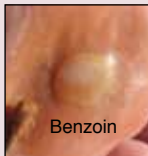
### Prevention & Hot Spot Tx



### Friction Blister Tx

#### At home:

- Leave closed and wear footwear that does not irritate the blister—or paint area with 2 coats of tincture of Benzoin & pad with mole foam donut—until it is reabsorbed (3-10 days).



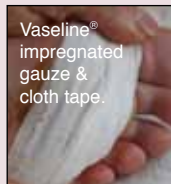
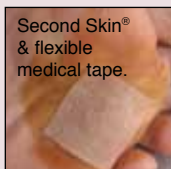
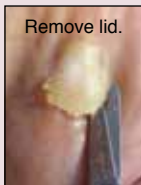
#### To complete a day hike:

- Drain the blister by nicking with a clean scissors, scalpel, or knife; leave skin cover intact. Pad with “donuts” of mole skin or mole foam to relieve pressure. Add a ENGO® blister patch to footwear or socks.



### *To continue a multi-day hike:*

- Remove skin over blister. Cover the exposed blister with a hydrogel dressing (preferred) or petroleum jelly and gauze. Secure in place with porous cloth tape or flexible medical tape (preferred). Add a ENGO® blister patch to footwear or socks. Use Tincture of Benzoin prior to taping.



### *Blood Blister:*

- Treat as per normal friction blister. Blood blisters once open—because they are deeper—are at higher risk of infection. Keep clean.
- If under a nail and painful, heat a small piece of metal (paperclip, needle) over the blue flame of your cook stove until it's red hot and melt nail to release blood, pressure, and pain.



### *Full Thickness Lacerations*

- Clean lacerations with neat edges are at low-moderate risk for infection.



### *Full Thickness Lacerations Tx*

- *Begin the cleansing process after bleeding has stopped; complete within two hrs. Do not clean if associated with severe life threatening bleeding.*
- Wash the skin surrounding the wound (not inside the wound itself) with soap and clean water; OR a 10% PI solution.
- Use your fingers to distract the wound, then pressure flush numerous times

with copious amounts of clean water. A 30 or 60 cc irrigation syringe is ideal but other delivery methods can also work well: a bicycle water bottle, an old saline container, a strong plastic bag with a corner removed, etc. Flush using intense short bursts rather than one long stream. Avoid forcing material into tissue pockets by flushing along the axis of the wound. Pat or air dry.



- **Avoid vigorous scrubbing.** In the unlikely event of more severe bleeding, **STOP** the cleansing process and apply direct pressure until the wound has reclotted. Gently resume cleaning after the bleeding has stopped.
- Cover with a thick gauze dressing ± abx ointment and bandage.
- Monitor, reclean, redress, and rebandage when the dressing becomes wet from wound drainage, sweat, or environmental conditions.
- While wound closure often ↑ healing, it also ↑ the chance of infection by preventing drainage. **Only attempt to close clean, shallow lacerations.** To close: approximate edges with adhesive strips (Steri-strips®, tape strips, butterfly closures), tissue adhesive, or skin staples.
- Consider a Level 3 Evacuation if oral abx are unavailable.

### Full Thickness High Risk Wound

- Deep, dirty full thickness wounds with ragged edges, ± damage to underlying tissue (including puncture wounds & animal bites) are at high risk for infection.



### Full Thickness High Risk Wound Tx

- **Follow the wound cleaning process for full thickness lacerations and:**
- Use a clean sharp scissors or scalpel to remove poorly attached dead skin and tissue. **Do not cut or remove deep tissue or structures.**
- Remove any foreign material left behind after flushing with clean tweezers or forceps; gently probe prn. A large magnifying glass is often helpful.
- Finish with multiple flushes PI solution (dilute to < 1%), saline solution, or fresh echinacea tea.
- **Do not close high risk wounds in the field** due to an ↑↑↑ chance of infection.
- Impregnate the first few layers of the dressing with a 10% PI ointment

ointment (or solution), white/light petroleum jelly (Vaseline®) or a water/petroleum based abx ointment. Do not apply petroleum-based ointments directly into the wound; they are difficult to remove. Secure dressing with a conforming bandage (Coban® or vet wrap).

- If the wound is over a joint, splint to prevent mechanical disruption of the protective barrier. All wounds associated with an unstable injury require splinting. If the limb is angulated or deformed it will also require realignment. Refer to unstable injuries on page 11 and extremity splints on page 16.
- Consider packing deep wounds with narrow gauze strips soaked in 1% PI solution to prevent premature closure and encourage drainage. Remove, reclean, and replace packing qid (breakfast, lunch, dinner, & before bed).
- *Begin a Level 2 Evacuation for all pts who have wounds associated with an unstable injury.*
- All pts with high risk wounds are at high risk for contracting Tetanus. If pt has not had a Tetanus vaccination or booster within the past five yrs they **MUST** receive shots containing the antitoxin (tetanus immune globulin) and vaccine within 24 hrs of the incident.

### **Tourniquets**

- Apply a tourniquet approximately two inches above the wound site when direct pressure or a pressure bandage does not stop severe life-threatening bleeding. Do not place a tourniquet over a joint. Tighten until bleeding stops and *begin a Level 1 or 2 Evacuation depending on the pt's overall condition.*
- *Do not remove the tourniquet in the field if an amputation or near-amputation is present, pt exhibits S/Sx of volume shock, or the pt's condition is unstable 2° to a different MOI.*
- Reassess pt after 30 min. If none of red flags for removal are present, place a pressure bandage over the wound site and, leaving it in place, loosen the tourniquet. If there is significant bleeding from the site, retighten the tourniquet. If there is no significant bleeding from the site, remove the tourniquet. If appropriate, downgrade the evacuation level. **DO NOT clean the wound.**

### **Tx for Animal Bites**

- Tx all animal bites as high risk wounds; pts are at risk for contracting rabies. Thorough and aggressive wound cleaning is **EXTREMELY** important. *Flushing is not enough to kill the Rabies virus and all wounds should be*

*physically swabbed; use a 2% solution of benzalkonium chloride (Cure-Chrome®) or a 20% soap solution. Thoroughly flush all chemical agents after a few min of contact time.*

- All mammals are susceptible to rabies and are potential carriers; however, only certain animals commonly transmit the virus to humans. Rabies reservoirs in the United States include: skunks, raccoons, foxes, and bats. Rodents, rabbits and hares, and urban cats and dogs are considered low risk.
- Contact local health officials for advice before beginning your trip; consider pre-exposure immunization. At risk pts will need a 5 dose vaccine series and additional immune globulin. The first shot in the vaccine series should be given as early as possible and the site infiltrated with immune globulin. People who have been vaccinated against rabies do not need the immune globulin but will require booster doses of the vaccine. **ALL PEOPLE INFECTED WITH THE RABIES VIRUS DIE!** *The CDC recommends all persons bitten by a wild animal receive post-exposure Tx UNLESS the animal has been captured and examined for rabies; begin a Level 2 Evacuation.*

### **Impaled Objects**

In general, because of the high risk of infection and difficulty of transport, all objects impaled in skin and muscle tissue should be removed *IF* they are easy to remove and do no additional damage to the underlying structures as they are being removed. *Do not attempt to remove objects impaled in a pt's skull, eye, chest, or abdomen.*

### **Impaled Objects Tx**

- It may be necessary when attempting to remove small impaled objects (splinters, nails, etc.) to make an incision through the skin following the axis of the object to gain solid purchase with a forceps, tweezers, or pliers to help prevent breakage. Use a clean sharp knife or scalpel. Do not cut underlying structures in an attempt to loosen any impaled object.
- Once the object has been removed, any existing puncture wounds are at a high risk for infection; treat accordingly. *If the impaled object cannot be removed easily and safely it must be stabilized in position and the pt carefully evacuated to a major hospital.*



### **Fishhook Removal**

Push down on the eye as you pull sharply on the line.

# Infection

## **Local Infection S/Sx**

- ↑ local redness, tenderness, & pain are present at both the site and surrounding tissue.
- ↑ swelling may pull the wound edges apart.
- The wound continually drains large amounts of pus OR the surface has sealed preventing drainage and forms a pus pocket beneath the skin.

Local Infection



## **Local Wound Infection Tx**

- Immerse the wound site and the affected tissue in hot water or cover with hot compresses 105°-112° F (40.5°-44.5° C) or as hot as the pt can bear for 30 min, until the wound opens OR, in the case of an abscess, a pustule head develops. If a pustule head develops make a small incision through the skin to expose the pocket and permit drainage.
- Gently pull the wound edges apart and aggressively clean in the same manner as any high risk wound. Do not squeeze pus pockets; squeezing forces bacteria into healthy tissue ↑↑↑ the infection.
- Apply 10% PI ointment or abx ointment to the first few layers of the dressing, then bandage. Splint to help establish a new protective barrier.
- Soak and reclean on a regular basis (4-6 times per day); closely monitor for a systemic infection.
- Keep the wound and dressing clean to speed healing and prevent the spread of drug resistant bacteria.
- Consider prophylactic oral abx therapy or a Level 3 Evacuation if abx are unavailable.

## **Systemic Wound Infection**

- ↑↑↑ pain, tenderness, & swelling invading more of the surrounding tissue.
- ↑↑↑ redness; red streaks may appear radiating along the limb towards the trunk of the body.
- Pt complains of general achiness and feels tired.
- Fever and chills are common.

Systemic Infection



## Systemic Wound Infection Tx

- Tx as per local infection (see above) AND:
- Give fever reducing meds (NSAIDs) IF pt's temp is 102° F (39° C) or greater. The body's immune system functions efficiently in the temp range between 99°-101° F (37.5°-38.5° C); therefore, pts with a low grade fever should not be given fever reducing medications.
- Rest (no exercise) to decrease the production of metabolic waste.
- Administer fluids to increase the elimination of waste. Monitor the pt's urine color and output.
- Start a oral course of systemic antibiotics and monitor. Resistant strains of Staphylococcus aureus (MRSA) are ↑ and may not respond to penicillin-based or traditional abx. Doxycycline provides good coverage against mild infections from many gram-negative and gram-positive organisms, including most CA-MRSA. Give 100 mg by mouth every 12 hrs until inflammation has resolved. Avoid sun during therapy and 5 days after the course is complete; sun blocks are typically ineffective. IV vancomycin is the Tx of choice for resistant infections.
- *Begin a Level 2 Evacuation and upgrade to Level 1 if pt's condition worsens.*

## Cellulitis S/Sx

- Cellulitis may occur with or without a wound and is more prevalent in the lower leg and feet.
- Rapidly spreading skin rash with ↑↑↑ tenderness, swelling, redness, and warmth.
- Fever, chills, & red streaks indicate a systemic infection.
- The presence of blisters, crepitus, & dead tissue indicate severe infection.



## Tx for Cellulitis

- If associated with a wound, soak & clean as per local wound infection.
- If no wound appears to be present, soak as per local wound infection.
- Start a course of oral abx and monitor as above.
- Begin a Level 3 Evacuation if abx are not available and S/Sx are mild.
- *Begin a Level 2 Evacuation if S/Sx are systemic/severe: red streaking, fever, chills, crepitus, blisters, and/or dead tissue even if abx therapy has been initiated and upgrade to Level 1 if pt's condition worsens.*

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# Dehydration

**Dehydration** occurs when  $H_2O$  loss  $>$  intake and is often 2° to exercise, a heat challenge, or nausea, vomiting, & diarrhea; it may occur under any environmental condition.

## Dehydration Prevention

- Maintain  $H_2O$  & electrolyte balances. Cool oral fluids are more easily tolerated and absorbed than warm or very cold ones. Replace fluids at 1 L/hr with small sips to prevent vomiting. Dilute electrolyte replacement or sport drinks to tolerable levels (usually  $<$  50%). Dilution  $\uparrow\uparrow$  the absorption rate.
- Monitor urine color & output. Hydrated = clear or pale yellow urine.
- Thirst is unreliable; drink before you are thirsty.

## Dehydration S/Sx

- Hx of fluid loss & minimal or no replacement.
- Urine output is  $\downarrow\downarrow\downarrow$ . Urine is concentrated & dark yellow or orange in color.
- Headache, nausea  $\pm$  vomiting (vomiting occurs in severe cases as electrolytes become unbalanced).
- Awake & irritable or lethargic with  $\downarrow\downarrow\downarrow$  mental & physical performance.

## Dehydration Tx

- Replace  $H_2O$  & electrolytes with cool water & commercial Oral Rehydration Solution (ORS) slowly to prevent vomiting.
- *Improvise ORS recipe: 1/2 tsp salt (sodium chloride), 1/4 tsp salt substitute (potassium chloride), 1/2 tsp baking soda (bicarbonate), 2-3 tbsp of table sugar, honey, or Karo syrup. Mix in 1 L  $H_2O$ . The ratio of salts to sugar should be at least 1 part salt to 2 parts sugar to ensure absorption.*
- Electrolytes may also be replaced with foods high in simple sugars, potassium, and sodium (bananas, raisins, etc.).
- Monitor urine color & output.
- Consider subcutaneous replacement for mild to moderate dehydration; severe losses may require IV fluid replacement.

# Sunburn

**Sunburn** is 2° to UVR exposure and is a major cause of dehydration as fluids shift from the vascular bed into injured tissues; prevention cannot be overrated.

## Sunburn Prevention

- Seek shade during the peak exposure hrs. UVR is strongest when your shadow is shorter than you are (roughly 10 AM to 4 PM). Altitude, snow, water, and white sand ↑↑↑ exposure.
- Clothing is safer and more effective than sun screen. Dark clothing is better than light, dry better than wet, and a tighter weave better than a loose weave. Light colored sun-block clothing works extremely well.
- Use waterproof sunscreens with SPF 30 as adjunct protection to augment clothing. Most sun screens do NOT offer significant protections against UVA radiation. Opaque zinc oxide offers the best skin protection.

## Sunburn S/Sx

- Redness, pain, tenderness, & swelling ↑↑ during the first 24 hrs due to inflammation followed hrs to days later by peeling as healing occurs and epidermis is replaced.
- In severe cases, clear fluid filled blisters may develop within 24 hrs.

## Sunburn Tx

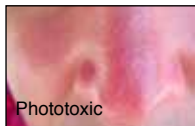
- Protect from further exposure.
- Tx superficial burns with topical Aloe vera & ibuprofen po 200-400 mg qid.
- Tx blisters as per Thermal Burns Tx (page 43).
- Dehydrated pts are predisposed to heat exhaustion, heat stroke, & AMS. Give H<sub>2</sub>O & electrolytes; monitor urine color & output.
- Due to vascular damage, pts with large area burns have a limited ability to thermoregulate and are predisposed to hypothermia.
- Give OTC anti-inflammatory & pain meds: ibuprofen or naproxen sodium.

# Photosensitivity

**Photosensitive** reactions are 2° to light-activated compounds that cause direct cell damage and a severe inflammatory response (phototoxic reaction) or an allergic skin reaction (photoallergic reaction).

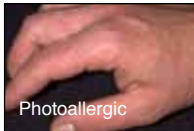
## S/Sx Phototoxic Reactions

- Onset is min-hrs after exposure. Looks like severe sunburn ± blisters; typically limited to exposed areas.
- Does NOT require previous exposure.
- Causes: Abx (tetracyclines, fluoroquinolones, sulfonamides) NSAIDs (ibuprofen, ketoprofen, naproxen), Antifungals (itraconazole, voriconazole), Sun Screen (PABA), Diuretics (acetazolamide).



## S/Sx Photoallergic Reactions

- Onset is 24-72 hrs.
- Severe reactions may spread to unexposed areas.
- Prior exposure is required.
- Itchy, bumpy, dermatitis ± small, clear blisters.
- Causes: NSAID (celecoxib), Sun Screens (cinnamates, benzophenones, salicylates), Fragrances (musk ambrette, 6-Methylcoumarin), Oral Contraceptives (all estrogen-progestin combinations).



### Photosensitivity Tx

- Attempt to identify and discontinue the sensitizing agent. Resolution is variable once the offending agent is removed and depends solely upon the chemical composition of the compound.
- Cool compresses may offer relief. Sunscreen is usually ineffective.

# Photokeratitis

**Photokeratitis** (Sun Blindness) is 2° to UVR damage to the conjunctiva and occasionally the cornea.

### Photokeratitis Prevention

- Sunglasses that filter 100% UVB and 80% blue light (UVA) are mandatory in mountain, river, ocean, and desert environments where sunlight and glare are unavoidable. Consider goggles, wraparound glasses, or glasses with side protection.
- Emergency “slit glasses” can be made from duct tape and a piece of cord or cloth.
- A wide-brimmed hat blocks about 50% of UVR & ↓↓↓ the amount of light entering above or around glasses.



### Photokeratitis S/Sx

- Bilateral eye pain, tenderness, swelling, headache, & light sensitivity.
- Onset is 6-12 hrs after exposure & often accompanied by a sunburned face.
- Severe burns may cloud the cornea (rare).

### Photokeratitis Tx

- Remove from sunlight until the S/Sx subside; usually within 24-48 hrs.
- Severe cases may require bandaging. Tx with bacitracin ophthalmic ointment qid until S/Sx are relieved.
- Consider Level 3 Evac. *Monitor for corneal ulcer (page 104).*

# Heat Stroke

**Heat Stroke** occurs when the body's ability to cool itself is overwhelmed by a heat challenge. When the pt's core temp reaches 108° F, proteins—including the enzymes responsible for all chemical reactions within the human body—break down. This rapidly leads to irreversible multiple organ failure and death; most pts are unacclimatized and exercising in a moderate to severe heat challenge. *Adequate time for heat acclimatization is required in order to perform safely in a new heat challenge. In healthy individuals, initial acclimatization occurs within 3-5 days, 80% within 2-3 wks, and 100% acclimatization wks to months later. Heat insult is accumulative with the highest risk during the second day of exposure.*

## Heat Stroke Prevention

- Allow time for heat acclimatization to occur. *Unacclimated individuals are at ↑↑↑ risk for heat stroke and all heat related illnesses. Minimize exercise in a new heat challenge until primary acclimatization has occurred.*
- Monitor temp & mental status. Adjust layers & exercise levels to existing heat challenge.
- Maintain H<sub>2</sub>O & electrolyte balances (page 37). Avoid sunburn (page 38).

## Heat Stroke Early S/Sx

- Pts typically c/o the heat. *If pt is anxious, irritable, lethargic, dizzy, or exhibits bizarre behavior in a heat challenge immediately begin Tx for heat stroke.*
- Core temp is typically > 105° F (40.5° C). Seizures are possible.
- Skin color varies and is not an assessment tool.

## Heat Stroke Late S/Sx

- Onset may be very fast (min to hrs) after initial S/Sx.
- V P U. Seizures are common. Coma & death are possible.

## Heat Stroke Tx

- **STOP exercise & COOL pt.** Use cold/cool water immersion in humid environments. Use a combination of spray misting & fanning (evaporative cooling) on pt's bare skin in arid climates. Avoid over-cooling & shivering; shivering ↑ body temp and is counter productive.
- If pt is awake, replace fluids & electrolytes slowly (page 37).
- Monitor H<sub>2</sub>O intake, urine color & output, and core temp.
- Awake pts who have not undergone a significant AVPU change (↓VPU) may remain in the field, are at high ↑↑↑ for heat injuries and must be closely

monitored. *If their environment cannot be modified (change route, exercise levels, etc.) to permit acclimatization, begin a Level 2 Evac.*

- *Begin a Level 1 Evac for all pts who remain V P U after cooling; maintain their critical systems en route.*
- Cardiac arrest = death; CPR is not indicated.

## Heat Exhaustion

**Heat Exhaustion** occurs when dehydration inhibits the pt's normal cooling processes. Pt Hx shows insufficient H<sub>2</sub>O intake in a heat challenge.

### Heat Exhaustion S/Sx

- ↓↓↓ mental & physical performance.
- ± ↑↑ core temp but < 105° F (40.5° C).
- Awake & irritable or lethargic, often c/o of the heat.
- Skin is typically pale 2° vasoconstriction unless sunburn is present.
- Headache, nausea, & chills ± vomiting. Urine is dark with ↓↓↓ output.

### Heat Exhaustion Tx

- *STOP exercise and COOL pt as per heat stroke (page 40).*
- Replace lost fluids & electrolytes slowly as per dehydration (page 37).
- Monitor H<sub>2</sub>O intake, urine color & output, & core temp.
- Pts remain at ↑↑↑ risk for heat injuries and must be closely monitored. If their environment cannot be modified (changing route, exercise levels, etc.) to permit acclimatization, begin a Level 3 Evac. *If not effectively Tx, Heat Stroke is an anticipated problem.*

## Heat Rash

**Heat Rash** usually occurs in a humid environment after ↑↑↑ sweating as sweat ducts become blocked & inflamed.

### Heat Rash S/Sx

- Red swollen skin with small pustules.



### Heat Rash Tx

- Lightly scrub affected area to clear blocked sweat ducts. Monitor for infection.
- Give 200-400 mg ibuprofen qid to ↓ inflammation.
- ↓↓ Sweating may predispose the pt to heat stroke.
- Limit exercise & heat exposure.

# Heat Cramps

**Heat Cramps** typically occur in the large muscle groups of the thigh and abdomen 2° to an electrolyte imbalance (see hyponatremia below).

## **Heat Cramps Tx**

- Replace H<sub>2</sub>O & electrolytes slowly as per dehydration (page 37).
- Rest. Massage is often helpful.

# Heat Syncope

**Heat Syncope** (dizziness or fainting) is 2° to extreme systemic vasodilation during a heat challenge. It typically occurs when a person stands suddenly or remains standing for an extended period of time with their knees locked. Dehydration is a contributing factor.

## **Heat Syncope Tx**

- Cool pt and replace H<sub>2</sub>O and electrolytes slowly as per dehydration (page 37).

# Hyponatremia

**Hyponatremia** occurs when the pt's sodium (Na<sup>+</sup>) balance is upset 2° to ↑↑↑ H<sub>2</sub>O intake & subsequent flushing of electrolytes via urine.

## **Hyponatremia Prevention**

- Replace electrolytes with foods containing salts (sodium & potassium) and sugar; sugar ↑↑ absorption of electrolytes (2 parts sugar to 1 part salt).
- Unacclimated persons exercising in a hot environment should ↑↑ dietary sodium and allow time for acclimatization.

## **Hyponatremia Early S/Sx**

- Awake & irritable ± c/o the heat.
- Headache, general weakness, & fatigue.
- Nausea, vomiting, & diarrhea.
- Urine is clear or light yellow with ↑↑↑ output.
- Cramps in large muscle groups. Seizures are possible.

## **Hyponatremia Late S/Sx**

- V P U with death 2° to multi organ failure. Seizures are common.

### **Hyponatremia Tx**

- Most cases are mild and may be Tx by restricting water and adding sodium to the pt's diet until S/Sx resolve. VERY mild cases may be Tx with ORS.
- Awake pts who respond to Tx may remain in the field IF their diet, environment, route, & exercise levels are modified to allow time for acclimatization.
- *If pt is awake with mild S/Sx & field Tx is NOT possible, begin a Level 2 Evac.*
- *Begin a Level 1 Evac with ALS for all V P U pts.*
- Cardiac arrest = death; CPR is not indicated.

## **Respiratory Burns**

All pts who report having inhaled toxic gases—especially hot toxic gases—are at risk for delayed respiratory swelling, constriction, and pulmonary edema within 24 hrs of inhalation even if they do not present with respiratory distress.

### **Respiratory Burns Early S/Sx**

- Awake & anxious c/o of difficulty breathing.
- Pt assumes the tripod position and exhibits broken speech patterns (word and phrase apnea). Wheezing sounds are present in both lungs.
- ↑ pulse & respirations.

### **Respiratory Burns Late S/Sx**

- In severe cases wet lung sounds (rales or gurgling) are present. ± clear or blood-tinged (rare) productive cough. Pt becomes V P U.
- Cyanosis (blue color) may develop in mucous membranes.
- ↑↑ pulse & respirations; death 2° respiratory arrest.

### **Respiratory Burns Field Tx**

- *Begin a Level 1 Evac with ALS to a burn center for pts suspected of inhaling toxic or hot gases even if S/Sx of respiratory distress are not present.*
- Support pt in a sitting position.
- Administer supplemental oxygen & PPV prn. The effect of PPV may be limited due to lower airway constriction & developing pulmonary edema.
- Cardiac arrest = death; CPR is not indicated.

## **Thermal Burns**

Most backcountry **Thermal Burns** occur in the camp kitchen from boiling water, grease, or stove flares. Pts with large surface area burns often die from volume shock or infection; pain is difficult to manage in a wilderness environment.

## Thermal Burns Prevention

- Set camp kitchens outside traffic pattern; limit people in the kitchen to cooks. Keep camp stoves on the ground and ensure they are well supported. Wear shoes in the kitchen. Avoid putting oversized, top-heavy pots on stove.

## Thermal Burns S/Sx

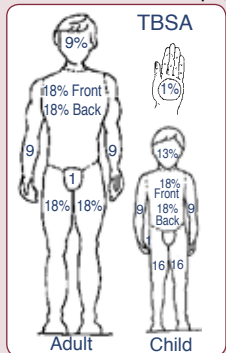
- Superficial Burn: Redness, pain, & tenderness.
- Partial Thickness Burn: Initial redness, pain, & tenderness progress to clear fluid-filled blisters within 24 hrs.
- Full Thickness Burn: No redness, pain, or tenderness. Skin is unnaturally white, grey, or black. Burned area may be deep with little or no bleeding and often surrounded by superficial & partial thickness burns in a bull's-eye pattern.

## Thermal Burns Tx

- Immerse or soak thermal burns in cool water to decrease damage and reduce pain. **CAUTION: superficial & partial thickness degree burn pts have a limited ability to thermoregulate and are predisposed to hypothermia.**
- If pt is awake, give oral fluids & electrolytes (ORS) to help prevent dehydration. Monitor urine color & output.
- Tx superficial burns with topical Aloe vera & ibuprofen po 200-400 mg qid.
- Flush partial thickness burns with clean water. Open large blisters and remove dead skin prior to cleansing. Pat or air dry. Give ibuprofen 600 mg qid to reduce inflammation. Keep moist. Use bacitracin, triple abx, or silver sulfadiazine (Rx) ointment, Second Skin<sup>®</sup>, or cover with a micro thin dressing. Reclean bid. Leave micro thin dressing in place unless an infection develops; lance dressing if a "blister" forms under it.

**CAUTION: In rare cases silver sulfadiazine may cause an allergic reaction.** If no ointment or dressings are available a protective scab will develop if the burn is left open to the air.

- Tx full thickness burns as high risk wounds (page 31). Give morphine (Rx) to control extreme pain.
- **Begin a Level 1 Evac with ALS to a major burn center: partial thickness burns > 20%, mixed burns > 30% of the pt's Total Body Surface Area (TBSA), full thickness burns, and burns to the head, hands, or groin. Burns remain sterile for 24-48 hrs; burn Tx should not delay an Evac.**
- Cardiac arrest = death; CPR is not indicated.



# Lightning Injuries

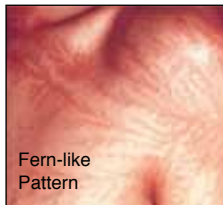
**Lightning Injuries** are 2° a direct hit, splash, or ground current; severity is associated with the electrical pathway through the pt's body.

## Lightning Injury Prevention

- **KNOW** local weather patterns (both frontal & diurnal)
- **SEEK SHELTER** when you hear thunder.
- **STAY AWAY** from high exposed places.
- **STAY AWAY** from open areas (fields, open water, etc.)
- **DO NOT** take shelter directly under isolated trees.
- **REMOVE** all metal from contact with your body (watches, rings, necklaces, body piercings, climbing rack, belt buckles, ice axes, etc.)
- **SEEK** shelter in dry areas not exposed to the storm's rain shadow & insulate yourself from the ground. Consider crouching with your feet together.
- **AVOID** shallow caves, gullies, & overhangs. Caves should be BIG and dry (at least twice as long as high).
- **AVOID** holding onto metal fences, wires, or shrouds.
- **IF WOKEN** by thunder at night while in a dry shelter, get up, squat on your sleeping pad, and remain there until 30 min after the storm ends.
- **MOVE** if your hair stands on end, you see or hear static electricity, or you see a blue ring around objects – *a strike is imminent.*
- *If caught in a strike zone, MOVE in an organized fashion to a safer area.*

## Lightning Injury S/Sx

- Both respiratory & cardiac arrest are possible.
- Traumatic injuries are likely; assess as per Trauma Index (page 2). Temporary paralysis is possible. *Assume all lightning victims have an unstable spine.*
- Fernlike or star-burst patterns on pt's skin indicate a lightning strike.
- Small entry/exit wounds are possible at conduction/contact points with metal fences or shrouds.



- If pt's clothes have been blown off or torn, check for thermal burns 2° to steam. Pt may also have thermal burns from contact with metal or plastic.
- Ruptured ear drums are common; pts may be disoriented & deaf with vertigo & tinnitus (high-pitched ringing in ears). Pt may be temporarily blind.
- Assume any person with ↓↓ mental status to have been struck by lightning. If pt is awake or awakens, they tend to remain awake. General confusion, amnesia, & exhaustion may persist for days or wks. Permanent personality changes are common, including irritability & depression.
- Cardiac dysfunction & arrhythmias may be present on arrival or develop over time. Pulmonary edema is possible but rare.

### **Lightning Injury Tx**

- *Immediately begin CPR if pt is in cardiac arrest. Recovery with CPR is possible.* Continue PPV if respirations are absent & pulse is present; pts may require ventilations for hrs before resuming breathing on their own. Heart dysrhythmias may occur immediately or be delayed for several days.
- Immobilize the pt's spine & RO (page 9) as the situation warrants.
- Tx all linear & star burst pattern burns as per Thermal Burns (page 44).
- Assess & Tx all traumatic injuries as per Trauma Index (page 2). Musculoskeletal paralysis is usually temporary. For ruptured ear drums see page 101.
- Fernlike patterns on pt's skin are temporary and will disappear in 24-48 hrs.
- Begin a Level 3 Evac for all lightning-struck pts who are awake with no loss of consciousness, present with a normal physical exam, and are asymptomatic.
- *Begin a Level 2 Evac for all lightning-struck pts who are awake with an altered mental status and minor S/Sx.*
- *Begin a Level 1 Evac for all lightning-struck pts who have suffered cardiac arrest, respiratory arrest, or who are currently V P U.*

# Hypothermia

**Hypothermia** occurs when the pt's ability to produce & retain heat is overwhelmed by a cold challenge. ↓ mental status may prevent conscious adaptation.

### **Hypothermia Prevention**

- Stay hydrated. Avoid nicotine; it is a vasoconstrictor.
- Monitor temp & mental status. Adjust layers & exercise levels to meet cold challenge. Seek shelter before becoming hypothermic.
- Balance intake & stored calories with energy output. Use rest days to resupply sugar & fat stores before strenuous exercise in a cold challenge.

**Cold Response S/Sx** (96°-97° F; 35.5°-36.5° C)

- ↑ Metabolism, mild shivering, minor ↓ dexterity, ↑ urination.

**Mild Hypothermia S/Sx** (90°-96° F; 32.5°-35.5° C)

- ↑↑↑ shivering that stops as calories are depleted, ↓↓↓ dexterity, ↑↑↑ urination, impaired judgment, unable to speak clearly, awake & lethargic to V<sup>+</sup>, ataxic, ↓↓↓ cerebral metabolism, up to 25% ↓ O<sub>2</sub> use.
- Good ability to rewarm in field. *Assume high voice responsive (V<sup>+</sup>) pts have moderate hypothermia & Tx accordingly.*

**Cold Response & Mild Hypothermia Tx**

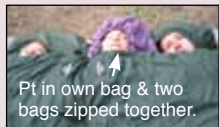
98° F (35.5° C)

96° F (36.5° C)

90° F (32.5° C)

**Cold Response****Mild Hypothermia***Shelter, Insulation, & Heat*

- Add Insulation Layers. Seek Shelter.
- Use a standard hypo-package if pt needs transportation (page 48).
- Use a modified hypo-package with three people, bags, & pads if pt is to remain in camp (pt is in center bag between two normothermic people).
- Add Heat Packs (hot water in hydropack).

*Food & H<sub>2</sub>O*

- If awake add food, warm H<sub>2</sub>O, & electrolytes. Begin with simple sugars & carbohydrates; *add protein & fats later.*

*Rest vs. Exercise*

- Rest if calorie stores are ↓↓ & pt has been exercising.
  - Exercise if pt is awake, calorie stores are intact, & pt has been inactive.
- IF pt is V<sup>+</sup> assume & Tx for moderate hypothermia: DO NOT EXERCISE.*

**Moderate Hypothermia S/Sx** (86°-90° F; 30°-35.5° C)

- Limited ability to rewarm in the field.
- Shivering stops as hypothalamus shuts down, cardiac arrhythmias, up to 33% ↓ in cardiac output, insulin is ineffective.

**Severe Hypothermia S/Sx** (< 86° F; < 30° C)

- Unable to rewarm in the field.
- Progressive ↓ in V P U, pt may appear dead, major pH changes, & risk of spontaneous ventricular fibrillation

## Moderate & Severe Hypothermia Tx

90° F (32.5° C)

86° F (30° C)

### Moderate Hypothermia

### Severe

Assist pt's breathing (PPV) if P or U. Handle Gently: No exercise or rapid external rewarming. No chest compressions if cardiac function is suspected.

#### Standard Hypo-package

- Remove wet clothes.
- Internal Vapor Barrier (reflective mylar blanket or bag).
- Multiple Layers of Insulation (minimum: two sleeping bags & pads).
- Add heat slowly between insulation layers (hot water in hydropacks).
- External Vapor Barrier (bivy sack or tarp).

ALS Drugs and Defibrillation are ineffective below 86° F (30° C).

Begin a gentle Level 1 Evac.



#### Improved Hypo-package

Lay out packaging materials, roll together from both sides, and tie. To load: lift pt axially, slide hypo-package under pt, untie, and roll out; then lower and package pt.





## Non-freezing Injuries

**Reynauds** affects the extremities in afflicted people; recurrent cases can result in atrophy of the skin, subcutaneous tissues, and muscle. **Chilblains** occurs when skin is directly exposed to cold, wet, & typically windy conditions. **Cold Water Immersion Injury** occurs with prolonged immersion in cold water or chronic cold, wet digits. Onset ↑ as H<sub>2</sub>O temp ↓.

### Non-freezing Injuries Prevention

- Wear protective clothing.
- Herbal teas that stimulate circulation: fresh ginger, angelica, & prickly ash.
- Herbal teas that promote vasodilation: yarrow, hawthorn, & horse chestnut.
- Avoid smoking, dipping, and patches; nicotine is a strong vasoconstrictor.
- Keep extremities warm & dry; change socks daily.
- Massage regularly to ↑ local circulation.

### Reynauds S/Sx

- Rapid white, cyanotic, or flushed skin upon cold exposure or stress.
- Numbness, pain, and/or throbbing is common in the affected area.



### **Reynauds Tx**

- Rewarm; warm water works well.
- In situations where the environment cannot be modified, consider a vaso-dilating calcium channel blocker: extended-release nifedipine.

### **Chilblains S/Sx**

- Hx of skin exposure to cold (32°-60° F or 0°-15.5° C), wet, & windy conditions. People with Reynauds are predisposed to chilblains.
- Local burning & itching upon rewarming.
- Localized blotchy patches with swelling, redness, & tender blue nodules; in severe cases, small blisters or pustules may appear 12-24 hrs after rewarming.
- S/Sx may persist for 10-14 days.



### **Chilblains Tx**

- Avoid continued exposure.
- Apply topical ointments containing the herbs Aloe vera and rue.
- Elevate to reduce swelling.
- **KEEP CLEAN, WARM, & DRY**; monitor for secondary bacterial infection.
- Avoid smoking, dipping, and patches; nicotine is a strong vasoconstrictor.

### **Cold Water Immersion Injury S/Sx**

- Hx prolonged immersion (usually > 10-12 hrs) in 32°-50° F (0°-10° C) H<sub>2</sub>O.
- Decreased CSM in the affected extremity *before* rewarming; numbness is common and may last for wks to months.
- Swollen, red, or cyanotic (blue) skin; hot, dry & painful *after* rewarming.



### **Cold Water Immersion Injury Tx**

- Tx any existing hypothermia first (page 46).
- Pat or air dry – **DO NOT RUB**. Elevate feet.
- Administer ibuprofen at 600 mg qid & topical Aloe vera.



- Tx as a high risk wound. Debride prn.
- Avoid repeated exposure – **DO NOT USE.**
- Begin a Level 3 Evac for mild S/Sx or *Level 2 for severe S/Sx.*

## Freezing Injuries

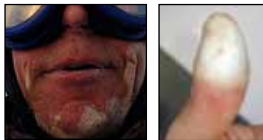
Both **Frostnip** & **Frostbite** occur with exposure to temps below freezing (32° F or 0° C). Depth and severity ↑ with exposure time and cold. Hypothermia, traumatic injury, circulatory diseases, fatigue, illness, and high altitude may compromise peripheral circulation and predispose pts to frostbite.

### Frostnip & Frostbite Prevention

- Prevent hypothermia (*page 46*).
- People with circulatory system Px are predisposed to frostbite.
- **AVOID** alcohol.
- Monitor protected extremities (feet, hands, etc.) subjectively for numbness or lack of sensation while traveling. **Only inspect feet visually when in camp.**
- Avoid local constriction (tight boots, wrist loops, etc.).
- Consider camping or changing route as environmental conditions deteriorate.
- Avoid smoking, dipping, and patches; nicotine is a strong vasoconstrictor.

### Frostnip S/Sx

- Pt c/o numbness & lack of local motor skills.
- Affected area feels soft & dough-like upon palpation.
- Skin appears white & waxy before rewarming and flushed or mottled after rewarming with no blisters.



### Frostnip Tx

- *Tx any existing hypothermia first (page 46).*
- Consider spontaneous rewarming by increasing exercise & local perfusion.
- Consider skin to skin rewarming.
- If, after 24 hrs, no blisters appear the limb may be used. The limb is now predisposed to further cold injury; care should be taken to keep it warm.
- *If blisters appear Tx as Frostbite.*

## **Frostbite S/Sx**

- Complete loss of sensation with no movement.
- Affected tissue feels solid and “wooden” to the touch.
- Skin is white, gray, or cyanotic ± ice crystals in skin before rewarming. Normal sensation, color & warmth; swelling within 3 hrs; and early formation of clear blisters that extend to the tips of the digits are good signs; no swelling, late formation of small, blood-filled blisters, and black tissue are poor signs.

## **Frostbite Tx**

- *Tx any existing hypothermia first (page 46).*
- Walk out on frozen feet if < 24 hrs from care. *Field rewarm if medical care is > 24 hrs and subsequent use & refreezing can be avoided.*
- For controlled field rewarming: Rewarm limb in “warm” 104°-108° F (40°-42.2° C) water for 30-40 min. Monitor the temp constantly. Remove limb when adding additional hot water to prevent thermal burns.
- Administer ibuprofen at 600 mg qid & topical Aloe vera.
- Tx as a high risk wound. Apply cotton between digits during healing phase.
- Avoid refreezing & use during Evac and healing phase.

## **Prognostic Signs after Rewarming**



# **Near Drowning**

**Near Drowning** describes a submerged pt who has responded to CPR or PPV and currently has a pulse & respirations.

## **Near Drowning S/Sx**

- If a traumatic MOI is present the pt's spine should be stabilized during both rescue and Tx.
- If pt becomes Awake chance of a complete recovery is good. Pts who remain V P U are at risk for ↑ ICP within the next 24 hrs.
- Decreased water quality increases the chance for delayed pulmonary edema over the next 24 hrs and subsequent respiratory infections.

## **Drowning/Near Drowning Tx**

- *Begin BLS resuscitation efforts if documented immersion time is less than 1 hour. Begin PPV if respirations are absent. Begin CPR if pulse is absent regardless of core temp. Consider stopping CPR after 30 min.*
- If Trauma is a potential MOI, immobilize the pt's spine then assess & Tx as per Trauma Index on page 2.
- Anticipate vomiting during resuscitation.
- Tx for hypothermia prn.

### *Post-Rescue/Resuscitation Tx*

- Unless water quality is extremely poor, pts who self-rescue are not at risk of developing delayed pulmonary edema. In heavily contaminated or muddy water, consider a Level 3 Evac. Monitor pt for at least 6 hrs and *begin a Level 1 Evac if S/Sx of respiratory distress appear.*
- *Begin a Level 2 Evac for awake pts after a successful resuscitation with no S/Sx of respiratory distress; the chance of a complete recovery is good.*
- *Begin a Level 1 Evac for awake pts after a successful resuscitation who present with or develop respiratory distress.*
- *Begin a Level 1 Evac for all pts who remain V, P or U after a successful resuscitation; they have a higher risk of a poor outcome.*
- Monitor pts for 3-7 days for a secondary respiratory infection.

# Wilderness Toxins

**Wilderness Toxins** may affect any or all body systems. Toxic reactions may be roughly broken down into hemotoxic, neurotoxic, and proteolytic effects.

*Some toxins may cause an immediate or delayed allergic reaction (page 62).*

## **General Assessment Guidelines**

- A specific Hx of the toxin detailing what, where, when, how much and the size/weight of the pt is necessary for Tx using specific antidotes or antivenin.
- When dealing with an incomplete Hx, follow the general Tx guidelines.
- Wounds associated with any bite or sting have a high potential for infection.
- Monitor for anaphylaxis (*page 64*).

## **General Tx**

- Tx for Anaphylaxis if present (*page 64*).
- Support critical systems. Cardiac arrest = death; CPR is not indicated.
- Remove and dilute.



- Tx S/Sx as they develop.
- *Begin a Level 1 Evac of pts with serious or potentially serious reactions.*
- Antivenins & antidotes are available for many wilderness toxins. They are specific to the toxin and best given as soon as possible after exposure. Anaphylaxis and serum sickness are specific problems associated with the use of most antivenins and usually prohibit their use as a field Tx. *In the USA call the Arizona Poison Control Center for advice on antivenin & antidotes 2° to indigenous wilderness toxins at:*
- Tx wounds associated with bites as per page 32.

## Absorbed Toxins

### Absorbed Toxins S/Sx

- Skin reactions (rash, itching, pain, swelling) typically follow contact.
- Poison ivy, poison oak, and poison sumac produce antigenic resins that cause delayed allergic reactions in 50% of the population (page 63).

### Absorbed Toxins Tx

- Remove contaminated clothing & flush the pt's skin with large amounts of H<sub>2</sub>O.
- Tx any wounds (page 28).

## Ingested Toxins

### Ingested Toxins S/Sx

- Nausea, vomiting, & diarrhea accompanied by abdominal pain & tenderness.
- Systemic S/Sx are possible and vary with the toxin. Death is possible.

### Ingested Toxins Tx

- If Awake, force fluids (H<sub>2</sub>O) and give activated charcoal (1 ml/kg of pt's body weight). Either may cause vomiting.
- Inducing vomiting is rarely indicated but may be useful if the toxin has been ingested within the past 20 min, the toxin is not corrosive, and the pt is awake, alert, & cooperative. *Do not induce vomiting if the pt is drowsy, lethargic, or V P U.* To induce vomiting dissolve mustard (1 tsp) or salt (1 tbs) in a 8 oz of warm water; do not use hot water. Swallow all at once; follow it in ten min with another 8 oz of warm water, if pt has not vomited. Alternately have pt stick their finger down their throat.

# Inhaled Toxins

Smoke is the most common inhaled toxin in a wilderness environment; ↑ chemicals in the smoke = ↑ lung damage.

## Inhaled Toxins S/Sx

- ↑ respirations & difficulty breathing indicate respiratory distress. Anticipate ↑↑↑ respiratory distress during the next 24 hrs as swelling and constriction occur in the lower airway & edema develops in the alveoli.
- Wheezing indicates lower airway constriction 2° to bronchial swelling.
- Clear productive cough, rales, and/or gurgles indicate pulmonary edema.
- A bloody froth indicates severe damage to alveoli.

## Inhaled Toxins Tx

- Remove the pt from the toxic environment.
- Monitor for respiratory distress.
- *Begin a Level 2 Evac for all awake pts with no S/Sx of respiratory distress once coughing has subsided; the chance of a complete recovery is good. If respiratory distress is present or develops, begin a Level 1 Evac.*
- Reassure and calm the pt to slow their breathing rate.
- Place the pt in a sitting or semi-reclining position.
- Administer O<sub>2</sub> during transport.
- PPV prn. Respiratory arrest may occur during Tx if ventilations are unable to maintain effective blood O<sub>2</sub> levels.

# Bites & Stings

While all **Bites & Stings** carry the potential for causing a local or systemic allergic reaction, stings from Hymenoptera (honeybees, bumblebees, hornets, yellow jackets, wasps, & fire ants), scorpions, and venomous aquatic animals (jellyfish, fire coral, hydroids, anemones, sponges, & bristleworm) are the most likely. *Always monitor for and be prepared to Tx anaphylaxis.*

## Bees, Wasp, & Hornet Stings S/Sx

- Honeybees leave their stinger & venom sac in place; wasps and hornets do not and may sting numerous times.
- Pain, itching, redness, & swelling (welt) at site.
- 300+ stings may produce fatal toxic reactions.
- *Monitor for an allergic reaction; be prepared to Tx anaphylaxis.*



### **Bee, Wasp, & Hornet Stings Tx**

- Remove bee stinger from skin by scraping or pulling.
- Attempt to disassociate the toxin using papain-based meat tenderizer (remove within 15 min) or a weak base (ammonia or baking soda).
- Use OTC pain and anti-inflammatory medications (ibuprofen or naproxen sodium) to relieve pain.
- Use oral or topical antihistamine to reduce itching.
- *Monitor for an allergic reaction; be prepared to Tx anaphylaxis.*

### **Fire Ant Stings S/Sx**

- Immediate burning pain at site moves up the limb via the pt's lymphatic system and into the lymph gland.
- Within seconds a tiny, itchy welt appears and is followed within 24 hrs by a small blister or blisters. The fluid in the blister becomes cloudy after 8-10 hrs. The blister eventually ruptures, forms a crust and heals several days later, sometimes leaving a small scar. Scratching may lead to a secondary infection.
- The ant's mandible may leave two small puncture marks.



### **Fire Ant Stings Tx**

- Administer an oral antihistamine for mild reactions. Evacuate pts with severe reactions.
- Cool compresses relieve pain. Keep clean.
- Monitor for a secondary infection.
- *Monitor for an allergic reaction; be prepared to Tx anaphylaxis.*

### **Black Widow Bite S/Sx**

- Not all widow spiders are black. Not all ventral abdominal markings appear as the classic red hour glass.
- Bite may be painless, a pin-prick, or very painful  $\pm$  red bite wounds. A small blister may develop in  $\pm$  1 hr that may  $\uparrow$ , form a blanched center & ulcerate. Worst pain is in the first 8-12 hrs and may continue for several days.
- Numbness at the site and involuntary muscle spasms develop within 30-60 min in the large muscle groups of the abdomen, lower back, and limbs. Abdominal pain mimics a ruptured ovarian cyst or appendicitis. In pregnant females, it may initiate uterine contraction and cause premature labor.
- Other systemic reactions include:  $\uparrow$  BP, nausea, light sensitivity, restlessness, difficulty breathing, sweating, diarrhea, and seizures.



- Facial swelling with drooping eyelids may develop hrs after the bite.
- S/Sx tend to resolve in 2-3 days; pain can last longer.

### **Black Widow Bite Tx**

- Apply ice or cool compresses. Clean and irrigate wounds prn.
- Administer pain medication and muscle relaxants prn.
- *Begin a Level 1 Evac for children, pregnant women (venom may initiate contractions) and pts with Hx ↑ BP. Antivenin is reserved for severe cases.*

### **Recluse, Wolf, Hobo, & Jumping Spider Bites S/Sx**

- Identification is difficult & rarely required. Most recluse, wolf, hobo, & jumping spider bites develop a single small lesion that heals without advanced care.
- Bite is painless or produces a sharp, stinging pain that gradually fades.
- Venom is primarily a digestive toxin that destroys human tissue. Within a few hrs a red-to-purple halo typically develops at the site, and is occasionally followed by a small blister. Over the next few days the skin sloughs off the blister, leaving a raw area of exposed tissue, generally a few millimeters to 1-2 centimeters wide that often takes wks to heal.



- Larger ulcers—usually due to skin-eating bacteria rather than the spider's toxin—may take months to yrs to heal (some require skin grafts). Rarely, ulcers can become extensive and may reach 30 cm in diameter.
- Systemic symptoms are rare and indicate a more severe reaction.
- Secondary infection is possible and may be severe.

### **Recluse, Wolf, Hobo, & Jumping Spider Bites Tx**

- Apply cool to cold compresses for the first four days; **DO NOT USE HEAT.**
- Aggressively clean & debride site once the skin begins to slough. Monitor for infection and further tissue damage. Consider a Level 3 Evac.
- *If a secondary infection develops, re-clean prn, apply a topical abx/antiseptic, start oral abx, & begin a Level 2 Evac.*
- *Begin a Level 1 Evac if systemic S/Sx develop.*



## Scorpion Stings S/Sx

- All stings produce burning pain, minimal swelling, redness, occasional blisters, numbness, tingling, and local weakness in the affected limb.
- *Centruroides* (bark scorpion) venom is neurotoxic; death is possible but rare. Site is hypersensitive to touch, pressure, heat, & cold; tapping confirms Dx. Neurological S/Sx may include ↑ anxiety, blurred vision, heavy sweating, ↑ salivation, difficulty swallowing, loss of bowel control, jerky muscular movements, & respiratory distress.



## Scorpion Stings Tx

- Apply cool to cold compresses to relieve pain & help pt break down the toxin.
- Evacuate pts with severe systemic S/Sx; the evac level depends on severity.
- *Monitor for an allergic reaction; be prepared to Tx anaphylaxis.*

## Centipede Bites S/Sx

- Small puncture wounds. Pain & tenderness vary from mild to severe.
- Local redness, swelling, & itching are similar to Hymenoptera stings.
- Swollen, painful lymph nodes.
- Anxiety, palpitations, headache, nausea, ± vomiting.
- Most S/Sx last 4-8 hrs; S/Sx 2° severe reactions may last wks.
- Severe reactions may cause localized tissue death; bites are not fatal.

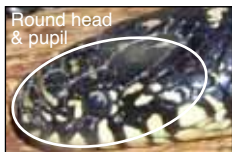


## Centipede Bites Tx

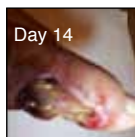
- Oral antihistamine and/or topical hydrocortisone for itching.
- Pain medications prn. Infiltrate locally with lidocaine to manage severe pain.
- Monitor for four hrs for systemic S/Sx, secondary infections, & tissue death.
- Begin a Level 3 Evac for pts with severe S/Sx.
- *Monitor for an allergic reaction; be prepared to Tx anaphylaxis.*

## North American Pit Viper (Crotalid) Bites S/Sx

- Pit vipers (Rattlesnake, Copperhead, & Cottonmouth) have a characteristic triangular shaped head with elliptical pupils, small heat-sensing pits below and behind their nostrils, and hollow hinged fangs connected to venom sacs; 20-30% of strikes do not envenomate.



- One, two, or more fang marks  $\pm$  minor bleeding.
- Local burning pain, swelling, and bruising (generally within 10-15 min).
- Venous envenomation (extremely rare) may not present with severe local S/Sx and progress rapidly to systemic S/Sx & death.
- Local necrotic damage and secondary infection can be severe.
- Blood-filled blisters may develop locally within 6-36 hrs and progress up the limb. Tissue will blacken & slough as it dies.
- Moderate systemic S/Sx include: general weakness, sweating, nausea/vomiting, lightheadedness, &  $\downarrow$  BP.
- Severe hemotoxic S/Sx include small red purple spots caused by bleeding into the skin (petechiae), coughing up blood, vomiting blood, tarry stools (from intestinal bleeding), blindness, and pulmonary edema.
- Neurotoxic effects from a Mojave Rattlesnake may be delayed and include: hoarseness, difficulty swallowing, eyelid droop, and respiratory paralysis.



## North American Pit Viper (Crotalid) Bites Tx

- Remove jewelry & constricting clothing. Tx as a high-risk wound & splint.
- Antivenin is available for all North American pit vipers; is best administered within 6 hrs, and is primarily used to Tx systemic reactions.
- *Begin a Level 2 Evac with local S/Sx; Level 1 Evac with systemic S/Sx.*

## North America Coral Snake (Elapid) Bites S/Sx

- Coral snakes have two fixed, short, hollow fangs in the front of their upper jaw that release venom as they chew; in order to successfully envenomate they must hold on. They are not aggressive; most bites occur during handling.



Red on yellow,  
kill a fellow;  
Red on black,  
venom lack.

(But only in  
North America.)

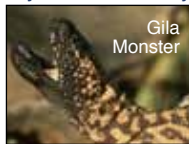
- Neurotoxic with little or no local S/Sx; ± 60% of bites do not envenomate.
- Typical onset: Within 90 min: weakness or numbness in limb. 3-4 hrs: tremors, drowsiness, or euphoria; ↑ salivation. 5-10 hrs: slurred speech, double vision, difficulty swallowing, and respiratory distress. Complete flaccid (drooping) paralysis & respiratory arrest are possible.
- S/Sx may be delayed up to 13 hrs.

## North America Coral Snake (Elapid) Bites Tx

- Keep pt calm, quiet and still; **DO NOT** self evacuate.
- *Splint and begin Level 2 Evac immediately; do not wait for S/Sx to appear.*
- *Begin a Level 1 Evac if systemic S/Sx develop.*

## Mexican Beaded Lizard & Gila Monster Bites S/Sx

- Both venomous lizards that grow up to two feet in length, are heavy, slow-moving, & offer little threat to humans. Teeth are loosely attached & may break off in wound; venom is released into saliva from specialized glands in their jaws and enters the victim with chewing. The more irritated the lizard is, the more it salivates and the more venom is released. Irritated lizards may hang onto a limb and require physical removal. The longer a lizard remains attached, the worse the envenomation; envenomation occurs in < 70% of cases.
- Severe local burning pain within 5 min that progresses up limb; swelling follows ± systemic weakness, sweating, & lightheadedness. Pain generally lasts 3-5 hrs & subsides after 8. Tenderness may last 3-5 wks.



### **Mexican Beaded Lizard & Gila Monster Bites Tx**

- To remove: Submerge in water, cover eyes with cloth, pry jaws with a stick.
- Tx as high risk wound. Probe for and remove any broken teeth.
- Administer pain medications prn and begin a Level 3 Evac.

### **Jellyfish, Fire Coral, Hydroid, Anemone, Sponge, & Bristleworm Stings S/Sx**

- Skin irritation develops in sec to hrs: stinging, burning, redness, blistering, impression patterns, swelling, & itching.
- Systemic S/Sx include: weakness, nausea, vomiting, diarrhea, headache, increased salivation, chills, fever.



### **Jellyfish, Fire Coral, Hydroid, Anemone, Sponge, & Bristleworm Stings Tx**

- Flush with clean seawater. Fresh water or pressure will trigger any stored nematocysts. Air dry and remove any nematocysts by powder and scraping.
- Soak in vinegar (preferred) or other weak acid (40% isopropyl alcohol) or base (dilute ammonia) until pain is relieved. A papain-based meat tenderizer (remove within 15 min) or baking-soda paste may also be effective.
- Remove any embedded sponge spicules, bristles, or spines with forceps and/or sticky tape.
- Administer systemic corticosteroid in tapering dose for all severe reactions (60-100 mg prednisone over 14 days).
- *Begin a Level 2 Evac for all pts with systemic S/Sx.*
- Monitor for infection and an allergic reaction; *be prepared to Tx anaphylaxis.*

### **Box Jellyfish & Cone Shell Snail Stings S/Sx**

- Box Jellyfish envenomation will present with characteristic local dermatitis.
- Cone Shell Snail envenomation will present like hymenoptera stings.
- Systemic S/Sx are often delayed and include: weakness, nausea, vomiting, diarrhea, headache, increased salivation, chills, fever, & delirium.
- Generalized paralysis often leads to respiratory and/or cardiac failure.

### **Box Jellyfish & Cone Shell Snail Stings Tx**

- *No antivenin for Cone Shell Snail stings; begin a Level 1 Evac.*
- *Antivenin for Box Jellyfish stings may be administered in the field. If unavailable, begin a Level 1 Evac; remove Box Jellyfish stings and soak in vinegar/acid solution prior to administering antivenin.*

## **Starfish, Urchin, Stingray, Scorpionfish, Lionfish, Stonefish, Catfish, & Weeverfish Punctures S/Sx**

- Obvious wound ± bleeding.
- Mild to intense pain, redness, swelling, blisters, and sloughing may develop.
- Systemic S/Sx include: weakness, nausea, vomiting, diarrhea, headache, increased salivation, chills, fever, and delirium.

## **Starfish, Urchin, Stingray, Scorpionfish, Lionfish, Stonefish, Catfish, & Weeverfish Punctures Tx**

- Soak in non-scalding hot water (45°C, 113°F) to tolerance until pain is relieved. ↑↑ heat tolerance by adding heat slowly versus sudden immersion.
- Remove any spine fragments embedded in muscle tissue; splint if in tissue near joints. Tx as high-risk wound.
- Pain medications prn; infiltrate with lidocaine for severe pain.
- Monitor for secondary infection; consider prophylactic abx.
- Evac level varies depending on severity.

## **Sea Snakes & Blue Ringed Octopus Bites S/Sx**

- Both types of envenomations present with little or no local S/Sx beyond bite marks; most Sea Snake bites DO NOT result in envenomation.
- Local numbness may spread to include the limb.
- Local redness, swelling, tenderness, and itching.
- Systemic S/Sx are often delayed and include: weakness, nausea, vomiting, diarrhea, headache, increased salivation, chills, fever, and delirium.
- Generalized paralysis often leads to respiratory and/or cardiac failure.

## **Sea Snakes & Blue Ringed Octopus Bites Tx**

- *No antivenin for Blue-Ringed Octopus bites; begin a Level 1 Evac.*
- *Antivenin for most Sea Snakes may be administered in the field; if unavailable, begin a Level 1 Evac.*

# Allergic Reactions

**Allergic Reactions** are caused by “abnormal” (IgE) antibodies and/or abnormal killer T-cells produced by the pt’s immune system in response to a specific allergen. Common allergens include: Hymenoptera stings; ingestion of nuts (including oil), fruit, shell fish, MSG, & drugs; and contact with poison ivy, oak, or sumac. *Tx is based on the type of reaction, either contact, local, or systemic, not the MOI.*

# Contact Allergies

In the wilderness, **Contact Allergies** are caused by casual contact by sensitized individuals with the resin from the roots, stems, bark, berries, and leaves of members of the Anacardiaceae family: “poison” ivy, oak, sumac, or mango skin (not juice). The resin contains urushiol and is released when the plant is injured. Urushiol is oily, spreads easily on contact, and may penetrate clothing and gloves. Depending on the thickness of the pt’s skin, absorption may take hrs. Once absorbed, the urushiol initiates an allergic response that mobilizes urushiol-specific killer T-cells to attack and destroy the affected skin cells.



## Contact Allergy S/Sx

- Local dermatitis with itching & burning ± blisters appears in sensitized individuals within 72 hrs.
- In sensitized individuals, respiratory arrest may result from inhaling smoke from the burned plant.
- Ingested plants do not cause mucous lesions but can result in gastrointestinal S/Sx and itching around the anus.



## Contact Allergy Tx

- Plant resin bonds with skin ± 30 min after contact. Wash with cold or cool water & soap ASAP. Hot water ↑↑ absorption and ↑↑ rash. Tech Lab’s Oak & Ivy Cleanser® and Goop® are more effective than traditional soaps.
- Urushiol remains active for yrs; recontamination by touching clothing, gear, and pets is common. Wash everything potentially in contact with plant resin.
- Oral (not topical) antihistamine: diphenhydramine 25-50 mg q 4-6 hrs.
- Drying agents/astringents: Burrow’s solution, oatmeal paste, calamine lotion, or Technu Extreme gel. Open blisters to release serum to allow topical agents contact with underlying tissue.
- Consider oral corticosteroid (Rx) for severe reactions > 10% of pt’s body.
- Monitor for secondary infection; *be prepared to Tx for anaphylaxis.*

# Local Allergies

## **Local Allergic Rhinitis (Hayfever)**

- Runny nose, congestion, & sneezing ± swollen, itchy eyes & tears.

## **Local Allergic Reactions to Bites and Stings**

- Toxic & local allergic reactions occur concurrently.
- Local redness, itching, & burning; progressive swelling eclipses the welt formed in response to the injected venom.



## **Local Allergic Rhinitis (Hayfever) Tx**

- Tx intermittent symptoms with oral antihistamines and decongestants.
- Tx chronic symptoms with a nasal corticosteroid spray (Rx) alone or in combination with an antihistamine and/or decongestant.
- Tx eye symptoms with antihistamine eye gtt.

## **Local Allergic Reactions to Bites and Stings Tx**

- OTC oral antihistamine & follow package directions. Adult dose of diphenhydramine is 25-50 mg q 4-6 hrs; do not exceed 400 mg/day. Child dose is 1 mg/kg.
- Consider Tx severe local reactions with oral corticosteroid (Rx) in a tapered dose for 14-28 days.
- Monitor for infection. Tx secondary infections with oral abx.
- Tx the concurrent toxic reaction separately.

# Systemic Allergies

## **Systemic Allergic Reactions (Anaphylaxis) S/Sx**

- No local reaction occurs with most systemic reactions. The faster the reaction, the greater its severity. Onset depends on MOI: sec to 20 min for bites & stings; min to 4 hrs for ingested allergens; and within sec for inhaled allergens. Anaphylaxis is rare with contact allergens.
- Itching, redness, & hives appear, usually near the groin, armpits, flanks, and/or back. The



reaction is away from the site of the bite or sting and may follow the ingestion or inhalation of an allergen.

- Anxiety & nausea ± vomiting, diarrhea, & abdominal cramps.
- ± Respiratory distress: ↑↑↑ respirations, difficulty breathing, & wheezing. Death is possible 2° to respiratory arrest.
- ± Vascular shock: flushed skin, ↑↑↑ Pulse & respiratory rates followed by ↓ BP & AVPU. Death is possible 2° to cardiac arrest.

### **Systemic Reactions (Anaphylaxis) Tx**

- When MOI is a bite, sting, or inhalation, epinephrine may be safely administered at the first S/Sx of a systemic allergic reaction (usually with red, itchy skin and/or the development of hives).
- When suspected MOI is ingestion, give an oral antihistamine, monitor, and administer epinephrine at the first S/Sx of respiratory distress.
- Preferred epinephrine administration: IM injection of 1:1000 epinephrine in mid-thigh. Adult dose is 0.3 cc; for children < 75 pounds give 0.15 cc.
- Also give an oral antihistamine for 24-72 hrs. Adult dose of diphenhydramine is 25-50 mg q 4-6 hrs; do not exceed 400 mg/day. Child dose is 1 mg/kg.
- Closely monitor pt. Give a 2nd dose of epinephrine if the S/Sx do not disappear within 5-15 min or if they re-appear at any time (maximum of 3 doses).
- A recovery period of 24-72 hrs is usually required for pts Tx with epinephrine. The pt will remain hypersensitive to the responsible allergen for an undetermined period of time. Evacuate according to your protocols.
- Begin a Level 3 Evac if a limited amount of epinephrine is available and the possibility of re-exposure to the allergen exists.
- Monitor for a late-phase response for 72 hrs; most occur 4-6 hrs after the initial Tx. Tx late-phase responses in the same manner as an acute-phase response and *begin a Level 2 Evac*.
- *Begin a Level 1 Evac if epinephrine is unavailable & pt develops respiratory distress or S/Sx of vascular shock; pt may die during evac.*

### **Adjunct Txs (second line only)**

- An aerosolized epinephrine MDI (Primatene mist, Medihaler-Epi) may counteract the effects of bronchoconstriction and laryngeal edema in some individuals. Have pt rinse mouth and spit out immediately afterward to avoid gastrointestinal problems.
- Bronchospasm and wheezing may also be Tx with an albuterol MDI 4-8 puffs every 15-20 min prn.

# Acute Mountain Sickness

Prevention is preferable to Tx. Effective field Tx requires early Dx. Four basic rules apply: 1) Stop ascent at first S/Sx. 2) Descend if S/Sx do not resolve within 2-4 days or if S/Sx ↑. 3) Descend immediately if pt exhibits pulmonary edema, ataxia, or becomes V P U. 4) Never leave an AMS pt alone.

## AMS Prevention

- Slow ascent. Allow the kidneys to maintain normal blood pH. Above 10,000 ft ascend 1-2,000 ft/day, rest every 3-5,000 ft. Climb high, sleep low.
- Restrict exercise during the first 24 hrs at a new altitude.
- ↑↑↑ carbohydrate diet; avoid fats & proteins. Stay hydrated; closely monitor urine output & color.
- Avoid respiratory depressants (sleeping pills, alcohol, etc.) & nicotine.
- Consider taking Ginkgo biloba at 100 mg bid beginning 3-21 days before the climb and continuing throughout the climb. Ginkgo ↓ the incidence and severity of AMS in some individuals and has no side effects.
- AMS Drugs prn (page 68).

## Mild AMS S/Sx

- Usually occurs at altitudes > 8,000 ft; onset is variable.
- Headache, ↓↓ appetite ± nausea, swollen hands & feet ± face.
- Abnormally ↑↑ respirations with SOB during normal exercise.
- Insomnia. Cheyne-Stokes breathing and/or anxiety attacks while sleeping.

## Mild AMS Tx

- *STOP Ascent & rest until S/Sx disappear (generally 2-4 days).*
- If S/Sx ↑↑, descend 1,000-2000 ft or until S/Sx resolve.
- Ibuprofen or naproxen sodium at OTC dose for headache during rest days.
- ↑↑ Fluids & electrolytes; monitor urine output & color.
- ↑↑↑ carbohydrate diet; avoid proteins & fats.
- AMS Drugs prn (page 68).

## Moderate AMS S/Sx

- Usually occurs at new altitudes > 10,000 ft; onset is variable & typically delayed 10-12 hrs.
- Awake & irritable/lethargic, ↑↑ fatigue, ↑↑ debilitating headache ± vomiting.
- Abnormally ↑↑ respirations & SOB during mild exercise ± rales or minor “crackling” in lungs.

### **Moderate AMS Tx**

- *STOP Ascent & DESCEND until S/Sx disappear (generally 1,000-2,000 ft). Pt may or may not be able to self-evac. Drug therapy is adjunctive.*
- Decrease and limit exercise.
- Use supplemental O<sub>2</sub> (1 L/min at rest) if available.
- Use a portable hyperbaric chamber to stabilize pt prior to descent or if descent is not immediately possible (below).
- ↑↑ fluids & electrolytes; monitor urine output and color.
- Use Promethazine (Rx) 25 or 50 mg suppositories tid/d for a maximum of 3 doses to control nausea and vomiting.
- Ibuprofen or naproxen sodium at OTC dose for headache during rest days.
- AMS Drugs prn (page 68)

### **Severe AMS: HACE/HAPE S/Sx**

- Usually occurs at new altitudes > 10,000 ft. Onset is variable; however, death may occur within 6 hrs of initial S/Sx.
- Awake & extremely lethargic/exhausted progressing to V P U.
- ↑↑ Debilitating headache, persistent vomiting, & ↓↓ coordination (ataxia). Ataxia is often subtle and requires a specific test: Have pt walk in a heel-to-toe straight line; if their balance wavers or they stumble, they fail the test.
- Abnormally ↑↑↑ respirations & SOB at rest. Rales or minor “crackling” in the lungs that progresses to a productive cough and/or gurgling.

### **Severe AMS: HACE/HAPE Tx**

- *STOP Ascent & DESCEND until S/Sx disappear (generally within 2,000-4,000 ft). Simple carry or litter evac is required. Drug therapy is adjunctive in nature and does not substitute for descent.*
- Use supplemental O<sub>2</sub> (1 L/min at rest); support HAPE pts in sitting or semi-reclined position. PPV may be helpful but difficult during an Evac.
- Use a portable hyperbaric chamber prior to descent or if descent is not immediately possible (below)
- AMS Drugs prn (page 68)

### **Portable Hyperbaric Chambers**

- NOT a substitute for descent or Evac; use in conjunction with AMS drugs & O<sub>2</sub>. *Do not hook-up O<sub>2</sub> to the pump intake.*
- Insulate bag from ground; place sleeping bag inside.
- Shade the bag if in the sun.



- Pt should urinate & defecate before going inside the bag.
- Instruct pt to breathe normally & swallow as bag is inflated to avoid over-pressurizing their ears. If the bag suddenly deflates, instruct pt to exhale.
- Give awake pts Promethazine (Rx) 25 or 50 mg suppositories tid for a maximum of 3 doses to control nausea & vomiting.
- Place V P U pts on side in case of vomiting.
- Put the pt into the bag, pump until the pop-off valve hisses; continue to pump to flush fresh air through the system and prevent CO<sub>2</sub> build-up. Keep the pt at pressure for about one hour; then remove and reassess. Additional cycles of inflation and reassessment are usually necessary until the pt is well enough to descend. HAPE typically requires 2-4 hrs of Tx, HACE 4-6 hrs. If successful, Tx generally provides a 10-12 hour Evac window.
- Talk to and reassure pt; claustrophobia & anxiety are common.
- Tilt bag if pt can not tolerate lying flat.

### **AMS Drugs**

- The same Rx drugs are used for prophylaxis & Tx. *Use Rx drug prophylaxis discriminately, NOT as common practice.*
- **Acetazolamide (Rx)** is indicated for new climbers or those with a Hx of AMS with a forced rapid ascent (greater than 5,000 ft/day) to camp at altitudes greater than 9,000 ft. Give 125 mg bid po and continue for 3 days at fixed altitude; double dose to Tx moderate and severe AMS. Use with a potassium supplement. *Acetazolamide is a sulfa drug and may cause anaphylaxis in sensitized individuals; consider carrying epinephrine and an oral antihistamine.* Side effects: frequent urination, numbness and tingling in the face, lips, and occasionally hands, blurred vision, and a general sense of weird. Beer and carbonated drinks lose their “fizz”.
- **Dexamethasone (Rx)** ↓ the S/Sx of AMS but does not speed acclimatization; use with climbers unable to take acetazolamide or with acetazolamide for forced rapid ascents to altitudes > 14,000 ft. HACE Tx: give 4 mg qid po or IM. Continue until acclimatized or upon return to base altitude. Side effects: euphoria, upset stomach, difficulty sleeping, immunosuppression with prolonged use, and hyperglycemia in diabetics.
- **Nifedipine (Rx)** is a calcium channel blocker that prevents pulmonary edema in susceptible individuals by relaxing smooth muscle that surrounds arteries and thereby reducing pulmonary arterial pressure. Give 30 or

60 mg by mouth slow release during ascent; continue for 3 days at fixed altitude. Side effects: dizziness, mild tachycardia.

- *Sildenafil Citrate or Tadalafil (Rx)* prevent pulmonary edema in susceptible individuals but have little effect on accumulated fluid in an already damaged lung. Give 50 mg of Sildenafil citrate tid or Tadalafil 10 mg bid. Sildenafil Citrate may cause a ↓ BP in some individuals; Tadalafil has no significant side effects. **DO NOT take either drug concurrently with nitrates.**
- *Salmeterol (Rx)* clears fluid from the alveoli. Given via an MDI or DPI inhaler (125 mcg) bid to Tx HAPE. Side effects: Mild tachycardia.

## POPS

**POPS** (Pulmonary Over Pressure Syndrome) is a SCUBA injury where alveoli expand & rupture as they become over-pressurized during ascent. **Early recognition & Evac are essential to successful Tx.**

### POPS Prevention

- Ascend slowly and breathe normally; **DO NOT** hold your breath.

### POPS S/Sx

- Onset occurs while the diver is surfacing, upon surfacing, or within 10 min of surfacing. Drowning is a significant risk if the affected diver is in the water.
- Air often leaks into the middle compartment of the chest and presents with the S/Sx of a heart attack; air may also percolate into the surrounding tissue surfacing as small crackling bubbles under the skin. Air bubbles in the neck often affect the pt's vocal chords and change the sound of their voice.
- Air bubbles entering general circulation may lodge in small arteries and block blood supply to everything downstream causing pain and loss of function in the affected tissue. S/Sx may present as a heart attack, stroke, respiratory distress, or joint pain, respectively. Bloody froth may issue from pt's mouth or nose.
- In rare cases the diver's lung(s) may delaminate and collapse; pt presents with S/Sx of increasing respiratory distress and may arrest.
- **Initially mild S/Sx often progress to life-threatening in a few hrs.**

### POPS Tx

- **Support critical systems & begin a Level 1 Evac to the closest decompression chamber; decompression is helpful even after long delays.** Multi-place chambers are preferred to mono-place chambers.

- Within the United States call the Diving Alert Network (DAN) for the nearest decompression chamber: *24 hr emergency phone:*
- Pt should not be flown unless the cabin pressure = sea level. Unpressurized aircraft (usually helicopters) must stay below 100 meters. *Commercial aircraft are usually pressurized to 8,000 ft and should be avoided.*
- Place the pt in a neutral position on back or left side; air bubbles rise.
- Administer supplemental O<sub>2</sub> at high liter flow. Reassure awake pts.
- PPV & chest compressions prn. *Consider stopping CPR after 30 min.*

## Nitrogen Narcosis

**Nitrogen Narcosis** may become a problem at depths near or > 100 ft using SCUBA *with compressed air*. Large amounts of nitrogen have a narcotic effect on the brain leading to serious secondary problems that become progressively worse with increased depth.

### Nitrogen Narcosis Prevention

- Avoid diving at depths near or > 100 ft using SCUBA with compressed air.
- Dive with a friend. Often the afflicted diver fails to recognize the developing condition and recognition is dependent on an unimpaired diving partner.
- A helium/oxygen mixture is safer than compressed air for deep dives.

### Nitrogen Narcosis S/Sx

- Onset is within min *at depth* but varies with individuals.
- Diver becomes confused or lethargic and may develop bizarre behavior. An affected diver may forget to check their air supply, depth gauge, bottom time, etc. and a secondary life-threatening problem may develop.
- The condition deteriorates as the depth ↑↑.

### Nitrogen Narcosis Tx

- Reduce the pressure and the problem by ascending to shallow water; there are no after effects.

## Bends

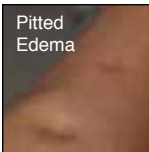
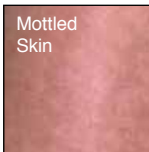
The **Bends** (Decompression Sickness) is a SCUBA injury that occurs when large amounts of nitrogen become diffused and trapped in the diver's blood during a rapid ascent. *Early recognition and Evac are essential to successful Tx.*

## Bends Prevention

- Stay hydrated to facilitate nitrogen off-gassing.
- Avoid dives that require stage decompression OR plan dives according to the U.S. Navy diving tables and be conservative.
- Know how to convert the dive tables for high altitude diving.
- Avoid ascending at a rate  $> 60$  ft per min (1 ft/sec).
- Avoid flying in unpressurized aircraft within 24 hrs after a dive; allow surface time to fully decompress.
- Divers with cardiovascular disease are predisposed to the Bends.
- Avoid nicotine products.
- Divers who have undergone minor decompression therapy should not dive for a minimum of 1-2 months following therapy. Those who have undergone Tx for serious decompression sickness should not dive for 4-6 months. *Divers should not dive again if they have undergone repeated Tx for serious decompression sickness.*

## Bends S/Sx

- *The MOI is a rapid ascent. Many cases initially present with mild S/Sx that progress into life-threatening conditions within a few hrs.*
- Onset is variable upon surfacing: 50% of cases occur immediately or within the first 30 min; 85% of cases occur within one hour; 95% of cases occur within three hrs; and, 99% of cases occur within six hrs. *All abnormal S/Sx within 48 hrs after a dive should be attributed to and Tx as decompression sickness until proven otherwise.*
- Early S/Sx include unusual fatigue with itching, burning or mottled skin. Pitted edema indicates a serious injury.
- Deep aches, pain & tenderness in shoulder, elbow or knees indicate the formation of nitrogen bubbles that may lead to life-threatening problems within a few hrs.
- Serious S/Sx are variable and include: heart attack, stroke, & respiratory distress  $\pm$  nonproductive cough.
- When the spinal cord is affected, girding abdominal & back pain, inability to urinate, numbness, tingling & weakness in arms or legs may progress to irreversible paralysis.
- Vertigo & ataxia indicate damage to the inner ear.
- Headache, confusion, double vision, & difficulty speaking  $\pm$  seizures indicate brain involvement. Loss of consciousness is rare.



## **Bends Tx**

- *Support critical systems and begin a Level 1 Evac with ALS to the closest decompression chamber; decompression is helpful even after long delays. Multi-place chambers are preferred to mono-place chambers.*
- Within the United States call the Diving Alert Network (DAN) for the nearest decompression chamber: *24 hr emergency phone:*
- Pt should not be flown unless the cabin pressure = sea level. Unpressurized aircraft (usually helicopters) must stay below 100 meters. *Commercial aircraft are usually pressurized to 8,000 ft and should be avoided.*
- Place the pt in a neutral position on their back or left side.
- Administer 100% O<sub>2</sub> via a non-rebreathing face mask to ↑ nitrogen excretion.
- Reassure awake pts & administer oral fluids: one liter within the first hour. IV fluids are preferred & required with V P U pts; use isotonic sodium chloride solution or lactated Ringers; maintain urine output at 1-2 ml/kg/hr. Increasing the pt's fluid volume ↑ circulation, perfusion, & absorption of nitrogen bubbles.
- Use a urinary catheter in awake pts unable to urinate and in all V P U pts.
- Administer sublingual aspirin (650 mg) to ↓↓ the formation of intravascular clots. Chewable baby aspirin is absorbed faster than regular aspirin.
- PPV or CPR prn. Consider stopping CPR after 30 min.

# Squeeze

**Squeeze** (Barotrauma) is 2° to a pressure imbalance inside closed air spaces (sinuses, ears, teeth, small intestine, & goggles); it occurs during descent with SCUBA or free diving.

## **Squeeze Prevention**

- Avoid diving (free diving and SCUBA) while congested from a cold, flu, allergy, sinus infection, or inner ear infection.
- Descend and ascend slowly allowing time for equalization.
- Avoid gas producing foods prior to diving.
- Do not wear goggles or ear plugs while diving; they create closed air spaces.

## **Squeeze S/Sx**

- Immediate pain in the affected area usually during descent.
- Severe ear pain followed by a rush of cold water, a full feeling, & vertigo ± tinnitus (high pitched whining or ringing) or hearing loss indicate a ruptured ear drum. Vertigo ↓↓ as water in the ear reaches body temp. Severe vertigo accompanied by nausea & vomiting ↑↑ diver's risk of drowning.

- Severe pain behind the forehead, eyes, or nose and nose bleed indicates a rupture in the sinus lining.
- An unequalized face mask or goggles act like a suction cup over the eyes. The suction causes small blood vessels to dilate, leak, and finally burst, leaving the eyes red & bloodshot. Vision is not affected.
- An ↑↑ toothache indicates air pockets in or under a tooth or filling.
- Intestinal pain due to gas is usually self-limiting & of short duration.

### **Squeeze Tx**

- **STOP DESCENT & attempt to equalize the pressure (or ascend).** If successful, continue descent at a slower pace. If unsuccessful, surface slowly.
- Tissue damage associated with pressure imbalances are Tx according to the location & type of injury. Control pain with NSAIDs or Rx narcotic analgesics.
- Inspect for ruptured ear drum & Tx prn (page 101).
- Tx persistent dizziness or vertigo upon surfacing with systemic decongestants.

## Shallow Water Blackout

**Shallow Water Blackout** occurs when a free or skin diver hyperventilates prior to diving in order to remain underwater longer. Hyperventilation lowers blood  $\text{CO}_2$  below normal & shifts the respiratory stimulus to ↓  $\text{O}_2$ . If blood  $\text{O}_2$  drops far enough AVPU ↓ and the diver may drown if not rescued.

### **Shallow Water Blackout Prevention**

- Avoid hyperventilation prior to free diving. A few deep breaths are acceptable to clear the lungs.

### **Shallow Water Blackout S/Sx**

- Hx of hyperventilation prior to diving.
- Free or skin diver loses consciousness while diving & requires rescue.

### **Shallow Water Blackout Tx**

- PPV or CPR prn. Consider stopping chest compressions after 30 min.
- Evacuate as per near drowning.

## Sea & Motion Sickness

**Sea & Motion Sickness** occur when the input from either the musculo-skeletal receptors, balance centers in the inner ears, or sight is out of alignment.

## Sea & Motion Sickness Prevention

- Avoid abrupt changes in direction and/or speed.
- Avoid focusing on close objects (no reading, television, etc.), overeating, overheating, & foul odors.
- Stay low, midline, & in the stern of the boats, where there is the least motion. Focus on the horizon. Take slow, deep breaths of fresh, cool air.
- Consider using acupressure (P-6), ginger root, scopolamine or an anti-histamine prophylactically.

## Sea & Motion Sickness S/Sx

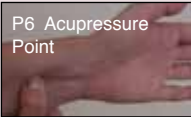
- Nausea & vomiting, pale skin, cold sweats, & ↑↑ salivation.
- **ALERT:** *prolonged seasickness leads to dehydration.*

## Sea & Motion Sickness Tx

**Scopolamine** transdermal patch or oral tablet. Start Tx 1-4 hrs before exposure & continue throughout trip. Put patch behind ear; cut into small, pie-shaped sections to ↓ dosage; provides protection for 3 d. Take 1-2 tablets PO on an empty stomach q 8 hrs prn. Side affects: dry mouth, drowsiness, & blurred vision; use hard candy, ice chips, or gum to relieve dry mouth.

**Ginger Root** avoids the drowsiness associated with antihistamines. Take 1000 mg powdered root or capsule 1 hr before exposure & 250 mg qid after.

**Acupressure** Measure three finger widths up the arm, from the wrist line. Use thumb to pinch the hollow between the two bones & between the tendons. A slight soreness will let you know you have found the right location. Press the P6 point firmly while you breathe out; release pressure as you breathe in; repeat 8 x on each wrist. Commercial wrist bands are available that apply continuous pressure.



P6 Acupressure Point

**Antihistamines** cross the blood-brain barrier and effectively prevent & Tx motion sickness. Side affects: drowsiness. Do not operate machinery.

- Cyclizine (OTC: Marezine) 50 mg po q 4-6 hrs for pts > 12 y/o; 25 mg po q 6-8 hrs for children 6-11 y/o. NOT RECOMMENDED for children < 6.
- Meclizine (OTC: Bonine, Dramamine II) 25-50 mg/d po for pts > 12 y/o.
- Dimenhydrinate (OTC: Dramamine) 50-100 mg po q 4-6 hrs for pts > 12 y/o; 25-50 mg po q 6-8 hrs for pts 6-11 y/o; 12.5-25 mg po q 6-8 hrs for children 2-5 y/o.
- Promethazine (Rx) tablets or suppositories 25 mg q 8-12 hrs for adults; 12.5 to 25 mg q 8-12 hrs for children. May be combined with 25 mg of Ephedrine or Pseudoephedrine for better results in adults.

**MEDICAL INDEX****General Assessment & Tx of Medical Pxs page 77**

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# Medical Pxs

Most **Medical Pxs** that occur during an expedition are related to the pt's medical Hx, poor personal or camp hygiene, food preparation, water purification, or exposure to an infectious disease. Prevention & often Tx require an in-depth and accurate medical form, screening, and attention to all of the above.

## General Assessment of Medical Pxs

- Diagnostic strategy focuses first on ruling out traumatic and environmental mechanisms then taking a close look at the pt's S/Sx & Hx. *In assessing medical mechanisms the majority of diagnostic errors occur because rescuers fail to take a thorough Hx, multiple sets of vital signs, and a good head-to-toe physical exam. Do not make this mistake.*
- Pain is a common chief complaint and it is vitally important to rigorously examine its: onset, severity, character (dull, sharp, aching, etc), location, progression (constant and getting better or worse, intermittent and the timing of the intervals, closer or further apart), what makes it worse or better, and all associated S/Sx.

## General Supportive Tx for Medical Pxs

- Rest; maintain pt's core temp. Replace lost fluids & electrolytes. Monitor urine output & color.
- Herbs that stimulate the immune system and have strong antimicrobial properties include: echinacea & golden seal in combination, ginseng & astragalus in combination, and hyssop.
- **Vomiting & diarrhea** are usually self-limiting; control only if pt is in danger of becoming dehydrated. Control persistent vomiting (>12 hrs) with promethazine 25 mg po q 6-8 hrs or suppository 12.5-25 mg q 12 hrs. Alternately, use diphenhydramine (Benadryl™) 50 mg po q 6 hrs x 4 doses. Mild diarrhea may be controlled with teas made from five finger grass or the inner bark of slippery elm. Control severe diarrhea with loperamide (Imodium™): po 4-8 mg per day **DO NOT exceed 16 mg in 24 hrs**. Begin with the lowest dosage possible and repeat after each loose bowel movement. Constipation & abdominal cramps are possible.
- Consider using diphenhydramine (Benadryl™) 50 mg po q 6 hrs to provide relief from the **itching** associated with rashes.
- Control **fevers** > 102° F (39° C) with acetaminophen. Yarrow tea is a strong antipyretic.

## **General Evac Guidelines for Medical Pxs**

Any Px that is persistent, uncomfortable, and not relieved by your field Tx requires an evac. The urgency of the evac depends on the degree of involvement, or potential involvement, of any critical system. The greater the degree or potential, the more urgent the evac. *If possible, consult with a physician.*

*When in doubt, take them out.*

- Consider a Level 3 Evac for pts with diarrhea and/or vomiting; *upgrade to Level 1 if you are unable to keep the pt hydrated.*

### **Begin a Level 2 Evac for:**

- Abdominal pain, loss of appetite and fever ± non-specific tenderness and chills that are **NOT** accompanied by diarrhea.
- Abdominal pain and tenderness accompanied by stomach or intestinal bleeding (coffee ground vomitus or black tar-like stools).
- Pain that begins slowly and gradually gets worse.
- Intracranial, thoracic, or abdominal pain, even mild pain, from an unknown medical mechanism in pts > 60 y/o.
- Vaginal bleeding when bleeding exceeds 5 soaked maxi-pads per day.

### **Begin a Level 1 Evac for:**

- All V P U pts.
- Pain that is abrupt, new, and severe.
- Large amounts of bright red blood from the mouth or anus.
- Chest pain that is clearly not heart burn or not relieved by rest/nitroglycerin.
- Severe abdominal pain with guarding. Bleeding into the abdominal cavity causes severe abdominal pain and tense (rigid) abdominal muscles. Pt typically presents on back with knees bent. Movement ↑↑ pain.
- Abdominal pain that becomes specific or is accompanied by rebound pain. As perforation or rupture becomes imminent, pain becomes specific to one or two quadrants and/or pt shows pain on release of pressure during an abdominal exam (rebound pain).
- Abdominal pain and tenderness with the clinical pattern of volume shock.

# **Heart Problems**

Heart Attack (MI) is 2° to death of cardiac muscle. Angina occurs when stress or exercise overwhelm a diseased heart's ability to maintain adequate cardiac perfusion. Congestive Heart Failure (CHF) or Cardiogenic Shock may follow a heart attack or present as a separate Px. *Cardiac arrest is unpredictable.*

## Angina & Heart Attack, CHF, & Cardiogenic Shock S/Sx

- Hx of cardiac Pxs ± meds. Cardiac arrest & death are unpredictable.
- Both **Angina & Heart Attack** present with non-traumatic, typically non-tender, chest pain often described as pressure or squeezing; the pain may mimic indigestion. In most cases, there is no change in the pain with pt movement. Pain may radiate to pt's neck, arms, or back. Fatigue & weakness are present. SOB, sweating, & pale skin are common.
- Chest pain 2° to Angina is relieved within 20 min by stopping exercise & removing stress and within 3 min of administering sublingual nitroglycerin. *Persistent chest pain indicates a heart attack.*
- ↑ Pulse & respirations, ↓ AVPU & BP indicate **Cardiogenic Shock**.
- **Congestive Heart Failure** often presents as respiratory distress in the middle of the night. Rales, gurgling ± productive cough indicate pulmonary edema.

## Angina & Heart Attack, CHF, & Cardiogenic Shock Tx

- Begin a Level 3 Evac for confirmed angina that responds to Tx.
- *Begin a Level 1 Evac for suspected Heart Attack, Congestive Heart Failure, or Cardiogenic Shock; limit exercise, carry if possible.*
- If respiratory distress is present support pt in an upright position. Provide rest, reassurance, and O<sub>2</sub>.
- Administer two tablets of chewable baby aspirin or one adult aspirin dissolved sublingually with the onset of chest pain. The aspirin acts as an anticoagulant and may help minimize cardiac damage.
- Administer nitroglycerin in awake pts as per prescription: one tablet (.4 mg) dissolved under tongue OR .4 mg delivered as a metered spray. Repeat q 5 min until S/Sx are relieved (max 3 doses). Nitroglycerin will cause a tingling or burning sensation if it is active. Headaches are common following administration and rarely last > 20 min. *If pt's BP < 100 systolic, pt reports dizziness, or faints, DO NOT give additional nitroglycerin. DO NOT give nitroglycerin if pt is currently taking meds for erectile dysfunction (Viagra®, Cialis®, etc.).*
- If the pt has a Hx of CHF with prescribed diuretic meds, they should continue to take their meds on schedule.
- *If pt arrests & defibrillation and/or ALS response is within 20 min, BEGIN CPR. Recovery with CPR alone is not possible. Consider stopping CPR after 30 min of documented arrest.*

# Heart Burn

**Heart Burn** ensues when stomach acids leak into the esophagus due to a failure of the lower esophageal sphincter.

## Heart Burn S/Sx

- Occasional pain after a big meal is common; more than once a week indicates Acid Reflux Disease.
- Sub-sternal burning pain often mimics a heart attack. **CAUTION: without a previous Hx it may be difficult to assess & RO angina or heart attack.**
- Mild respiratory distress may mimic asthma.
- Chronic cough & nausea may be present.
- Presence or Hx of hiatal hernia ↑ risk.

## Heart Burn Tx

- Drugs: antacids, baking soda & water, acid reducers (H-2 blockers), seaweed alginates (forms protective coating), & proton pump inhibitors (stop stomach cells from producing acid).
- Position: sleep on left side, avoid slouching, raise head of sleeping platform at least 6-8 inches.
- Do not eat 3-4 hrs prior to lying down or sleeping.
- Avoid: coffee, alcohol and high doses of vitamin C before sleeping (stimulates gastric secretion); chocolate, peppermint and chamomile tea before sleeping (relaxes the stomach); fatty foods (slows emptying stomach); milk products and cruciferous vegetables (difficult to digest); citrus, tomato products and carbonated drinks (acidic).
- Consider a Level 3 Evac if Tx is unsuccessful.

# Aortic Aneurysm & Dissection

**Aortic Aneurysms** tend to occur at weak spots in the arterial wall as ↑ BP causes the weakened area to bulge and rupture or to develop a clot that leads to an arterial embolism. An **Aortic Dissection** occurs when the inner lining of the arterial wall gradually breaks down and then abruptly tears due to ↑ BP. Either may occur with healthy individuals under extreme physical or emotional stress.

## Aortic Aneurysm & Dissection S/Sx

### Thoracic Aortic Aneurysm

- Chest pain or pain between shoulder blades, ± coughing & wheezing.

- If high enough to put pressure on the subclavian arteries the pt's blood pressure tends to have more than a 10 point spread between arms and a noticeable difference in pulse strength between radial arteries.
- Upon rupture, pain tends to begin high in the back and radiate down the back into the abdomen as the rupture progresses. Pts may also report chest pain that radiates to the arms as per a heart attack. Rapid death 2° volume shock is common.

### *Abdominal Aortic Aneurysm*

- May occur at any age but are most common among men 50-80 y/o.
- ± Pulsing sensation within abdomen and/or a deep, penetrating pain in back. Rapidly enlarging aneurysms close to rupture commonly hurt or feel tender when pressed during an abdominal examination.
- Excruciating pain in the lower abdomen and back with tenderness over the aneurysm site upon rupture. Rapid death 2° volume shock is common.

### *Aortic Dissections*

- No early S/Sx.
- Pain may be variable but tends to be abrupt, excruciating, often described as tearing or ripping, and follows the dissection as it advances along the aorta. Additional S/Sx vary and depend on if the dissected portion blocks a branching artery and/or if blood leaks into the chest or abdomen: S/Sx of a stroke, heart attack, sudden abdominal pain, low back pain, nerve damage, and volume shock are possible.

### ***Aortic Aneurysm & Dissection Tx***

- *Begin an Level 1 Evac* if either an aortic aneurysm or dissection is suspected.

# Stroke

**Stroke (CVA)** is 2° to a blocked or ruptured cerebral artery; brain tissue serviced by the artery loses perfusion and dies within a few min. S/Sx reflect the amount of brain damage. Extremely mild strokes may go undetected. Severe strokes may be instantly fatal. S/Sx may resolve within 24 hrs if a clot spontaneously dissolves (TIA).

### ***Stroke S/Sx***

- Awake pts present with a loss of motor & sensory skills on one side of their face and the opposite side of their body. Slurred speech & partial paralysis are common. Ask pt to smile & repeat a simple rhyme; test arm strength.

- Most Awake pts are lethargic & tired with no memory of the event.
- V P U pts have a poor prognosis.

### **Stroke Tx**

- Administer O<sub>2</sub> & *begin a Level 1 Evac* to a major hospital; small strokes may be followed by more serious ones.
- Permit awake pts to sleep; transport V P U pts on their side. Closely monitor pt's airway; vomiting is possible 2° ↑ ICP (rare).

# Asthma

**Asthma** attacks are commonly triggered by cold, exercise, allergens, or stress as per pt's Hx. Exposure produces an immediate bronchial spasm, ↑↑ mucus production, and bronchial constriction. Swelling is possible during the 24 hrs following the attack 2° to an inflammatory response. Either may be fatal.

### **Prevention**

- Avoid exposure to known triggers.
- Short acting bronchodilators (Rx) may be used for prevention & Tx.
- Inhaled corticosteroids are often used with long-acting bronchodilators for pts with moderate to severe asthma. Dose varies with meds, delivery system (MDI or DPI), & pt. Pts should rinse mouth after each use to help prevent a local fungal infection (thrush) & systemic absorption of the drug.
- Long-acting bronchodilators (salmeterol & formoterol) DO NOT Tx inflammation and are ONLY used with inhaled corticosteroids to lower the dose of corticosteroids needed for effective prevention.
- Mast cell stabilizers (cromolyn sodium & nedocromil) are used primarily for allergy-induced asthma pts who cannot avoid the allergen or pts with exercise-induced asthma who cannot avoid exercise. They are delivered with an MDI.

### **Asthma Attack S/Sx**

- Most pts present with mild respiratory distress & wheezing that may or may not ↑↑↑ over time. In severe cases, pt typically assumes an erect, eyes forward, tripod position and is focused on their breathing. Acute episodes may quickly develop severe respiratory distress, cyanosis, and ↓ V P U. Death is possible 2° to respiratory arrest.

### **Asthma Attack: Emergency Field Tx**

- Remove the pt from the trigger (stop exercise, warm and humidify the pt's air, remove the stress, remove the allergen or irritant, etc.).

- Reassure pt to help slow breathing rate & permit more complete lung expansion; O<sub>2</sub> is helpful.
- Use short-acting bronchodilators with MDI & spacer at 4-8 puffs q 20 min up to four hrs; then q 1-4 hrs prn. Bronchial dilators are more effective when the pt is able to inhale deeply & hold their breath for 10 sec. Wait 1 min between puffs to permit a deeper inhalation with the following puff.
- Use epinephrine for pts who do not respond to short-acting bronchial dilators; adult dose is 0.3 cc 1/1000 IM for a maximum of 3 doses. Repeat prn q 10-15 min until respiratory distress is relieved. **DO NOT USE** in pts with a Hx of cardiac Pxs.
- After the attack, administer inhaled corticosteroid (Rx) if prescribed.

### **Post Asthma Attack Evac Guidelines**

- No evac is required for pts who respond to the normal dose of their bronchodilators.
- Begin a Level 3 Evac for pts who have more than 2 attacks per week, require frequent doses of their bronchodilator to successfully Tx an attack, or whose respiratory distress limits their participation in the trip.
- *Begin a Level 2 Evac* with ALS for pts who obtain only partial relief from frequent/emergency doses of their bronchodilator during an attack or experience respiratory distress at rest that interferes with normal conversation.
- *Begin a Level 1 Evac* with ALS for pts who require epinephrine to successfully treat an attack, experience respiratory distress at rest and cannot speak, faint or become unresponsive, or have any risk factor for death due to asthma.

### **Risk Factors for Death from Asthma**

#### **Asthma Hx**

- Previous severe attacks (previous intubations, ICU admission for asthma).
- Two or more hospitalizations for asthma in the past year.
- Three or more emergency room visits for asthma in the past year.
- Hospitalization or emergency room visit for asthma in the past month.
- Using more than 2 canisters of short-acting bronchodilator per month.
- Difficulty perceiving asthma symptoms or severity of attacks.

#### **Other**

- Lack of a written asthma action plan.
- Sensitivity to Alternaria (a plant fungus & major airway allergen or irritant).
- Moderate to severe attack at altitude.

# Pulmonary Embolism

A **Pulmonary Embolism** (PE) occurs when a venous clot forms in another part of the body, breaks free, travels through the right side of the heart and lodges in the lungs. Backcountry risk factors include immobilization in a cast or litter and medications containing estrogen (birth control, post hormonal therapy).

## **Pulmonary Embolism S/Sx**

- S/Sx are highly variable and atypical S/Sx are common; Dx is difficult even for physicians. PE should be considered in all pts who present with unexplained respiratory distress or chest pain.
- ↑ Pulse & respirations with SOB ± rales. Coughing ± blood.
- Pleuritic chest pain (chest pain upon taking a deep breath) that may be indistinguishable from a heart attack.
- Pt may c/o of leg pain & tenderness ± swelling.

## **Pulmonary Embolism Tx**

- *Begin an Level 1 Evac* if a pulmonary embolism is suspected.

# Spontaneous Pneumothorax

A **Spontaneous Pneumothorax** occurs when a weak spot in a lung membrane forms a small blister, ruptures, and air leaks into the pleural space collapsing the lung. Smoking ↑↑↑ risk; more common in tall thin males.

## **Spontaneous Pneumothorax S/Sx**

- Abrupt chest pain upon rupture on the same side as the rupture. Severity varies depending on the size of the rupture. Recurrence is common and pts may have a Hx of a similar episode, typically in the same lung.
- Healthy pts with no underlying lung disease or damage tolerate the loss of lung capacity fairly well; some may be asymptomatic. Pts with an underlying lung Px tend to present with respiratory distress at rest or with exercise. Pain may radiate down the arm if the leaking air puts pressure on the brachial plexus. The pain is sharp and different from the squeezing chest pain of MI; it generally ↓ after rupture and resolves within 24 hrs.
- Air may escape into the surrounding tissue and present as small crackling bubbles under the skin of the pt's chest, neck, & throat causing jaw or neck pain, difficulty swallowing, sore throat, ± coughing, ± mild respiratory distress.

# Lower Airway Infection

All **Lower Airway Infections** are 2° to a bacterial or viral infection (common cold or flu). Pt Hx usually shows exposure to an infected person within the last two wks, a recent near drowning event, or Fx ribs.

## Lower Airway Infection S/Sx

- Productive cough, fever, malaise, nasal congestion, SOB on mild exertion, chest pain, wheezing, and sore muscles are common; severe cases may develop rales. Pneumonia is an anticipated Px.

## Lower Airway Infection Tx

- Most lower airway infections are self-limiting within 7-10 d with supportive care (page 77); abx are typically not indicated. Consider a Level 3 Evac.
- An OTC expectorant may be useful during the day. Herbal expectorants include skunk cabbage, pleurisy root, and lung wort.
- Herbs specific to colds & flu: catnip, bone set, osha, sage, thyme, & angelica.
- Use an OTC nonnarcotic cough suppressant before bed to permit rest. Herbal suppressants: Black cherry bark or mullein taken as a tea.
- Steam inhalation therapy may ease daily episodes of respiratory distress. Sage or eucalyptus oil may be added for their antimicrobial properties.
- Consider using Rx abx for bacterial infections that do not respond to supportive Tx if evac is not an option. All respiratory tract bacterial infections respond to the extended range erythromycins: Clarithromycin (Rx) po 250-500 mg bid x 10-14 days OR azithromycin (Rx) 500 mg po qid on day 1 then 250 mg po qid x 4 more days.

# Sinus Infection

The sinuses are normally sterile. **Sinus Infection** is typically 2° to obstruction and subsequent infection by a virus in the nasopharynx; a secondary bacterial infection often follows. Severe sinus infections may travel up the eustachian tubes and become established in the middle or inner ear.

## Sinus Infection S/Sx

- ± Recent Hx of severe throat infection.
- Runny nose (↑ mucus production), sneezing, congestion, colored discharge, facial pain & tenderness; headache & eye pain if ethmoid sinus is involved. Pain is often exacerbated by leaning forward or with any head movement. Fever is rare.

## **Sinus Infection Tx**

- Sinus infections usually resolve with symptomatic Tx in otherwise healthy people within 7-10 d with supportive care (page 77); use colloidal silver as a nasal spray to combat the infection. Abx may be required for acute bacterial infections. TMP/SMX or amoxicillin are the drugs of choice but azithromycin and clarithromycin are also effective.
- Steam inhalation therapy may ease congestion and pressure headaches.
- A systemic OTC decongestant (pseudoephedrine po 6 mg q 4 hrs prn) is useful to relieve general congestion & ↑ drainage. Eyebright tea may also be used to relieve nasal congestion.
- Use local OTC decongestant (nasal spray) before bed to ↑ rest. Have the pt inhale the spray deeply into their sinuses and hold for 10 sec.
- Consider sinus flush using Neti pot and warm salt water 2-4 times per day until S/Sx resolve. Regular flushing is as effective as abx Tx.
- *DO NOT USE antihistamines; they thicken mucus secretions, ↓ drainage, and slow healing.*
- Monitor for a middle or inner ear infection.

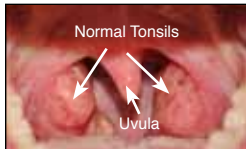
# Throat Infection

Most **Throat Infections** are 2° to viruses and resolve on their own without consequence. A few, however, are 2° to group A Streptococcus bacteria. Some people are asymptomatic carriers. Untreated Strep can cause a variety of life-threatening illnesses: kidney inflammation; toxic shock; skin & soft tissue infections; and rheumatic fever. Rheumatic fever can (although rarely) lead to inflamed & painful joints and damaged heart valves. Strep is highly contagious and can be difficult to diagnose in the field. Depending on the strain, it is transmitted via skin contact or respiratory droplets; however, food and water borne outbreaks have occurred. All throat infections may spread to middle ear & sinuses.

## **Throat Infections S/Sx**

- Sore throat may be 2° to post nasal drip and NOT a throat infection. Post nasal drip is usually caused by allergies; however, birth control pills or pregnancy may also be a cause 2° elevated levels of estrogen hormones.
- Local inflammation, a sore throat, ± dry cough, no productive cough or congestion. Fever & swollen lymph glands occur with more severe infections.
- In addition to the above S/Sx, strep typically presents with red and swollen tonsils ± white patches or streaks of pus, and tiny red spots (petechiae)

at the back and on the roof of the mouth. Depress tongue with a clean spoon handle and use a small light to view the back of the pt's throat.



### **Throat Infections Tx**

- Throat infections usually resolve with symptomatic Tx in otherwise healthy people within 7-10 d with supportive care (page 77).
- Use an OTC cough suppressant or cough drops to suppress irritation due to a dry nonproductive cough. Mullein and black cherry bark are effective herbal cough suppressants; give as syrup, tea, or lozenge.
- Gargling with warm salt water or thyme tea may help reduce inflammation.
- Zinc lozenges may speed healing; take with food to avoid stomach upset.
- Begin a Level 3 Evac if strep is suspected; pt cannot remain in field. Isolate pt from group; **DO NOT** let them handle group food, cook, or clean up. Penicillin VK is the drug of choice; however, azithromycin and clarithromycin are also effective.

## **Nose Bleeds**

Anterior **Nose Bleeds** are common 2<sup>o</sup> dry and/or cold air, chronic nose picking, chronic sneezing, or trauma. Posterior nosebleeds are unusual, more serious, and cannot be Tx in the field without advanced training and materials.

### **Nose Bleed Prevention**

- Coat the lining of the nose with petroleum jelly, saline gel, or aloe vera gel before exposure to unusually cold or dry air.

### **Nose Bleed S/Sx**

- Bleeding varies between individuals & MOI; bilateral bleeding is unusual.
- Nausea occurs if blood is swallowed.
- Broken nose: pain, tenderness, swelling, crepitus, ± deformity, ± bruising of nose or under eyes (black eye), ± lacerations, & difficulty breathing through nose; mouth breathing is common. The nose can visually appear straight but the septum can be internally deviated.

## ***Nose Bleed Tx***

- Have pt sit upright (to ↓ blood pressure), lean forward (to keep from swallowing blood), & pinch the lower nostrils closed between thumb and finger(s). Pinching higher on the bony part of the nose doesn't work; it doesn't apply pressure to the septum. Hold for at least 10-15 min. Ice does NOT help. Use a vasoconstricting nasal spray or drops to speed clotting.
- After bleeding stops, gently blow out clots. AVOID heavy lifting/straining, smoking, nose picking, alcohol, sneezing (cough instead), & dust/irritants.
- Acetaminophen for pain; avoid other NSAIDS: they may increase bleeding.
- Consider a Level 3 Evac for a broken nose. Reduction/repair is done within 72 hrs, 5-10 days after swelling has gone down, or repaired surgically after the initial damage has healed. Begin a Level 3 Evac if pain or swelling remain after three days, pt develops a fever, nasal breathing remains restricted after swelling goes down, or pt's nose is crooked.

### ***Nasal Packing***

- Consider nasal packing if bleeding does not stop.
- Use commercial nasal tampons, gauze, or small vaginal tampons.
- Lubricate gauze or tampons with petroleum jelly and spray with topical vasoconstrictor prior to insertion. Have pt gently clear nose by blowing.
- If possible, examine the nasal passage before packing.
- The nasal cavity goes straight back, not up. Press up with your thumb on the tip of the pt's nose. Twist gauze and insert straight back as far as possible. Leave strings or part of the packing material accessible to facilitate removal. A forceps may be required.
- Bleeding should stop within a few seconds with packing; clotting will take longer. If bleeding persists apply outside pressure over septum and consider packing the other side to increase pressure.
- Remove after 30 min. Repack if bleeding reoccurs.
- Begin a Level 3 Evac if repacking is necessary. Leave packing in until arrival at hospital. Nasal packing may remain in place for 24-72 hrs. Because the packing blocks sinus drainage, begin prophylactic abx to prevent sinusitis and staphylococcal toxic shock syndrome. DO NOT over pack. The nasal cartilage has no blood supply and receives all of its nutrients and oxygen from its connective tissue. Over packing or pressure on both sides of the cartilage can kill it within 24 hrs.



# Seizure Disorders

**Seizure Disorders** (epilepsy) are controlled with anti-seizure meds; the type and dose of the meds vary with each pt. The most common cause of seizures with a pt undergoing Tx for a seizure disorder is failure to take their meds; however, *exposure to new environments, participation in new activities, or alcohol withdrawal may trigger a seizure even in pts current with their anti-seizure meds.*

## Seizure Disorder S/Sx

- Partial seizures present as localized muscle jerking, short-lived painful sensations, or repetitive behavior.
- Generalized seizures are characterized by severe and repetitive muscular contractions, unresponsiveness, and a loss of bladder & bowel control; they commonly last < 2 min. Pts will be confused and potentially combative during the post ictal period (10-60 min); headaches & fatigue are common. Pts may bite their tongue or lips during a generalized seizure.

## Seizure Disorder Tx

Most seizures are self-limiting and followed by an indeterminate recovery period dependent upon their cause. Initial field Tx is supportive while definitive care must address the cause.

### *During a generalized seizure:*

- Protect pt from injury; **DO NOT restrain. DO NOT place anything in pt's mouth.**
- Continuous seizures require immediate intervention. Administer rectal diazepam (Valium) at 0.5 mg/kg (do not exceed 10 mg). ***If rectal diazepam is unavailable, begin a Level 1 Evac.*** Respiratory arrest and death are possible.

### *After a generalized seizure:*

- PPV prn. Place pt on side in recovery position during the post ictal period.
- Separately assess & Tx any associated traumatic injuries (page 2).
- Begin a Level 3 Evac if seizure is outside of pt's normal pattern.

# Diabetes

Insulin dependant diabetics are subject to **Hypoglycemia** (insulin shock) and **Hyperglycemia** (DKA, HHS, or diabetic coma). Hypoglycemia results from too much exercise, too much insulin, or not enough food; it is commonly encountered when the wilderness environment or activity is new. Hyperglycemia

results from ↓↓ blood insulin levels. In compliant diabetics, it is usually due to loss of insulin. Illness, especially infection, alters glucose requirements and ↑ susceptibility. Hyperglycemia is rare in a wilderness setting.

### **Prevention of Diabetic Emergencies**

- Contact the diabetic's personal physician before leaving on a trip or expedition for specific recommendations, a Sick Day Plan, and standing orders.
- Balance food intake (complex carbohydrates & proteins) with energy output; avoid simple sugars, alcohol, and fats. *Eat regular meals.*
- *Avoid dehydration*; monitor urine output and color.
- *↑↑↑ Monitoring of daily blood glucose levels, when participant is sick, engaging in new activities, in a new environments, or under stress.*
- Extremes in environmental temp affects insulin requirements. Plan trips to minimize exposure to temp extremes.
- Protect insulin from direct sunlight. Bring additional supplies and carry in different locations (packs, boats, etc.) to prevent accidental loss.
- Type 1 diabetics should carry a glucagon kit in a standardized known location for emergency Tx of hypoglycemia & urine test strips (Ketostix, Chemstrip K) for checking ketone levels when sick or hyperglycemic. Both participants and trip leaders should carry glucose tabs, glucose paste, or GU® energy gel for Tx of hypoglycemia.

# Hypoglycemia

### **Hypoglycemia S/Sx**

- Onset occurs within min. Pt's blood sugar is < 50 mg/dl; check before Tx.
- Awake & lethargic, irritable, or confused. Pts often appear "drunk." Pts typically c/o headache, hunger, weakness, & dizziness. Respirations are normal or shallow.
- *Without the ability to test a pt's blood sugar, assume all V P U diabetics are suffering from hypoglycemia.*
- Seizures are common; death is possible.

### **Hypoglycemia Tx**

- *STOP & restrict exercise until blood sugar levels are normal for 24 hrs.*
- Feed awake diabetic pts. Begin with simple sugars (glucose paste/tabs, honey, candy, juice) and follow with complex carbohydrates & proteins.
- Maintain fluid balance; monitor urine output & color.

- Protect the pt from all environmental insults.
- **DO NOT give insulin as an emergency Tx.** Check pt's blood glucose level after they become fully awake; then adjust their meds accordingly.
- IV glucose is the definitive Tx for V P U diabetic pts. If unavailable, **administer 0.5-1 unit of glucagon IM.** If pt does not respond in 10-20 min, repeat dose for a max 3 injections. If successful, begin a Level 3 Evac; glucagon will elevate pt's blood sugar for several days. **Begin a Level 1 Evac** for diabetic pts who remain V P U.
- Diabetics who have a brief hypoglycemic episode that was easily corrected are usually safe to stay in the field but need to take additional care with insulin dosing and food intake to prevent a recurrence. Begin a Level 3 Evac if a second hypoglycemic episode occurs.

## Hyperglycemia

### Hyperglycemia S/Sx

- The pt has not taken their usual dose of insulin, has an infection or illness. Blood sugar is > 180 mg/dl & frequently 300-500 mg/dl. Onset S/Sx is delayed 24-72 hrs or more after last dose of insulin.
- Initially awake & restless with abdominal pain, nausea, & vomiting. ↑↑ Urine output as blood sugar ↑↑; dehydration is likely. Skin is warm, flushed, & dry.
- Check urine for ketones every 4-6 hrs if blood sugar is > 240 mg/dl using a ketone urine test strip (Ketostix, Chemstrip K). Fruity breath and/or rapid, deep respirations indicate changing blood pH & diabetic ketoacidosis (DKA) in Type 1 diabetic. Similar S/Sx in Type 2 diabetics without ketones indicates Hyperosmolar Hyperglycemic State (HSS). If not immediately corrected, either Px may result in death.

### Hyperglycemia Tx

- Follow pt's Sick Day Plan; Tx & evacuate per personal physicians's standing orders.
- If pt is awake, administer water and electrolytes (ORS) po at 1 L/hr to flush ketones and help raise blood pH during evac.
- **DO NOT EXERCISE if ketones are high and blood sugar is > 240 mg/dl.**
- If V P U, protect airway, suction prn.
- **Begin a Level 1 Evac** with O<sub>2</sub> & Advanced Life Support if ketones are high and blood sugar is > 240 mg/dl.

# STDs

Many people are asymptomatic carriers of sexually transmitted **Gonorrhea, Chlamydia, & Mycoplasma Infections** (bacteria); S/Sx indicate a serious infection. In women the infections may spread to the uterus and cause pelvic inflammatory disease (PID). The herpes simplex virus causes outbreaks of open sores, is extremely contagious during an outbreak, and predisposes people to other sexually transmitted diseases.

## **Gonorrhea, Chlamydia, & Genital Mycoplasma Infections S/Sx**

- Burning pain with urination is similar in all three infections; gonorrhea is the most severe. A culture is required for definitive assessment.
- Secondary gonococcal bacterial conjunctivitis may follow accidental transfer by fingers in either sex and is usually unilateral. Mild pharyngitis is common.
- Chlamydia infection is frequently found in gonorrhea pts.
- **In Males:** a yellow or green penile discharge ± scrotal swelling is associated with gonorrhea while a clear or milky white discharge is associated with chlamydia & mycoplasma infections. If bacteria infect the prostate lining they will cause the classic S/Sx of UTI, including flank & back pain. All will present with a positive (pink) urine nitrite dipstick test.
- **In Females:** Greenish yellow vaginal discharge with strong fishy odor. Lower abdominal and cervical motion tenderness are common.



## **Genital Herpes S/Sx**

- **In Males:** sores appear on the penis and occasionally on the scrotum, thighs, and buttocks. In dry areas, lesions progress to pustules and then encrust. The urethra is infected in 30-40% of cases and presents with extremely painful urination and clear mucoid discharge.
- **In Females:** sores appear on the external genitalia. In moist areas, the sores rupture, leaving tender ulcers. The vaginal mucosa is inflamed with a watery discharge. The cervix is involved in 70%-90% of cases. Extremely painful urination may lead to urinary retention.
- Recurrent genital herpes begins with tenderness, pain, & burning at site that lasts 2 hrs to 2 days.

## ***Pelvic Inflammatory Disease (PID) S/Sx***

- Acute PID is highly unlikely if no Hx of recent intercourse or IUD use.
- Onset tends occur toward the end of menses and 10 d after.
- Lower abdominal pain and tenderness; may radiate to low back.
- Unusual vaginal discharge, cervical motion tenderness, irregular menstrual bleeding, & painful intercourse.
- Fever, nausea, vomiting, & severe pain indicate a serious infection.

## ***General STD Tx***

- Treat sexual partners concurrently.
- Women taking abx should take oral acidophilus or eat yogurt with live cultures to help avoid vaginal yeast infections.

## ***Gonorrhea, Chlamydia, & Genital Mycoplasma Infections Tx***

- Administer a single 400 mg dose of Cefixime po. Begin a Level 3 Evac if abx are unavailable.

## ***Genital Herpes Tx***

- Tx wounds; abx may be required for secondary bacterial skin infections.
- Tx with oral antiviral medications: Acyclovir, Valacyclovir, & Famciclovir. Dosing depends on severity of infection. Begin a Level 3 Evac if antivirals are unavailable.

## ***Pelvic Inflammatory Disease (PID) Tx***

- Mild PID may be treated with 1 g of azithromycin weekly for 2 wks OR Doxycycline 100 mg po bid for 14 d. Severe infections require a combination of IV and oral abx. Begin a Level 3 Evac if abx are unavailable and upgrade if S/Sx become severe.

# *Vaginitis*

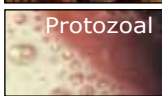
***Vaginitis*** is 2° to: yeast (common), bacteria, or protozoan (rare). Definitive assessment requires a vaginal smear. Women taking abx are at risk for yeast infections and should take oral acidophilus or eat yogurt with live cultures to help maintain or reestablish normal vaginal bacteria. Bacterial infections are usually due to an increasingly alkaline vaginal environment. Both bacterial and protozoan infections may be sexually transmitted and left untreated lead to a UTI or PID.

## ***Vaginitis Prevention***

- Take supplemental bacteria (yogurt, acidophilus capsules, etc.) with abx.
- Rigorously maintain personal hygiene.

## Vaginitis S/Sx

- **General S/Sx:** burning pain with urination; ± inflamed, itchy & sore vagina & vulva; intercourse may be painful. The pain is different from a UTI but confusion is common. Definitive assessment requires a vaginal smear.
- **Yeast infections** are 2° Candida and present with a thick, white, cheesy discharge ± slight yeasty smell. Recent Hx often reveals abx therapy. Women with a Hx of Tx for yeast infections easily recognize the S/Sx.
- **Bacterial infections** present with a thin, white or gray discharge with fishy (foul) smell that is stronger after intercourse ± low pelvic pain.
- **Protozoal infections** are 2° trichomonas and present similar to bacterial vaginitis but with an abundant foamy discharge; smell is stronger after menstruation. Abdominal pain and fever indicate a serious infection.



## Vaginitis Tx

- For **yeast infections** use OTC Clotrimazole or Miconazole nitrate (Monistat®) vaginal suppositories, tablets, or cream. Shorter courses with a higher dose increase compliance & cost; follow package directions.
- For **bacterial infections** (Gardnerella) use Rx intravaginal metronidazole (MetroGel-Vaginal®) given as a 5 g vaginal insert bid for 7 days OR intravaginal clindamycin 5 g vaginal cream insert at bedtime for 7 d. Alternately 300 mg clindamycin can be given po qid for 7 days OR metronidazole at 250 mg po tid for 7 days or 500 mg po bid for 7 d.
- For **protozoal infections** (Trichomoniasis) use Rx oral metronidazole; Tx sexual partner concurrently. Therapy has been successful using a single 2 g dose of metronidazole po. If unsuccessful, give 500 mg bid po for 7 d. Alternately use a single 2 g dose of Tinidazole po with food. For resistant infections, use 2 g bid for 14 days.
- Begin a Level 3 Evac if medication is unavailable.

# Urinary Tract Infection

**Urinary Tract Infections (UTI)** are more common in women; bacteria, usually *E. coli*, migrate from the vagina or anus; incidence ↑ with sexual activity. UTIs are rare in men < 50 y/o; incidence ↑ with age & Hx of enlarged prostate.

## Urinary Tract Infections Prevention

- Avoid dehydration; urinate frequently to flush bacteria. Don't "hold it in."
- Women should wash & dry bid, keep genital area cool & dry, and wear clean cotton underwear or skirts without underwear whenever possible.
- Good hygiene is important. Women should consider using "pee rags" to pat dry after urination; avoid "drip drying." Wipe front to back after a bowel movement to prevent contamination of the vagina.
- Direct trauma to the urethra from bicycles, climbing harnesses, vigorous sexual activity, etc. contribute to the development of UTIs.
- Many UTIs occur from bacteria exchanged during oral sex. Wash & urinate before & after sex.

## Urinary Tract Infections S/Sx

- Internal burning pain with urination accompanied by ↑↑ urgency & frequency, and ↓↓ output.
- Urine may be cloudy or bloody with strong smell; NO vaginal discharge. A sensation of a full bladder and/or lower abdominal discomfort are common.
- Positive (pink) urine nitrite dipstick test indicates a UTI; false negatives are possible.
- Fever, chills, & general malaise combined with flank or lower back pain indicate a kidney infection.

## Urinary Tract Infections Tx

- Force fluids to flush bacteria.
- Cranberry juice or vitamin C (both with colloidal silver) may successfully treat very mild infections; severe infections require abx.
- Herbs useful in treating UTIs include gravel root, couch grass, boldo, and parsley. These herbs act as a diuretic and have antimicrobial properties. Prickly pear juice may be used to alleviate the pain but has no antimicrobial action.
- Tx with abx to prevent spreading to the kidneys & blood. Use trimethoprim with sulfamethoxazole (TMP/SMX) or ciprofloxacin. Adult dose for TMP/SMX is one double strength tablet (960 mg) po bid for 7-10 d. Do not give TMP/SMX to pts allergic to sulfa drugs. Adult dose for ciprofloxacin is 250 mg po bid for 7-10 d.
- Women taking abx should take oral acidophilus or eat yogurt with live cultures to help avoid vaginal yeast infections.
- Begin a Level 3 Evac if abx are unavailable.
- *Begin a Level 2 Evac if kidney infection is suspected.*

# Prostatitis

**Prostatitis** is an inflammation of the prostate gland that may be 2<sup>o</sup> bacterial infection or a non-bacterial cause; it can be acute or chronic. The size of the prostate increases with the amount of inflammation squeezing the urethra; bladder dysfunction and the accompanying thickening of its walls also contribute significantly to the S/Sx.

## **Prostatitis S/Sx**

- S/Sx of UTI ± positive urine nitrite test, although positive (pink) urine nitrite test indicates an active bacterial infection.
- Trouble starting and/or maintaining a urine stream; dribbling.
- Vague genital and pelvic pressure and/or discomfort.
- Low back pain, fever, generalized muscle soreness, and painful ejaculation ± blood in semen indicate a serious bacterial infection.

## **Prostatitis Tx**

- Rest. Hydrate.
- Begin a Level 3 Evac if S/Sx interfere with the trip.
- **Begin a Level 2 Evac** for severe S/Sx. Abx are required for bacterial infections: Levofloxacin is DOC dosed at 500 mg po qid for 14-28 d. Alternate is Trimethoprim/sulfamethoxazole DS dosed at 1 DS tab (160 mg TMP) po bid for 10-28 d.

# Ectopic Pregnancy

An **Ectopic Pregnancy** may occur anytime during the first trimester. If not treated promptly, the fallopian tube may rupture and cause death 2<sup>o</sup> to volume shock.

## **Ectopic Pregnancy S/Sx**

- Hx of delayed menses and sexual intercourse within the past two months.
- Positive Early Pregnancy Test (EPT).
- General or localized abdominal cramps, pressure, & pain that progressively increases over time ± spotting. Painful intercourse. Heavy vaginal bleeding usually indicates a tubal miscarriage.
- Nausea & vomiting after rupture 2<sup>o</sup> pain. Shoulder pain indicates severe internal bleeding; monitor for S/Sx of volume shock.

### **Ectopic Pregnancy Tx**

- 50% resolve without Tx by spontaneous abortion.
- If early and tube is intact, methotrexate will safely induce a miscarriage. Surgery is required if tube is near rupture or has ruptured.
- Begin a Level 3 Evac for mild S/Sx. *Begin a Level 1 Evac* for moderate to severe S/Sx or suspected internal bleeding.

## Miscarriage

A spontaneous abortion or **Miscarriage** during the 1st trimester is usually not physically significant unless accompanied by severe bleeding or secondary infection. Miscarriage is unlikely, unless 2° to trauma, during the 2nd & 3rd trimesters. All pregnant women should consult a physician before joining an expedition.

### **Miscarriage S/Sx**

- Hx of pregnancy, delayed menses, and/or sexual intercourse within the past three months. Feelings of grief and loss are common.
- Spotting, abdominal pain, and cramping are followed by heavy vaginal bleeding prior to and during the abortion of fetus and placenta.
- Fever, chills, nausea, and vomiting after a miscarriage indicate an infection 2° decomposing fetal tissue attached to the uterine wall.

### **Miscarriage Tx**

- Agrimony, herb given as tea, ↑ clotting and may slow or stop heavy bleeding.
- Rest. Acetaminophen for pain. Exercise caution using aspirin, ibuprofen, and naproxen sodium; they may worsen bleeding.
- Consider a Level 3 Evac and monitor for S/Sx of systemic infection for 3-4 days. Administer ciprofloxacin (Rx) 500 mg po single dose *and* doxycycline 100 mg po bid x 7 d for an infection. Enforce bed rest for 72 hrs.
- *Begin a Level 1 Evac* if bleeding is > 5 soaked maxi-pads per day.

## Epididymitis

**Epididymitis** (infection of the reservoir behind each testis) 2° to a bacterial infection: Chlamydia & Gonorrhea in males 14-35 y/o and E. coli in males under 14 and men over 35. It is the most common cause of scrotal pain & tenderness.

## Epididymitis S/Sx

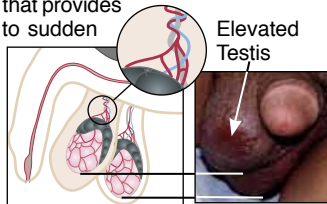
- S/Sx similar to Testis Torsion. The primary distinguishing features are a slow—versus acute—onset over 24+ hrs, testes are not elevated and remain equal in size, and pain is behind testis with no pain in testis.
- Scrotum is painful, tender, red ± swelling. Pain may be aggravated by bowel movement. Abdominal and/or flank pain may be present.
- Testis is increasingly sensitive to pressure and traction; scrotal elevation and support may decrease pain.
- ↑↑ & urgent urination with ↓↓ output.
- S/Sx of UTI are usually present ± abnormal penile discharge.
- Positive (pink) urine nitrite dipstick test indicates bacterial infection.
- Fever & chills are common; nausea & vomiting are unusual.

## Epididymitis Tx

- Rest. Hydrate.
- NSAIDs and ice packs to control pain and inflammation.
- Doxycycline is the oral drug of choice given at 100 mg PO bid for 10-14 d.
- Begin a Level 3 Evac if abx are unavailable.

# Testis Torsion

In **Testis Torsion** the spermatic cord that provides blood to the testis is twisted usually due to sudden exposure to cold (as in getting out of a sleeping bag), trauma, or exercise. The affected testis will die if not untwisted. Success approaches 100% if treated within 6 hrs, 70% within 12 hrs, 20% within 24 hrs, and near 0% after 24 hrs. Adolescents 12-18 y/o through early adulthood (± 30) are at highest risk. *Opposite testis is at risk.*



## Testis Torsion S/Sx

- Sudden onset of severe scrotal pain; pain may radiate from flank to groin.
- 50% of pts have a Hx of prior episodes that have spontaneously resolved.
- Affected testis is usually elevated. Scrotal swelling & redness. Cord is typically thickened & extremely tender. Nausea & vomiting are common.
- Increasing pain and swelling after 24 hrs (testis is dead) indicates an infection or tumor.

### **Testis Torsion Tx**

- Manually rotate the affected testis outward (like opening a book). If testis hangs lower but pain persists, continue to rotate up to 2 full turns. If pain does not resolve, reverse direction and rotate inward.
- If detorsion is successful, provide scrotal support, limit activity and begin a Level 3 Evac for surgical tacking. If unsuccessful, *begin a Level 2 Evac*. Removal of affected testis & surgical tacking of opposite testis will be necessary if the affected testis dies.

## **Insect in External Ear Canal**

Insects in the external ear canal can be mildly irritating to quite painful.

### **Insects in External Ear Canal Tx**

- Most insects leave on their own within 10-15 min. If they do not or the pt cannot wait due to irritation or pain, gently flush the ear with warm water. Alternately, kill the insect with a few drops of mineral or vegetable oil and then flush. Tx may require otoscope and alligator forceps to remove.

## **External Ear Infection**

**External Ear Infections** are usually 2° bacteria from trapped water; more common in children than adults. Fungal infections are rare but possible.

### **External Ear Infection Prevention**

- Avoid swimming in contaminated water.
- Avoid “cleaning” ear inside canals with a cotton swab; they irritate the lining of the external canal, making it susceptible to infections.
- Apply a few drops of alcohol to each ear to remove H<sub>2</sub>O after swimming.

### **External Ear Infection S/Sx**

- Pus drains from the canal and dries on the outer ear.
- Mild to severe earache. Pain increases when the ear canal is manipulated by pushing the tragus or pulling the ear lobe.
- Both the ear canal and drum are inflamed and red.
- The canal itches and hearing may be affected by the accumulation of swelling, drainage, and wax.
- Severe infections (rare) may cause fever & swollen lymph glands.



- In extremely rare cases usually reserved for diabetics and immune suppressed pts, an external ear infection can progress to infect the temporal bone. Toxins produced by the bacteria may cause facial nerve paralysis and progress to involve the brain. S/Sx include disproportionate and severe ear pain, temporal headaches, and an on-going discharge of pus despite Tx. Difficulty swallowing, hoarseness, and facial paralysis are possible. The soft tissue behind the jaw is typically extremely tender.

### **External Ear Infection Tx**

- Excess ear wax may need to be removed for accurate assessment and Tx. To remove: 1) Apply a few drops of warm mineral oil into the external ear canal. 2) Wait 5-15 min for oil to soften the wax. 3) Using an irrigation syringe, gently flush the ear canal with warm water; the wax will come out with the water. *DO NOT insert the tip of the irrigation syringe into the ear canal; aim the stream of water so that it “bounces” off the ear canal. DO NOT flush if the ear drum is ruptured or if the MOI indicates a rupture is possible.* 4) Apply a few drops of alcohol to break the surface tension of the water and to encourage drying. 5) Repeat prn until the ear canal is clean.
- Tx mild infections (without fever or swollen lymph glands) with diluted vinegar or GSE. Alternately an infusion of warm oil and garlic (strained) works well. Cover the ear to relieve pain.
- Use abx drops containing hydrocortisone when pt has a severe infection with fever & swollen lymph glands; consider a systemic abx: Penicillin VK or extended range erythromycins (clarithromycin, azithromycin). Penicillin VK & clarithromycin are given at 250-500 mg po bid for 10-14 d. Azithromycin is given at 500 mg po qid on day 1 then 250 mg qid for 4 more d. Begin a Level 3 Evac if abx are unavailable. Cover ear to relieve pain.
- If a temporal bone infection is suspected, start a course of ciprofloxacin and *begin a Level 3 or 2 Evac depending on the severity of the S/Sx.* Adult dose for ciprofloxacin is 250 mg po bid.

## **Middle & Inner Ear Infections**

**Middle & Inner Ear Infections** in children are 2° virus particles or bacteria that migrate up the eustachian tube from a throat or sinus infection. In adults, bacteria tend to enter through a ruptured ear drum with the introduction of water while swimming or bathing. In rare instances, inner ear infections may spread to the brain.

## Middle & Inner Ear Infection Prevention

- Monitor & Tx all sinus infections.
- Do not flush or use ear drops when a ruptured ear drum is suspected.

## Middle & Inner Ear Infection S/Sx

- Moderate to severe earache with full feeling in ear. Pain does NOT change when ear canal is manipulated by pushing tragus or pulling ear lobe.
- Fever, chills, swollen lymph glands, nausea, & vomiting with severe bacterial infections. If infection reaches inner ear, balance may be affected and brain infection (meningitis or encephalitis), although rare, is possible.
- Ear drum may rupture if left untreated as pressure ↑↑ behind ear drum causing it to bulge outward. Pain ↓↓ with pressure after a rupture.

## Middle & Inner Ear Infection Tx

- Viral infections often resolve on their own, however, a secondary bacterial infection may follow. Give general supportive care (page 77). Use a systemic OTC decongestant to relieve congestion and promote drainage.
- Many middle or inner infections will resolve with supportive Tx in 2-3 days. If abx are not available, consider a Level 3 Evac.
- If the infection appears bacterial in nature with worsening S/Sx despite supportive Tx consider administering one of the following abx: clarithromycin, azithromycin or TMP/SMX. Clarithromycin is given at 250-500 mg po bid for 10-14 days. Azithromycin is given at 500 mg po on day 1, then 250 mg per day for four more days. Adult dose for TMP/SMX is one double strength (960 mg) po bid for 10 days. *Begin a Level 2 Evac* if abx are unavailable and pt is unable to self-evacuate.
- **DO NOT FLUSH.** Avoid swimming, washing hair, and showers if a ruptured ear drum is present or suspected. Evacuate if abx are unavailable.

# Ruptured Ear Drum

**Ruptured Ear Drum** may be 2° to foreign object (twig when traveling off-trail through thick brush), abrupt ascent while SCUBA diving, abrupt loud noise (thunder) or pressure, or a severe bacterial infection of the middle ear.

## Ruptured Ear Drum S/Sx

- Immediate moderate to severe ear pain ± dizziness, nausea, vomiting, & hearing loss.
- A sudden relief of pain if the rupture is due to a middle ear infection.

### **Ruptured Ear Drum Tx**

- Consider a Level 3 Evac.
- Cover to prevent contamination; **DO NOT FLUSH**. Avoid swimming, washing hair, & showers until completely healed and visually inspected.
- Administer NSAIDs for pain.
- Monitor for a middle or inner ear infection; most ruptured ear drums heal on their own in 3-4 wks without complications.

## **Eye: Foreign Bodies**

**Foreign Bodies** include small insects, windblown dirt or sand, sticks, etc.

### **Foreign Bodies Prevention**

- Wear goggles while hiking in heavy brush. Seek shelter in wind storms and from helicopter rotor wash when flying sand & dirt are present.
- Wear a head net when bugs (no-see-ums, black flies, etc.) are bad.

### **Foreign Bodies S/Sx**

- Onset is abrupt with immediate irritation or pain, tearing, and redness.
- Difficulty opening eye and submitting to exam; may require topical ophthalmic anesthetic (Tetracaine 0.5%).
- If foreign body is not immediately obvious upon inspection, check under eyelids; invert using cotton-tipped applicator.
- If MOI is trauma, inspect and rule-out open globe injury.

### **Foreign Bodies Tx**

- If no globe damage, lightly flush eye and underneath eyelids toward nose (in the direction of tearing); use sterile saline. Clean water works but leaves eye feeling “dry” so moisten with artificial tears. A moistened cotton-tipped applicator can also be used.
- Use a topical ophthalmic abx ointment to prevent superinfection and lubricate conjunctiva. Apply to inside of lower eyelid and have pt blink their eye a few times to spread the ointment. Ophthalmic abx solutions are easier to apply but do not provide lubrication.
- Use NSAID ophthalmic solutions for pain. **DO NOT use anesthetics to control pain beyond initial assessment.**
- **DO NOT patch.** Eye patches slow healing and eliminate depth perception.
- **Monitor for a corneal abrasion and/or conjunctivitis.**



# Eye: Blunt Trauma

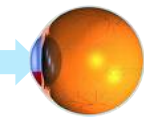
It is crucial to distinguish between an essentially harmless **Sub-conjunctival Hemorrhage** and an **Open Globe Injury** (an ophthalmic emergency).

## Sub-conjunctival Hemorrhage & Open Globe Injury S/Sx

- **DO NOT palpate or put pressure on the eye during physical exam.**
- Sub-conjunctival Hemorrhage: Bleeding between conjunctiva & sclera. No eye pain & normal vision. ± facial or orbital pain depending on the MOI.
- Open Globe Injury: Pain, bleeding behind cornea, irregular pupil, & blurred vision. Shine light from side and look for red blood cells deep in the cornea.



Open Globe Injury



Sub-conjunctival Hemorrhage



## Sub-conjunctival Hemorrhage & Open Globe Injury Tx

- Sub-conjunctival Hemorrhage: NO NSAIDS (may increase bleeding). Heals without Tx in 1-3 wks. Color may spread and change to green or yellow (bruise).
- **Open Globe Injury: DO NOT disturb impaled objects. DO NOT flush.** Cover eye with metal shield, and *begin a Level 2 Evac*; surgery is required.

# Eye: Corneal Abrasion

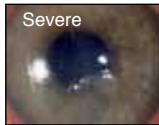
**Corneal Abrasions** are 2° to contact with branches, foreign bodies, etc. or associated with contact lenses. Inspect as per foreign body.

## Corneal Abrasions S/Sx

- Foreign body sensation or gritty feeling (in spite of thorough flushing), pain (severity varies), light sensitivity, excessive tearing.
- Only large scratches are visible without fluorescein staining. Stained abrasions glow green under cobalt blue light. Use a topical anesthesia (Tetracaine 0.5%) if pt resists examination or staining due to eye pain.



Mild



Severe

### **Corneal Abrasions Tx**

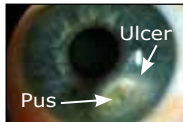
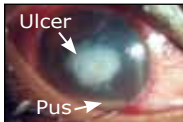
- Most corneal abrasions heal within 1-5 days. Consider a Level 3 Evac.
- Use a topical ophthalmic abx ointment (Bacitracin) to prevent superinfection and lubricate conjunctiva. Apply to inside of lower eyelid and have pt blink their eye a few times to spread the ointment. Ophthalmic abx solutions are easier to apply but do not provide lubrication.
- Tx non-traumatic corneal abrasions with topical Ciprofloxacin 0.3% 1-2 gtts qid until S/Sx are relieved (< 3 days). Discontinue contact lens use in both eyes; the solution may be contaminated.
- Use NSAID ophthalmic solutions for pain. *DO NOT use anesthetics to control pain beyond initial assessment.* Wear sunglasses if light sensitive.
- *DO NOT patch; eye patches slow healing and eliminate depth perception.*
- *Monitor for a corneal ulcer and/or conjunctivitis.*

## Eye: Corneal Ulcer

A **Corneal Ulcer** is an ophthalmic emergency with the potential to develop permanent eye damage or blindness within 24 hrs. Most corneal ulcers are infectious with a traumatic Hx. Even a small break in the surface of the cornea may lead to serious infection. Risk factors: extended-wear contact lenses, smoking, winter (cold and wind exposure), male, vitamin A deficiency.

### **Corneal Ulcer S/Sx**

- A topical ophthalmic anesthetic may facilitate examination.
- Foreign body sensation or gritty feeling, pain, light sensitivity, visible pus under cornea, & impaired vision.
- Cornea is red; ulcer is opaque and cream-colored or hazy. Fluorescein staining is typically unnecessary.



### **Corneal Ulcer Tx**

- *Begin a Level 2 Evac* for ophthalmological consultation. During evac Tx with topical Ciprofloxacin 0.3%: 1-2 gtts q hr while awake for 1 day; 1-2 gtts q 4 hrs while awake for another 7 days.

# Eye: Chemicals

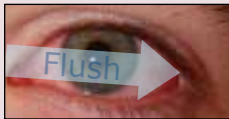
Sunscreen and insect repellent are common **Chemicals** that enter the eye during exercise or swimming and irritate the conjunctiva.

## Chemicals S/Sx

- Immediate and debilitating eye pain & tearing.

## Chemicals Tx

- Wash hands & face with soap & water to remove excess sunscreen or insect repellent.
- Immediately flush eye and underneath eyelids. **FLUSH AWAY FROM NOSE AND OTHER EYE**; use sterile saline. Clean water works but leaves eye feeling “dry” so moisten with artificial tears.
- If pain persists after flushing: use a topical ophthalmic abx ointment to prevent superinfection and lubricate conjunctiva. Apply to inside of lower eyelid and have pt blink their eye a few times to spread the ointment. Ophthalmic abx solutions are easier to apply but do not provide lubrication.
- Use NSAID ophthalmic solutions for pain.
- Begin a Level 2 Evac for severe pain, other chemicals, or if pain from sunscreen or insect repellent persists > 24 hrs.
- *Monitor for a corneal abrasion.*



# Eye: Conjunctivitis

**Conjunctivitis** is typically 2° to a bacterial or viral infection; it may also be 2° to a systemic infection of Chlamydia, Gonorrhea, or Candida. Risk Factors: corneal abrasion, extended-wear contact lenses, and/or close contact with an infected person.

## Conjunctivitis S/Sx

- Acute or subacute onset with minimal pain, foreign body irritation, & pus ± itching. May also redden the inner surface of the eyelid and cause surface changes.



- Blurred vision due to pus; visual acuity is not affected. Pus often “glues” eyelids together during sleep.
- *HIGHLY contagious. Thoroughly wash hands after assessment and Tx.*

### **Conjunctivitis Tx**

- Discontinue contact lens use. Replace disposable contacts & lens solution.
- Mild infections may be treated with repeated flushing using saline or fresh tea from chamomile, agrimony, cats claw, or eyebright. Begin a Level 3 Evac if unsuccessful and ophthalmic abx are unavailable.
- Bacterial infections may be treated with abx ointment or gtts every two hrs while the pt is awake. Ophthalmic abx solutions are easier to apply than ointments; however, ointments provide some pain relief. Consider Rx medications ophthalmic gentamicin or Neomycin-polymyxin B-gramicidin ophthalmic. Do not use abx containing steroids.
- If infection is 2° to a STD, also Tx pt’s sexual partner.

## **Avulsed & Fx Teeth, Lost Fillings & Crowns**

**Fractured & Avulsed Teeth** are typically 2° to trauma. Exposed pulp is at high risk for infection. Once established a local infection may become severe, systemic, and difficult (if not impossible) to Tx in the field.

### **Fractured & Avulsed Teeth S/Sx**

- A tooth is broken, sensitive, and painful. If the pulp is exposed there is a risk of infection.
- Tooth/crown is broken, sensitive, & painful ± exposed pulp.
- A filling or crown that has fallen out is usually sensitive and leaves an obvious hole in the affected tooth.
- An avulsed tooth leaves an exposed, painful hole in pt’s gums and is at risk for infection.

### **Fractured & Avulsed Teeth, Lost Fillings & Crowns Tx**

- **Pain** may be controlled with oil of clove (eugenol) and NSAIDs; in severe cases use a codeine-based drug. Soak a small piece of cotton or finely chopped gauze with eugenol and pack into the hole.
- **To repair a broken tooth or lost filling:** Flush the broken area thoroughly with salt water, a dilute vinegar solution, or an iodine solution. Dry. Place eugenol soaked cotton/gauze into hole as described above and cover with dental putty. Wear gloves and roll a small amount of putty into a ball;

press firmly into place. If putty is on top of a tooth, have pt bite down gently to mold the putty to their natural bite. When dry, sand or file any rough edges off the temporary filling. Coat filling and tooth with cavity varnish.

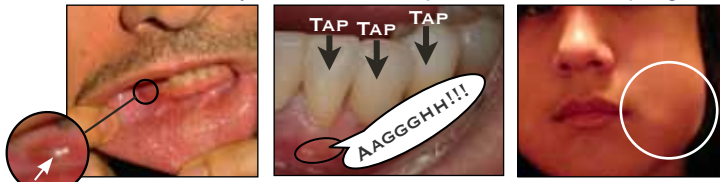
- **Crown Repair:** Using exam gloves, roll a small amount of putty into a ball, press firmly onto crown, press crown into position, then have pt bite firmly to set crown. For additional security use putty to splint both sides of crown to adjacent teeth.
- **Replace avulsed teeth** that have been out < 15 min and are clean. *Do not replace teeth in pts who have not had a tetanus booster within the last 5 yrs.* Rinse socket & tooth with normal saline then place tooth firmly in socket. Handle tooth by crown; do not scrub connective tissue from tooth. Use dental putty to splint loose or avulsed teeth to the adjacent teeth for 7-10 d. Monitor for infection. To ensure proper alignment and receive abx prophylaxis, begin a Level 3 Evac; ideally pts should be seen by a dentist within 48 hrs. If evac is not possible, administer penicillin VK or erythromycin PO. Both are dosed at 250-500 mg qid for 10 d. If an infection develops remove the tooth & Tx infection (below).
- *Dental putty can remain in place for days or wks. Caution pt not to chew hard objects (ice, hard candy, etc.) or sticky food.*

## Tooth & Gum Infections

**Tooth & Gum Infections** are 2° bacteria within the tooth pulp or bacteria from a foreign body or calcium/tartrate deposit below the gum line.

### Tooth & Gum Infections S/Sx

- Severe tooth pain on percussion. Lightly tap a normal tooth on the top of its crown first, then progress toward the suspected tooth.
- Surrounding soft tissue is red, tender, & swollen; swelling may progress to include the entire jaw. An abscess may be noticeable in the pt's gums.



- Swollen lymph glands, fever, & malaise indicate a systemic infection.

### **Tooth & Gum Infections Tx**

- Apply hot, moist compresses to the infected area inside the pt's mouth. Do not apply heat to the outside of a pt's face when their tooth or gum is infected. Abscesses move towards heat.
- Carefully lance any obvious pustule heads with a sterile scalpel blade or knife by making a quick horizontal cut to the bone. Apply ice directly to site for a few min OR infiltrate with a local anesthetic before making the incision. Thoroughly clean the infected area with a salt water, a dilute vinegar solution, or PI solution. Follow with saline rinses q 2 hrs.
- Administer a systemic abx. Consider penicillin VK or erythromycin. Adult dose for both is 500 mg po qid for 10 d. Begin a Level 3 Evac if abx are unavailable; *upgrade to Level 2 if fever is present.*
- Use codeine-based analgesics (Rx) for severe pain.

## **Fungal Infections**

**Fungal Infections** are 2° to Tinea or Candida fungi that primarily invade the dead outer layers of the skin, hair, nails, and, in the case of Candida, the mucous membranes.

### **Fungal Infections S/Sx**

- Rash, itching, & flaking on affected skin (between toes, under nails, soles of feet & palms, hair & beard, scrotum).
- S/Sx & Tx of vaginal yeast infections 2° to Candida (page 94).
- Oral Candida infections (oral thrush) present with creamy white lesions on pt's tongue or inner cheeks; may be painful & bleed slightly when scraped. Severe infections may spread to the roof of pt's mouth, gums, tonsils or back of throat.



### **Fungal Infections Tx**

- Tx varies and is based on the anatomic location of the infection. Most localized fungal infections may be treated with numerous topical antifungal agents: clotrimazole, econazole, ciclopirox, miconazole, ketoconazole, or nystatin prepared as creams, suppositories, lozenges, etc. Systemic or persistent infections are treated with oral antifungal therapy using either fluconazole or itraconazole.
- For skin rashes 2° both Tinea & Candida apply topical Lac-hydrin & Clotrimazole bid x 3-4 wks; *wash before reapplication.*

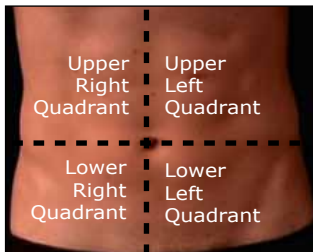
- For oral Candida infections dissolve a Clotrimazole lozenge bid for 7-14 d.
- Begin a Level 3 Evac if S/Sx are mild and antifungals are unavailable or pt does not respond. *Begin a Level 2 Evac if pt is immunosuppressed or a systemic Candida infection is suspected.*

## Abdominal Pain & Tenderness

**Abdominal Pain & Tenderness** are associated with the structure and function of the affected organs or tubes and their attending sensory nerves. Connecting tubes, hollow organs, and solid organs may become infected, damaged by toxins, cut by penetrating trauma, or ruptured 2° blunt trauma, blockage, or internal infection. Tubes and hollow organs can become blocked or kinked. Each produces varying degrees of pain and tenderness.

When the muscles of the hollow organs or the capsules surrounding solid organs in the abdominal cavity are either overly stretched or shortened, they produce a diffuse dull pain or ache. When the abdominal lining (parietal peritoneum) is irritated, it gives rise to a more specific, sharp, and intense pain that presents as abdominal tenderness, guarding, or rebound pain. Abdominal pain often begins as diffuse pain as an organ swells from inflammation and becomes sharp and localized when the peritoneum becomes irritated. Referred pain occurs when nerve pathways overlap causing the pain to appear at a site away from its actual cause.

Examiners **MUST** take a thorough Hx. Carefully evaluate pt's intake & output. Rigorously examine pt's pain: its onset, severity, character (dull, sharp, aching, etc), location, progression (constant & getting better or worse, intermittent & the timing of the intervals, closer or further apart), and what makes it worse or better. Palpate and apply gentle, firm pressure to all suspect organs; inflamed organs are tender. Tx the root Px if possible; otherwise, Tx the S/Sx and refer to the general evac guidelines discussed on page 78. Remember that accurate Dx is often difficult for physicians. Use the following charts and information to guide your decision. If possible, seek a physician consultation via radio or phone. When in doubt, take them out.



## Field Assessment of Abdominal Pain & Tenderness

Quality	Onset	Level	Site	Radiate	Character	Additional Hx, S/Sx, & Notes	Possible Px	Evac
Crampy	Slow	1-10	RLQ LLQ		Diffuse	Hx: gas producing food, altitude. S/Sx: cramps, relief after flatulence.	Gas	4
Bloated	Slow	1-5	LLQ		Diffuse	Hx: no bowel movement, dehydration, no/low fiber diet. S/Sx: cramps, bloated abdomen.	Constipation	4/3
Crampy	Rapid	5-10	ABD		Diffuse	Hx: ± poor hygiene, ± contaminated food or water. S/Sx: N, V, D, F.	Gastroenteritis	3/2
Burning Sharp	Abrupt	8-10	Epi	Back	Local early Diffuse late	Hx: antacid, aspirin or NSAID use. S/Sx: N, V, ± blood in vomitus/stool.	Ulcer	3/2
Colicky	Varies	8-10	Epi RUQ	Scapula Back	Local	Hx: ± gallstones, recent fatty meal. S/Sx: ± N, V, F.	Gallstone	3/2
Dull Ache	Slow	5-10	RUQ LUQ	Back	Diffuse early Local late	Hx: alcohol abuse. S/Sx: N, V, no appetite, ± D, F, ± ↑ P & guarding.	Pancreatitis	3/2
Sharp	Abrupt	1-10	RLQ LLQ		Local	Hx: ± hernia, lifting heavy object. S/Sx: lump in scrotum/inguinal area.	Hernia	3/2
Ache	Slow Mod	5-10	RLQ LLQ		Local	Hx: sexually active. S/Sx: ± F, weakness, abnormal vaginal bleeding, green/yellow vaginal discharge.	Pelvic Inflammatory Disease	3/2
Varies	Rapid	5-10	RLQ LLQ		Diffuse early Local late	Hx: ± ovarian cyst. S/Sx: N, V, ± guarding	Ovarian Cyst	3/2

Epi = Epigastric Region  
ABD = Entire Abdomen  
Sub = Substernal

RUQ = Right Upper Quadrant  
LUQ = Left Upper Quadrant

RLQ = Right Lower Quadrant  
LLQ = Left Lower Quadrant  
F = Fever

N = Nausea  
V = Vomiting  
D = Diarrhea

NOTE: There is considerable overlap in the above categories, and the conditions described can present in an atypical manner not covered by chart. When in doubt begin an urgent (2/1) evac for physician evaluation. See evac levels on page 128.

## Field Assessment of Abdominal Pain &amp; Tenderness continued...

Quality	Onset	Level	Site	Radiate	Character	Additional Hx, S/Sx, & Notes	Possible Px	Evac
Sharp Stabbing	Abrupt	8-10	Flank Back	RLQ LLQ Groin	Local	Hx: ± kidney stones. S/Sx: ± blood in urine, ± N, ± V.	Kidney Stone	3/1
Ache	Slow	1-5	LLQ		Local	Hx: straining at defecation; typically male > 40 y/o. S/Sx: F, D, bloody stools.	Diverticulitis	2/1
Ache	Slow	1-5	RLQ		Diffuse early Local late	Hx: no appendectomy; S/Sx: ± F, ± guarding, ± rebound pain	Appendicitis	2/1
Varies	Varies	1-5	RLQ LLQ Pelvis	Scapula	Diffuse early Local late	Hx: missed period, ± AM nausea, sexually active; S/Sx: cramps & spotting prior to rupture; Notes: FO with negative Early Pregnancy Test	Ectopic Pregnancy	2/1
Sharp	Abrupt	10	RLQ LLQ	Back	Local	S/Sx: ± tenderness over site prior to rupture, pain appears with rupture and is often followed by death. Notes: typically 50-80 y/o males or 2% extreme exertion/stress.	Abdominal Aortic Aneurysm	1
Tearing Ripping	Abrupt	10	RLQ LLQ	Back	Local	S/Sx: no early S/Sx, S/Sx are variable depending on location, death 2% volume shock is possible.	Abdominal Aortic Dissection	1

Epi = Epigastric Region  
 ABD = Entire Abdomen  
 Sub = Substernal

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 D = Diarrhea

NOTE: There is considerable overlap in the above categories, and the conditions described can present in an atypical manner not covered by chart. When in doubt begin an urgent (2/1) evac for physician evaluation. See evac levels on page 128.

# Intestinal Gas

Large amounts of **Intestinal Gas** are poorly transported by peristalsis. Causes include: lactose intolerance, sulfur-dried foods, improperly rehydrated foods, cruciferous vegetables, & legumes; pain is ↑↑ by lower pressure at altitude.

## Intestinal Gas Prevention

- Avoid gas-producing foods.
- Ensure complete rehydration of all dried foods prior to consumption.
- Use milk enzymes (Lactaid®) with dairy products.
- Use alpha-D-galactosidase (Beano®) with gas-producing foods.

## Intestinal Gas S/Sx

- Bloating, distention, abdominal cramps, and/or gas (flatulence).
- Colicky abdominal pain relieved by flatulence.

## Intestinal Gas Tx

- Simethicone liquid, tablets, or capsules (Phazyme, Flatulex, Mylicon, Gas-X, Mylanta Gas, etc.).
- Activated charcoal tablets.
- Kneel with butt in the air (gas does indeed rise).
- No evac is necessary.

# Constipation

**Constipation** occurs when fecal matter hardens over time until defecation is difficult or impossible (impaction). In a wilderness environment common causes are: lack of a perceived opportunity, dehydration, low fiber diet, stress, disruption of normal routine, and stopping smoking.

## Constipation Prevention

- Avoid dehydration & include high quantities of fiber in daily diet.
- Ensure that all group members are informed and understand the importance of proper diet, hydration, and the necessity to relieve their bowels on a regular basis. Create daily opportunities for regular elimination. Strategies include: taking regular breaks from daily travel and announcing “Now is a good time to go the bathroom...,” setting up the river toilet at lunch breaks and scouts without asking if a group member needs to go, and making an announcement that “The toilet is...,” etc.

## Constipation S/Sx

- Abdominal pain, bloating, & lack of appetite.
- Hard stools more than 25% of the time.
- Incomplete evac more than 25% of the time.
- Two or fewer bowel movements in a week.

### Constipation Tx

- Education, hydration, and high fiber diet.
- Tx: bulking agents, stool softeners, lubricating agents, osmotic agents, intestinal stimulant, or warm-water enema.
- Begin a Level 3 Evac for manual removal of impacted fecal matter.

# Gastroenteritis

**Gastroenteritis** is a nonspecific term for intestinal illnesses that produce diarrhea. In the majority of cases the diarrhea is accompanied by nausea, vomiting, and abdominal pain. Almost all diarrheal illnesses are a result of: poor personal or expedition hygiene, poor food preparation, or contaminated food or water. Rigorous attention to basic travel and expedition hygiene, water purification, and food handling guidelines cannot be overstated.

## Gastroenteritis S/Sx

- Diarrhea, nausea, vomiting, & abdominal pain.
- *Abdominal pain NOT accompanied by diarrhea is NOT gastroenteritis & may be a serious Px requiring a Level 2 or 1 evac (page 78).*
- Vomiting without diarrhea indicates a noninfectious cause.
- In adults fever  $\pm$  chills suggests an invasive organism.
- Pain in the lower quadrants or lower back and large volume stools indicate an infection in the large intestine.
- Blood in the stool indicates ulceration of the large intestine.
- Pain in the umbilical region and many small stools suggests an infection in the small intestine.
- White bulky feces that float indicate a high fat content typically 2° to a small bowel pathology and malabsorption.

## Gastroenteritis Tx

- *Follow the General Supportive Tx for Medical Pxs on page 77 AND:*
- Aggressively replace fluids with electrolytes via ORS at 1 L/hr until urine is clear, then give roughly 1.5 L of oral fluid per L of stool. Consider a Level 3 Evac and upgrade if pt is in danger of becoming dehydrated.

- Begin feeding with complex carbohydrates and lean meats to speed mucosal repair ASAP after vomiting has been controlled and pt rehydrated. Consider rice, wheat, bread, potatoes, & chicken.
- Grapefruit Seed Extract (GSE) at 6-8 gtts/L for a maximum of 32 gtts/d may successfully Tx mild to moderate bacterial & parasitic infections.
- A single dose of trimethoprim-sulfamethoxazole (TMP/SMX) at 1 DS tablet po or ciprofloxacin 500 mg po can ↓ the course of bacterial infections (traveler's diarrhea). Give the same dose bid for 3-5 d if S/Sx persist beyond the first day.

## Peptic Ulcer

**Peptic Ulcers** result as the lining of the stomach or first part of the small intestine breaks down 2° to NSAIDs use and/or a H-pylori bacterial infection.

### Peptic Ulcer S/Sx

- Epigastric pain (heart burn) & tenderness 2-3 hrs after eating.
- Nausea ± vomiting.
- Vomited blood: looks like coffee grounds (bleeding & perforated ulcers).
- Blood in stool. Stool looks black or tar-like (bleeding & perforated ulcers).
- ± Hx of long term NSAID use.

### Peptic Ulcer Tx

- Begin a Level 3 Evac if not relieved by symptomatic Tx.
- If 2° to NSAIDs: STOP NSAIDs use.
- Administer an antacid or ranitidine (Zantac®); both are H-2 blockers. Alternately administer proton pump inhibitors (Prilosec®, Prevacid®, Nexiumetc®).
- If due to H-pylori infection: Administer proton pump inhibitors plus abx (commonly amoxicillin or clarithromycin) for 7-14 d.
- Monitor for a bleeding or perforated ulcer.
- *Begin a Level 2 Evac for abdominal pain & tenderness accompanied by stomach or intestinal bleeding.*
- *Begin a Level 1 Evac if a perforated ulcer is suspected; death is possible. Monitor for S/Sx of internal bleeding/volume shock.*

## Gallstone

**Gallstones** are 2° to crystallized cholesterol deposits or calcium crystals and bilirubin that temporarily or permanently block the bile ducts and/or pancreatic duct. Stones can be small (sand grains) or quite large (golf ball).

A permanent block permits bacteria to flourish, causing inflammation and perforation. Females are at greater risk than males. Obesity, a high-fat diet, and high triglycerides further increase the risk.

### **Gallstones S/Sx**

- Gradually increasing abdominal pain—usually after a fatty meal—localizes within 10 min in RUQ.
- Pain may be constant or intermittent and NOT relieved by vomiting, antacids, defecation, or positional changes.
- Nausea & vomiting are common.
- Fever & increased pulse indicate an infection.
- Pts often exhibit tenderness with inhalation as steady pressure is applied to the RUQ along the costal arch. Breathing in expands the lungs and pushes the gall bladder down below the ribs where it can be palpated; an inflamed gall bladder is tender.
- Temporary blockages typically last 30-90 min; pain resolves quickly after stone dislodges.
- Localized rebound tenderness and guarding indicate perforation.

### **Gallstones Tx**

- Begin a Level 3 evac if S/Sx are mild, quickly resolve, and do NOT indicate an infection.
- *Begin a Level 1 Evac if fever or other S/Sx of an infection are present. Tx usually requires surgery.*

## **Pancreatitis**

Pancreatitis is typically 2° to long-term alcohol abuse OR a gallstone blocking the pancreatic duct at the common entrance to the small intestine. Pancreatitis due to alcohol abuse is more common in males > 40 y/o while pancreatitis due to gallstones is more common in females > 40 y/o.

### **Pancreatitis S/Sx**

- S/Sx often begin after a heavy meal or drinking binge.
- Nausea, vomiting, & lack of appetite ± diarrhea.
- Fever, ↑ pulse, abdominal pain, tenderness, & guarding.
- Onset is gradual and steady, eventually reaching a dull ache. Pain may radiate through to back and typically lasts more than a day.
- Some pts develop respiratory distress or jaundice.

## **Pancreatitis Tx**

- STOP all alcohol consumption.
- Liquid diet or fast until appetite returns, then restrict fats & protein.
- Maintain fluid and electrolyte balances.
- *Begin a Level 3 or Level 2 Evac, depending on severity.*

# Inguinal Hernia

A **Inguinal Hernia** occurs when a portion of the intestine breaks through a weak spot in the pt's abdominal wall. The MOI typically ↑↑ internal pressure from straining or lifting.

## **Hernia S/Sx**

- Pain is variable, may radiate to hip, back, or leg; pain ↑↑↑ with activity, obstruction, or strangulation.
- Presents as a soft lump in the scrotal or femoral area. Size often ↑ when pt coughs or strains and reduces when pt relaxes and/or lies on back.
- Colicky abdominal pain, distension, & vomiting indicate an obstruction.
- If strangulated, lump will become red & ↑↑↑ tender; femoral hernias are more common in women and more prone to strangulation.



## **Hernia Tx**

- Position pt on back with knees bent; rotate leg on the herniated side outward & support. Apply a cold pack to ↓ swelling & blood flow. Place two fingers at the edge of the break to prevent the hernia from riding over it during reduction. Apply firm steady pressure to the side of the hernia (close to the break) to guide it back in; avoid putting pressure on the apex of the lump. Once reduced, support groin and begin a Level 3 Evac.
- *Begin a Level 2 Evac* if reduction is unsuccessful or an obstruction/strangulation is suspected.

# Ovarian Cyst

Most **Ovarian Cysts** function as a normal part of a women's menstrual cycle. Rarely cysts become too large, tumorous, or cancerous; some twist and cut off circulation to ovary, others rupture blood vessels & cause internal bleeding.

## Ovarian Cysts S/Sx

- Lower abdominal pain accompanied by abdominal fullness, pressure or bloating. May radiate to lower back. Severity is variable. Onset tends to be at the beginning, during, or after the menstrual period.
- Irregular periods or spotting, nausea, ± vomiting, fatigue.
- ↑↑ Frequency in urination or difficult with bowel movements 2° intra-abdominal pressure from the cyst.

## Ovarian Cysts Tx

- 95% of ovarian cysts are benign and require no Tx other than rest and NSAIDs for pain. NSAIDs are more effective when given early.
- Maintain hydration to avoid constipation.
- Avoid caffeine, alcohol, sugar, & foods that cause gas.
- Limiting activity may reduce the risk of torsion or rupture.
- Consider Level 3 Evac if discomfort persists.
- *Begin a Level 1 Evac if pt exhibits severe abdominal pain and tenderness with guarding.*


# Kidney Stone

**Kidney Stones** form in the kidney from urine supersaturated with any mineral salt capable of forming a crystal. Once formed, they travel down the ureter where they become lodged until pressure or surgery removes them. The male to female ratio is 3:1.

## Kidney Stones S/Sx

- Uninterrupted flank pain with a gradual or abrupt onset that typically increases during the first ½-2 hrs, remains constant for 1-4+ hrs, and fades over the next 1½-3 hrs.
- Pts with severe pain are writhing and unable to lie still.
- Pain may radiate to back or groin and stops when the stone reaches the bladder; most stones pass painlessly through the urethra.
- Nausea ± vomiting is common. Fever is rare and indicates an infection.
- In pts > 60 y/o with no Hx, the S/Sx may indicate an abdominal aortic aneurysm (page 80).

## Kidney Stones Tx

- Roughly 80-85% of kidney stones pass spontaneously within 18 hrs; the remainder require hospitalization.
- 

- The cessation of pain after 24 hrs does NOT mean the stone has passed; verification requires advanced technology. Permanent kidney damage begins within 5-14 days if the stone is not removed.
- Begin a Level 3 Evac if stone does not pass within 18 hrs.
- *Begin a Level 1 Evac if pt is over 60 y/o with no Hx of kidney stones or if the S/Sx are accompanied by a fever.*

## Diverticulitis

**Diverticulitis** occurs when small pouches (diverticula) form in the intestinal wall, become infected, and later rupture or bleed internally. Risk factors include males > 40 y/o and a high fat/low fiber diet.

### Diverticulitis S/Sx

- Hx of previous dull, colicky, and diffuse abdominal pain accompanied by flatulence, bloating, diarrhea, and/or constipation.
- Abdominal pain usually specific to the LLQ; pain is steady, severe & deep.
- Nausea, vomiting, & low-grade fever are common.
- Abdomen may be distended and drum-like.
- Red or wine-colored stool indicates internal bleeding. Bright red blood issuing from the rectum in older pts (60+) is often caused by bleeding associated with diverticula and can be quite severe.
- Local pain becoming diffuse ± back or lower-extremity pain indicates rupture.
- Local rebound tenderness & guarding indicate perforation.
- Rule-out ectopic pregnancy with an early pregnancy test (EPT).

### Diverticulitis Tx

- *Begin a Level 2 Evac if diverticulitis is suspected.*
- *Begin a Level 1 Evac if large amounts of bright red blood issue from the rectum, or perforation or rupture is suspected.*
- Surgery may be required; no food for 6 hrs prior to arrival at hospital.

## Appendicitis

**Appendicitis** is 2° to blockage from a mucus plug OR the pt's stool that traps and permits bacterial growth and inflammation that often leads rupture, infection of the abdominal lining, and death. S/Sx may disappear with spontaneous healing; however, the risk of rupture increases with surgical delay. Perforation and rupture are higher with pts < 18 and > 50 y/o.

## Appendicitis S/Sx

- Early S/Sx can be vague and similar to many other abdominal Pxs. Consider appendicitis if the MOI is unclear. When in doubt, take them out.
- Abdominal pain and tenderness is diffuse early when the inflammation is confined to the appendix, localizes to the RLQ as the abdominal lining becomes irritated, and diffuse again after rupture.
- Fever  $\pm$  nausea and/or vomiting; vomiting tends to develop after the onset of pain. Diarrhea or constipation is possible.
- The right psoas muscle runs over the pelvis near the appendix. Flexing this muscle may cause abdominal pain if the appendix is inflamed. Check for the psoas sign by applying resistance to the right knee as the pt tries to lift the right thigh while lying down.
- The right obturator muscle also runs near the appendix. Check for the obturator sign by asking the pt to lie down with the right leg bent at the knee. Moving the bent knee left and right requires flexing the obturator muscle and may cause abdominal pain if the appendix is inflamed.
- Sharp pain with voluntary cough indicates inflammation of the abdominal lining as does standing on toes and jarringly dropping to their heels.
- Rebound tenderness and guarding are common prior to rupture. Pain felt on the RLQ of the abdomen upon the release of pressure on the left side may indicate an inflamed appendix.
- Rule-out ectopic pregnancy with an early pregnancy test (EPT).

### Appendicitis Tx

- *Begin a Level 2 Evac if appendicitis is suspected.*
- *Begin a Level 1 Evac if perforation or rupture is suspected.*
- Surgery is usually required; no food for 6 hrs prior to arrival at hospital.

# Hemorrhoids

**Hemorrhoids** are 2° to swelling, inflammation, and subsequent bleeding of the veins in the rectum and anus. Constipation is the major contributing factor. Most hemorrhoids are internal.

## Hemorrhoids S/Sx

- Presentation may be acute, chronic, or relapsing.
- Bright red blood covering the stool or toilet paper. Dark blood or blood mixed with the stool indicates bleeding higher in the intestinal tract.
- Painful swelling occurs in more severe cases. Pain peaks in 2-3 d.

## Hemorrhoids Tx

- Treat as per constipation (page 112).
- Most hemorrhoidal S/Sx will disappear within a few days.
- Cold compresses and/or topical analgesic (Nupercainal®) provide temporary relief. Use squatting position.
- Consider a Level 3 Evac if S/Sx ↑↑ during the 4th d.

# Infectious Diseases

**Infectious Diseases** are caused by viruses, bacteria, parasites, or fungi. They are transmitted through direct contact with infected body fluids, through animal or insect vectors, or via contaminated food & water. Good camp and personal hygiene play an important role in preventing the development and spread of an infectious disease within an expedition and cannot be overemphasized. *There are no reliable field Txs for the majority of infectious diseases.* Pts exhibiting the S/Sx of a potentially serious infectious disease should be evacuated to the nearest medical facility for accurate Dx & Tx. Information about prevention, vaccines, drug prophylaxis, & Tx is available from:

- **Centers for Disease Control (CDC)** ~ [www.cdc.gov](http://www.cdc.gov)  
24 hr phone HOT LINE:
- **Department of State** ~ [www.travel.state.gov](http://www.travel.state.gov)  
24 hr phone HOT LINE:
- **World Health Organization (WHO)** ~ [www.who.int](http://www.who.int)
- **International Association of Medical Assistance to Travelers (IAMAT)** ~ [www.iamat.org](http://www.iamat.org) ~ Phone:

**Insect bites** Common carriers are fleas, mosquitoes, sand flies, lice, chiggers, ticks, & assassin bugs; allergic reactions to proteins in the insect's saliva may cause allergic reactions. Use protective clothing & insect repellent.



**Sand Flies** and mosquitoes are active from dawn to dusk but will bite during the day if disturbed. Bites are painless and start itching hrs to days later. Allergic reactions are possible. Sand flies are 1/3 the size of mosquitoes.

**Ticks** live in forests, scrub, and grasslands. Disease transmission tends to occur at the end of a meal when the tick is full of blood. Do periodic tick checks during the day, before bed, and after waking. Remove and shake clothing before going inside a tent or shelter. Wear light-colored or white long pants, long sleeved shirts, and socks so ticks can be more easily seen; pull socks over pant cuffs.

To remove: grasp the tick as close to its head as possible with small tweezers or forceps and gently pull straight out; avoid twisting. Ideally the head will come free with the body leaving a small crater behind. Destroy the tick and thoroughly wash your hands, instruments, and the bite site with soap and water and apply 10% povidone iodine to the site; contact with tick tissue and fluids can transmit disease. Circle the site with a felt-tipped marker and monitor it over the next few days for a rash or infection.



**Chiggers** live primarily in grasslands & brush. The mites inject digestive enzymes into skin that cause severe irritation, swelling, & small red lesions or blisters after the larvae detach. Wash with soap & warm water to remove.



**Fleas** are wingless and capable of jumping great distances. They live in the bedding & clothes of infected persons. Flea bites are irritating and can become swollen or inflamed; scratching can lead to secondary infection. Outbreaks of bubonic plague or typhus tend to occur when people are in close proximity to wild rodents (rock squirrels, ground squirrels, prairie dogs, chipmunks, & rats). Select campsites with care.

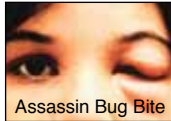


**Body Lice** live and lay eggs on clothing—often in the seams—and move to the skin to feed. Lice move by crawling and cannot hop or fly. They are easily spread by close contact and by sharing bedding or clothing. Animals do not play a role in the transmission of human lice.



Natural reservoirs of the parasite carried by **Assassin Bugs** are armadillo, opossums, rodents, bats, cats, and dogs. While feeding, the insect may defecate on the victim's skin. Scratching increases the chance of transmission. If the victim touches the feces, parasites may be transferred to the bite site or

the victim's eyes and mucous membranes. Assassin bites are gentle and painless, and occur at night while the victim is asleep. They cannot bite through clothing. They tend to infest primitive living quarters.



**Animal bites** Avoid dangerous animals; become familiar with specific animal habitat & behaviors. If bitten, Tx as high risk wound (page 31). *Thorough wound cleansing* **↓↓ risk of disease transmission.**

**Contaminated Food** CDC recommendations:

- Assume any raw food found in areas of poor sanitation to be contaminated.
- Raw food thoroughly washed with soap & rinsed in *potable* water is **SAFE**.
- Peeled vegetables & fruit are **SAFE**.
- Food that is still **HOT** is considered *reasonably SAFE*.
- Unpasteurized milk, milk products, raw meat, & shellfish are **NOT SAFE**.
- Tropical fish are **NOT SAFE** even when cooked 2° to toxins in their flesh.
- Ice made from contaminated water is **NOT SAFE**.

**Contaminated Water** Clarification removes suspended particulate matter (and many microorganisms). Purification ideally renders the H<sub>2</sub>O free from all infectious microorganisms. Clarify cloudy H<sub>2</sub>O prior to purification.

### **Clarification Options**

- **Sedimentation:** Let H<sub>2</sub>O stand for a minimum of one hr. Decant from the surface; pour decanted H<sub>2</sub>O through a coffee filter. Purify.
- **Coagulation/ Flocculation:** Add 1/8-1/4 tsp per gallon of aluminum sulfate (aka: Alum, pickling powder) to H<sub>2</sub>O, stir for 5 min, and allow floc to settle. Decant from the surface; pour decanted H<sub>2</sub>O through a coffee filter & purify.
- **Filters** clarify H<sub>2</sub>O and improve the taste by absorbing chemicals. Ceramic filters can be cleaned; most charcoal filters are disposable. A filter size of .2 microns effectively removes parasites, protozoans, and bacteria. *Viruses are not removed by filtration, and filtration alone is not considered a purification method. Filters that use an iodine resin should not be considered completely reliable because of the short contact time.*

### **Purification Options**

- **Boiling:** Bringing water to 185° F (85° C) for several min kills all enteric pathogens; bringing water to a boil at any altitude renders H<sub>2</sub>O safe to drink.
- **Ultraviolet Light Pens:** UVC radiation (240-290 nm) prevents microorganisms from reproducing by interfering with their ability to read and copy their own DNA. UVC purifies 16 oz (one pint) in 45 sec & 32 oz (1 L) in

about 90 sec. Clarify before use. Follow the manufacturer's instructions.

- **Grapefruit Seed Extract (GSE):** Use H<sub>2</sub>O or glycerine-based products for purification; follow the manufacturer's instructions. Not FDA approved.
- **Halogens (iodine & chlorine):** are *NOT* effective against Cryptosporidium cysts. Dirty water may be clarified and then treated as below or treated directly by doubling the dose. Add a small amount of powdered ascorbic acid (vitamin C) to H<sub>2</sub>O *after* it has been treated to eliminate the poor taste.

### Halogen Purification Methods

#### Concentration (ppm) vs Contact Time per Liter H<sub>2</sub>O

Method	4 ppm	8 ppm	
Iodine Tablets	1/2 tablet	1 tablet	
2% Tincture of Iodine	5 gtts	10 gtts	
10% Povidone-iodine Solution	8 gtts	16 gtts	
Halazone Tablets	2 tablets	4 tablets	
Bleach (5% sodium hypochlorite)	2 gtts	4 gtts	
Concentration	Contact Time		
	41° F (5° C)	59° F (15° C)	86° F (30° C)
4 ppm	3 hrs	1 hr	45 min
8 ppm	1 hr	30 min	15 min

**Body Fluids & Pt Care** (blood, mucus, genital secretions, saliva, feces, urine, sputum, and respiratory droplets). Avoid contact; gloves, masks, glasses, and clothing may act as a physical barrier and offer protection. *Washing immediately after exposure with soap & water* ↓↓↓ *the risk of disease transmission.*

### General Infectious Disease Assessment & Tx

- Incubation period is usually days to wks before the onset of S/Sx.
- Most initial S/Sx are generic and flu-like; many have skin rashes.
- V P U usually indicates a severe infection and a poor prognosis.
- Specific Dx usually requires a detailed exposure Hx and a blood serum test for antibodies or a culture.
- There are no reliable field Tx for the majority of infectious diseases. Pts exhibiting the S/Sx of a potentially serious infectious disease should be evacuated to the nearest medical facility for accurate Dx & Tx.

## Common Wilderness Infectious Diseases

Transmission Route	Possible Disease	T	Prophylaxis	Major S/Sx	Treatment
Body Fluids	Meningococcal Meningitis	B	Vaccine	M,F,N,V,L,±R; Stiff Neck, Pain when head is flexed	Ceftriaxone IM
	Diphtheria	B	Vaccine	M,S,Low F;Dx requires culture	Antitoxin IM Abx IM or po
	Hepatitis B	V	Vaccine	M,F,Ab,N,V,±J,±R, Jaundice	Supportive Only
	Bacterial Dysentery	B	None	M,F,Ab,Watery BD, V	ORS ± Ciprofloxacin po
Animal Bite	Rabies	V	Vaccine	Onset of S/Sx = death	Vaccine & immune globulin prior to onset of S/Sx
	Tetanus	B	Vaccine	Uncontrolled muscle spasms results in death	Wound cleaning Immune globulin
Deep Wounds	Tetanus	B	Vaccine		
Swimming or wading in contaminated water or mud	Leptospirosis	B	Doxycycline	M,F,C,E,Ab,N,V,R	Doxycycline po
	Schistosomiasis	P	None	M,F,±R	Praziquantel po
Aerosolized Rodent Urine/Feces	Hantavirus	V	None	Resp,Ab,N,V	Supportive Only

M = malaise; general sickness, headache, exhaustion, & sore muscles  
 Resp = acute respiratory distress  
 Ab = abdominal pain & tenderness  
 Con = constipation  
 Bubos = grossly swollen lymph glands  
 ORS = aggressive fluid & electrolyte replacement

T = Type  
 B = Bacteria  
 P = Parasite  
 V = Virus

L = light sensitivity  
 J = joint pain  
 E = eye pain  
 S = sore throat  
 IF = intermittent fever  
 BD = bloody diarrhea

F = fever  
 C = chills  
 N = nausea  
 V = vomiting  
 D = diarrhea  
 R = skin rash

## Common Wilderness Infectious Diseases continued...

<b>Transmission Route</b>	<b>Possible Disease</b>	<b>T</b>	<b>Prophylaxis</b>	<b>Major S/Sx</b>	<b>Treatment</b>
Flea Bite	Plague	B	Tetracycline	M, Resp	Doxycycline po
	Murine Typhus	B	None	M, F, R	Doxycycline po
Mosquito Bite	Malaria	P	Antimalarials Doxycycline	M, IF, C, N, V, J, ±laundice	Strain specific Antimalarials
	Yellow Fever	V	Vaccine	M, F, N, V, ±R, ±laundice	Supportive Only
	Japanese Encephalitis	V	Vaccine	M, F, C, J, Stiff Neck	Supportive Only
	Dengue Fever	V	None	M, F, C, E, R, Ab, N, V	Supportive Only
	West Nile Encephalitis	V	None	M, Low F, J, V, D, Stiff Neck	Supportive Only
Louse Bite	Epidemic Typhus	B	None	M, F, R	Doxycycline po
	Relapsing Fever	B	None	M, IF, ±C, ±Ab, ±J, ±N, ±V, ±D, ±R	Doxycycline po
Assassin Bug Bite	Chagas Disease	P	None	Swelling at site, M, IF, N, V, D	Benznidazole po or Nifurtimox po
Sand Fly Bite	Leishmaniasis	P	None	Nontender, firm, red papule that develops into an ulcer at site	USA: Sodium Stibogluconate IV India: Miltefosine po
Chigger Bite	Scrub Typhus	B	None	M, F, R	Doxycycline po

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R = skin rash

## Common Wilderness Infectious Diseases continued...

Transmission Route	Possible Disease	T	Prophylaxis	Major S/Sx	Treatment
Tick Bite	Rocky Mtn Spotted Fever	B	None	M,F,C,±R,J,Ab,N,V,D	Doxycycline po
	Lyme Disease	B	None	M,F,C,±R,J	Doxycycline po
	Colorado Tick Fever	V	None	M,F,±E,±N,±V,±R	Supportive Only
	Q-Fever	B	None	F,C,±M	Doxycycline po
	Tularemia	B	None	M,F,C,S,Ab,N,V,D, Ulcer,±Bubos	Streptomycin IM
	Relapsing Fever	B	None	M,I,F,±C,±Ab,±J,±N,±V, ±D,±R	Doxycycline po
	Ehrlichiosis	B	None	M,F,C,N,V,±Ab,±R	Doxycycline po
	Cholera	B	Vaccine	Watery-gray D,±V,±F	ORS ± Doxycycline po
	Bacterial Dysentery	B	None	M,F,Ab,Watery BD,V	ORS ± Ciprofloxacin po
	Hepatitis A	V	Vaccine	M,F,Ab,N,V,±R,±I, Jaundice	Supportive Only
Contaminated Food or Water	Typhoid Fever	B	Vaccine	M,increasing F,Ab,Con, ±R,±D	Levofloxacin po
	Giardia	P	None	Flatulence, Sulfurous burps,D,F,N,V	Tinidazole po or Metronidazole po

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F = fever  
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 N = nausea  
 V = vomiting  
 D = diarrhea  
 R = skin rash

# Evac Guidelines

The need for evacuation depends on the severity of the pt's Px and your resources. The type of evac depends on the mobility of the pt, the size of your party and its resources, the difficulty of terrain, and the distance involved. *Every effort should be made to accurately diagnose the pt's current and anticipated Pxs since an incorrect diagnosis may lead to a false sense of urgency and ↑↑↑ inherent risk.* Any evac, regardless of the type (self, assisted, simple carry, litter, or motorized vehicle), should not endanger either you or your pt beyond your capacity to effectively manage the risk.

If possible, seek a phone or radio consult with medical & rescue professionals prior to initiating an evac. A thorough pt assessment is required for a medical consult (SOAP note). At minimum, your location (GPS coordinates), party resources, and the current weather are required for a rescue consult. Conserve your batteries and set a communication schedule prior to signing off. When you are uncertain and a consult is unavailable any Px that is persistent, uncomfortable, and not relieved by your Tx requires an evac. The speed of the evac depends on the degree of involvement, or potential involvement, of any critical system(s). The greater the degree or potential, the faster the evac. In most cases, your field Tx for minor non life-threatening injuries will be effective and rapid evac will not be necessary. By contrast, your field Tx for most life-threatening illnesses or injuries will simply buy you and your pt some time.

The levels of evac used in this handbook are correlated to the severity of the pt's injury or illness and hence the urgency and speed of their evac. *Levels 1 & 2 represent urgent evacuations while Levels 3 & 4 are non-urgent.*

**Level 1:** *The pt's injury or illness is immediately life threatening and the pt may die without rapid hospital intervention.*

**Level 2:** *The pt's injury or illness may result in a permanent disability or the pt has the potential to develop a life threatening Px that requires hospital intervention.*

**Level 3:** *The pt's injury or illness is NOT life threatening, has little or no potential to become life threatening, and may be successfully Tx in the field with no permanent disability; however, the pt is unable to continue with the trip or requires advanced assessment and Tx.*

**Level 4 (No Evac):** *The pt's injury or illness is NOT life threatening, may be successfully Tx in the field with no permanent disability, and pt may safely continue with the trip with no risk to the expedition members.*

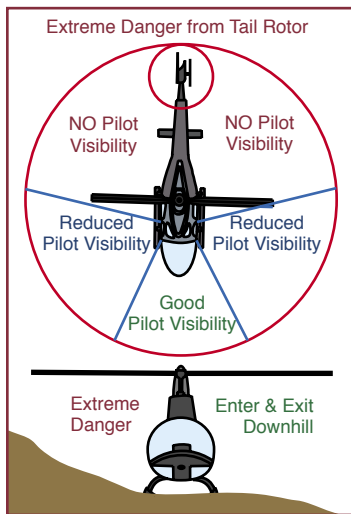
## Helicopter Use

Helicopters serve two primary purposes in wilderness medicine: 1) early pre-hospital Tx & rapid evac of the critically injured; and 2) the controlled evac of minor injuries where other methods of evac would be more difficult, more costly, and with a high level of inherent risk to rescuers. *Rescuers should immediately request a helicopter to standby if they suspect a critical need.*

Most helicopters fly under “Visual Flight Rules” (VFR) and require a minimum of 1/2 mile of visibility and a 500 foot ceiling during the day; the visibility minimum increases to 3 miles at night. Larger helicopters often have greater VFR minimums. Some helicopters, usually military, are equipped with specialized instruments that permit them to fly in more difficult conditions. Even with a helicopter en route to your scene, weather and air turbulence at the landing site could pose a significant Px and prevent landing. *Never assume that a helicopter dispatched for you will arrive; always have a backup plan.*

A safe landing zone is FLAT and approximately 100 ft x 100 ft depending on the size of the helicopter. It should permit the chopper to land and take off into the wind; a light breeze is preferable to no wind, heavy wind, or gusts. At

night use head lamps to illuminate the landing spot and any hazards. Rotors generate extremely high wind; hold down or anchor any loose gear. Direct everyone near the landing site to cover their eyes or look away. Most pilots circle the landing zone before landing. *Avoid waving your hands above your head to attract attention; this is the universal “wave-off” signal that tells a pilot NOT to land.* If possible contact and follow the pilot’s instructions via radio or cell phone. *Once the helicopter has landed, wait for the rotors to come to a FULL STOP.* Continue to wait until you receive a clear signal from the pilot (or crew member) before approaching the helicopter. Stay within the pilot’s (or crew member’s) line of site and follow directions. Do not smoke within 200 feet of any helicopter.



## Patient Soap Note

<b>PATIENT INFORMATION</b>		Name _____	
Age _____	Weight _____	Male <input type="checkbox"/>	Female <input type="checkbox"/>
Address _____		Phone _____	
		Date _____	
		Time _____	
Contact Person _____		Phone _____	
<b>DESCRIBE MOI</b> <input type="checkbox"/> Trauma <input type="checkbox"/> Environmental <input type="checkbox"/> Medical			
<b>WEATHER CONDITIONS</b>  Temp _____ <input type="checkbox"/> Sun <input type="checkbox"/> Partly Cloudy <input type="checkbox"/> Overcast <input type="checkbox"/> Wind <input type="checkbox"/> Rain <input type="checkbox"/> Snow			
<b>PATIENT FOUND</b> <input type="checkbox"/> Right Side <input type="checkbox"/> Left Side <input type="checkbox"/> Front <input type="checkbox"/> Back <input type="checkbox"/> Lying <input type="checkbox"/> Sitting <input type="checkbox"/> Standing		<b>INITIAL PX</b> <input type="checkbox"/> No Respirations <input type="checkbox"/> No Pulse <input type="checkbox"/> Vomiting <input type="checkbox"/> Unstable Spine <input type="checkbox"/> Severe Bleeding <input type="checkbox"/> Blocked Airway <input type="checkbox"/> V P U on arrival	
<b>INITIAL TX</b>  <input type="checkbox"/> Direct Pressure <input type="checkbox"/> Pressure Dressing _____ <input type="checkbox"/> Tourniquet _____ <input type="checkbox"/> Chest Compressions <input type="checkbox"/> Rescue Breathing <input type="checkbox"/> Abdominal Thrust <input type="checkbox"/> Suction <input type="checkbox"/> C-Collar <input type="checkbox"/> Stabilize Spine <input type="checkbox"/> Remove Wet Clothes <input type="checkbox"/> Hypothermia Package <input type="checkbox"/> Cool Pt <input type="checkbox"/> Glucose <input type="checkbox"/> Med _____ <input type="checkbox"/> Shelter <input type="checkbox"/> Evac 1 2			

## Subjective Information = What the patient tells you

**SYMPTOMS** = Describe onset, cause, & severity (1-10) of Chief Complaints

Time

**ALLERGIES** = Local or systemic, cause, severity, & Tx

**MEDICATIONS** = Rx, OTC, Herbal, Homeopathic, & Recreational Drugs

DRUG	REASON	DOSE	CURRENT
			Yes / No
			Yes / No

Notes

**PAST RELEVANT MEDICAL HX** = Relate to MOI

**LAST FOOD & FLUIDS** = Intake & Output during the past 24 hours

H <sub>2</sub> O	Calories	Electrolytes
Urine Color	Urine Output	Stool
<b>EVENTS</b> = Patient's description of what happened		Amnesia Yes / No

## Objective Information = What you see

**PHYSICAL EXAM** = Look for discoloration, swelling, abnormal fluid loss, and deformity. Feel for tenderness, crepitus, & instability. Check ROM and distal CSM.

Time

**VITAL SIGNS** = Get a baseline, then record changes. Record normal VS if known.

Time	Pulse	Resp	BP	Skin	Temp	O <sub>2</sub> Sat	AVPU
Normal							

### FOCUSED SPINE ASSESSMENT

Time	Yes	No	Yes	No
<input type="checkbox"/> Pass  <input type="checkbox"/> Fail	<input type="checkbox"/>	<input type="checkbox"/>	Reliable Patient	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	Spine Pain	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	Spine Tenderness	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	Shooting Pain	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	Distinguish between Pinprick & Light Touch on Hands & Feet	<input type="checkbox"/>
			Squeeze 1st & Ring Finger	<input type="checkbox"/>
			Press Down on Hands or Fingers	<input type="checkbox"/>
			Press Up on Foot or Big Toe	<input type="checkbox"/>
			Press Down on Foot or Big Toe	<input type="checkbox"/>

## **Assessment = What you think is wrong**

<b>Possible Px</b>	<b>Time</b>	<b>Current Px</b>	<b>Anticipated Px</b>
<p style="text-align: center;"><b><i>Traumatic Px</i></b></p> <p>Trunk Injury                      Concussion / ↑ ICP                      Respiratory Distress                      Volume Shock                      Unstable Spine                      Unstable Extremity Injury                      Stable Extremity Injury                      Wounds</p>			
<p style="text-align: center;"><b><i>Environmental Px</i></b></p> <p>Dehydration / Low Sodium                      Cold / Hypothermia                      Heat Exhaustion / Stroke                      Frostbite / Burns                      Local / Systemic Toxin                      Local / Systemic Allergy                      Near Drowning                      Acute Mountain Sickness                      Lightning                      SCUBA / Free Diving</p>			
<p style="text-align: center;"><b><i>Medical Px</i></b></p> <p>Circulatory System Px                      Respiratory System Px                      Nervous System Px                      Endocrine System Px                      Gastrointestinal System Px                      Genitourinary System Px                      Ear Px                      Eye Px                      Teeth &amp; Gum Px                      Skin Px                      Infectious Disease</p>			

**Plan = What you are going to do**

<b>FIELD TX</b>				<b>MONITOR</b>						
Time										
<b>EVACUATION PLAN</b>										
Time	Level			Type						
	1	2	3	4	<input type="checkbox"/> None	<input type="checkbox"/> Self	<input type="checkbox"/> Assist	<input type="checkbox"/> Carry	<input type="checkbox"/> Litter	<input type="checkbox"/> Vehicle
	1	2	3	4	<input type="checkbox"/> None	<input type="checkbox"/> Self	<input type="checkbox"/> Assist	<input type="checkbox"/> Carry	<input type="checkbox"/> Litter	<input type="checkbox"/> Vehicle
	1	2	3	4	<input type="checkbox"/> None	<input type="checkbox"/> Self	<input type="checkbox"/> Assist	<input type="checkbox"/> Carry	<input type="checkbox"/> Litter	<input type="checkbox"/> Vehicle

## Medical Abbreviations & Symbols

ASR	autonomic stress response		
↓ ASR	parasympathetic ASR (rest or digest: slows down)		
↑ ASR	sympathetic ASR (fight or flight: speeds up)		
↑ ICP	increased intracranial pressure		
abx	antibiotics	wks	weeks
Dx	diagnosis	yrs	years
Fx	fracture	min	minute
Hx	history	q	every
Px	problem	d	day
Rx	prescription	qd	every day
S/Sx	signs & symptoms	bid	2 times / day
Tx	treat, treatment	tid	3 times / day
c/o	complaining of	qid	4 times / day
O <sub>2</sub>	oxygen	prn	as necessary
H <sub>2</sub> O	water	po	by mouth
2°	secondary ( <i>due to</i> )	IM	intramuscular injection
pt	patient	SQ	subcutaneous injection
RO	rule out	mg	milligram
FB	foreign body	g	gram
ROM	range of motion	kg	kilogram
PI	povidone-iodine	gtts	drops
OTC	over the counter	lb	pound
SOB	shortness of breath	tsp	teaspoon
TIP	traction into position	tbls	tablespoon
DPI	dry powder inhaler	±	with or without
MDI	multi-dose inhaler	↑	increase
ALS	advanced life support	↓	decrease
TBSA	total body surface area	↓	
STD	sexually transmitted disease		
ORS	oral rehydration salts/solution		
MOI	mechanism of injury or illness		
MI	myocardial infarction (heart attack)		
NSAIDs	non steroidal anti-inflammatory drugs		
CSM	circulation, sensation, & motor function		
PPV	positive pressure ventilations (rescue breathing)		
AVPU	awake, voice responsive, pain responsive, unresponsive		



Tx continued on next page



ISBN 978-0-9670228-7-1



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