PARARESCUE MEDICATION AND PROCEDURE HANDBOOK

Second Edition

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“That Others May Live”
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THIS BOOK IS DEDICATED TO ALL PARARESCUEMEN, PAST AND PRESENT, WHO USE THEIR SKILL, TRAINING, COURAGE AND INGENUITY SO THAT OTHERS MAY LIVE
INTRODUCTION

This handbook is designed to provide concise information regarding management of patients in austere environments. It is a 'quick reference' and is not meant to provide detailed discussions of physiological events. You are expected to provide the standard of care for your EMT certification, including the unique skills native to Pararescue.

NOTE: No handbook can anticipate every tactical and/or medical situation that might occur in a rescue. When faced with adverse situations, a PJ and his team will have to improvise, adapt, and overcome. Always keep in mind the mission, your safety, and your patient’s safety.

References used in the preparation of this handbook include, but were not limited to:

- **Brady Paramedic Emergency Care**, Bledsoe, et al., Prentice Hall
- **Physicians’ Desk Reference**, Medical Economics Data Production Co.
- **Physicians GenRx**, Mosby, 1998
- **Medical Management of Biological Casualties Handbook**, US Army Medical Research Institute of Infections Diseases, August 1996
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*EMT-P authorized use and/or special mission requirement only

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MEDICAL COMMAND and CONTROL (MC²)

Care of injured personnel in combat or rescue situations requires medical command and control by licensed medical providers. Paramedical personnel providing care in these situations are acting under the principal of ‘delegated authority’, where the provider (usually a physician) allows appropriately trained personnel to perform specified diagnostic and therapeutic interventions. There are two types of medical control: **On-Line and Off-Line**

**On-Line Medical Control:** A physician is either present at the scene and personally directs patient care, or is in contact by radio or other means and able to direct ‘live’ instructions. On-line medical control is the preferred means of medical control for all casualty situations.

**Order of precedence for On-Line Medical Control is:**

1) Pararescue/Rescue or Special Tactics Squadron Flight Surgeon present at the scene.
2) Senior US Military Physician present at scene.
3) Qualified Allied Country Senior Military Physician, with training equivalent to U.S. physician, present at scene.
4) Qualified civilian physician, with training equivalent to U.S. physician, present at scene.
   **NOTE:** He/she must agree to assume responsibility for care and accompany the patient to a higher level of care.
5) Senior US Military Physicians Assistant present at the scene.
6) U.S. Military Physician in direct radio contact.

**Off-Line Medical Control:** Contact with a control physician is impossible or impractical. Care is administered based on specific physician-approved protocols. **In the event On-Line control is not available the following applies:**

1) The PJ Team Leader is responsible for directing medical care at all scenes where On-Line Medical Control is not possible. If the tactical situation requires it, he may delegate medical treatment responsibility to another PJ.
2) The protocols in this handbook are the approved procedures, medications and techniques for Pararescue Medical Care. Changes to protocols will be approved by the Pararescue Medical Operations Advisory Board (PJ MOAB) in coordination with your MAJCOM Surgeon.
PRINCIPLES OF COMBAT CASUALTY CARE

GUIDELINES AND CONSIDERATIONS:  Care of trauma patients in a combat environment is not the same as care of trauma patients in the civilian environment.  While ATLS, BTLS and PHTLS are worthy programs, they were never designed for use on the battlefield.  In combat medicine, care of the patient must be modified to fit the situation, tactical or otherwise.  Combat casualty care is divided into three phases:  1) Care Under Fire, 2) Tactical Field Care, and 3) Combat Casualty Evacuation (CASEVAC).  A synopsis of the level or degree of care rendered during each phase is given below.

**NOTE 1:** C-Spine precautions are seldom needed in penetrating neck trauma in combat casualty care.  (See spinal injuries and clinical clearing of the cervical spine, pp 46-47)

**NOTE 2:** Combat casualties from blast and penetrating trauma who are pulseless and apneic are dead.  Attempts to resuscitate these patients are futile.

**CAUTION:** These procedures hold for tactical combat casualty care only.  Peacetime rescue assumes all patients have a chance to survive.  However, in peacetime situations where the rescuer’s lives are in immediate danger (avalanche chutes, etc), these procedures may be needed.

1. **CARE UNDER FIRE:** Care given at the scene of injury while under effective fire.  Care is highly limited.  The goal is to get the victim out of the fire zone without creating new casualties.
   a. Return fire as directed or as required.
   b. Try to keep yourself from being injured.
   c. Try to keep the victim from sustaining any further injury.
   d. If the victim is awake and able to function, direct him to take cover and start self-aid.
   e. Airway intervention, if needed, is limited to a NPA.  Stop life-threatening hemorrhage with a tourniquet.
   f. Take the casualty with you when you leave.

2. **TACTICAL FIELD CARE:** Care is rendered once the operator and casualty are no longer under effective fire.  This phase is where the majority of Pararescue medical care will take place.
   a. Address the ABCs, replace tourniquets with pressure dressings as appropriate.
   b. Treat wounds with appropriate dressings/splints.
   c. Treat pain and administer antibiotics as required.

3. **Combat Casualty Evacuation (CASEVAC):** Care given once transport to higher level of medical care has commenced.  Usually involves aircraft/boat/vehicle transport, where additional medical equipment may be available.
   a. Continue treatment from phase 2, monitor the patient.
   b. Document the care given and prepare to hand-off the casualty to the next echelon of medical care.
GUIDELINES FOR INITIATION OF RESUSCITATION

- Medical treatment and resuscitation of victims should be initiated under all circumstances, with the following qualifications:

1) Combat (Direct Fire):
   a. Patient with no pulse, regardless of cause, should not have resuscitation initiated.
   b. Patients with a pulse but no respiration should have resuscitation initiated if it can be accomplished in relative safety.

**Note:** Body recovery should be attempted unless the attempt exposes the team to undue danger. If the body cannot be safely recovered the location should be noted as accurately as possible (GPS coordinates preferred) for later recovery efforts. If the body has a set of ID tags that can be safely recovered, leave one with the body, bring the other out.

2) Non-Combat: Decisions to not initiate resuscitation should be discussed with medical control if possible. If contact with medical control is not possible, the following guidelines should be followed:

   a. **Do not initiate resuscitation if victim is or has:**
      1) Obviously dead. Characterized by signs such as:
         - Obvious decomposition
         - Body partially consumed by scavengers
         - Dependent lividity
         - Rigor mortis (**Caution:** In hypothermia victims, severe hypothermia may resemble rigor mortis. Check body core temperature)
      2) Decapitated or partially decapitated with no pulse present
      3) Dismembered or body is fragmented
      4) Open head injury with brain matter exposed and no pulse present
      5) Injury to the trunk with chest contents exposed and no pulse present
      6) “Frozen” hypothermia victim, e.g., ice formation in the airway, incompressible chest
      7) Total body burns or body carbonization and no pulse present
      8) Suffered massive blunt trauma, e.g., fall of over 100 feet, and has no pulse

   b. **Decisions to not initiate resuscitation will be completely documented to include:**
      1) Time/Date of decision, 2) Reason for decision, 3) Name of medical control (if able to contact), and 4) location of victim (GPS coordinates if possible).

   c. **The decision to not initiate resuscitation IS NOT a legal declaration of death, unless a qualified physician declares the patient dead.**

**Note 1:** Body recovery should only be attempted if it can be accomplished with a minimum of risk to the rescue team. If there is any suspicion of death as a result of foul play, or other forensic circumstances (suicide, homicide, neglect, accident, etc) the body and the area around it should be left undisturbed until law enforcement authorities have had an opportunity to examine the scene.

**Note 2:** In the event of a military aircraft crash, body recovery may be the responsibility of local law enforcement or military authority, depending on the circumstances and location of the mishap. In most circumstances it is best to leave the bodies in position until investigating authorities arrive and survey the site. If the bodies must be moved prior to arrival of the investigative authority, every attempt should be made to record the exact location where the body was found, and the exact position it was in (photographs from multiple angles are helpful).
REFUSAL OF MEDICAL CARE AND/OR TRANSPORT

• In general, Active Duty military members may not refuse life-saving medical care. **Mentally competent adult civilians** (including dependents, spouses and retired military members) may refuse medical care, even if refusing medical care endangers their lives. PJs should make every effort to insure that patients refusing medical care are aware of the possible consequences of their actions. The patient should be urged to seek other medical care as soon as possible.

1) If the patient is unconscious, or unable to make a rational decision (secondary to head injury or any other cause of altered mental status) the principal of **Implied Consent** assumes that a normal, rational person would consent to life-saving medical treatment.

2) If the patient is a minor or mentally incompetent adult, permission to treat must be obtained from a parent or guardian before treatment can be rendered. If a life-threatening condition exists, and the parent or guardian is unavailable for consent, treatment shall be rendered under the principal of implied consent, as noted above.

3) If an alert, oriented patient with normal mental status refuses medical care, then care cannot be rendered. Medical control should be contacted (if possible) if such a situation occurs. **If a patient refuses medical care the following statement must be written on the medical treatment form and signed by the patient:**

   I, THE UNDERSIGNED HAVE BEEN ADVISED THAT MEDICAL ASSISTANCE ON MY BEHALF IS NECESSARY AND THAT REFUSAL OF SAID ASSISTANCE MAY RESULT IN DEATH, PERMANANT INJURY OR IMPERIL MY HEALTH. I REFUSE TO ACCEPT TREATMENT, AND ASSUME ALL RISK AND CONSEQUENCES OF MY DECISION. I RELEASE THE UNITED STATES AIR FORCE AND THE DEPARTMENT OF DEFENSE FROM ANY LIABILITY ARISING FROM MY REFUSAL TO ACCEPT MEDICAL CARE.

**NOTE:** The statement must be signed and dated by the patient, and countersigned by a witness. The medical record should completely document that the patient is awake, alert, oriented and has normal mental status. If the patient refuses to sign the form, and still refuses medical care, the patient’s refusal to sign should be documented and signed by the treating PJ and preferably by at least one other witness.
TRAUMA

Trauma patients are not definitively treated in the field, only critical interventions are made. Based on the environmental threat, pararescuemen need to judge the extent patient assessment to be accomplished during initial contact. A more thorough assessment can be accomplished once the patient is removed to a secure area. The following is the conventional approach to a trauma patient. It is NOT an all-inclusive list. Its purpose is as a reminder only.

NOTE: For injuries occurring in a combat zone, see Tactical Combat Casualty Care, page 9.

PRIMARY SURVEY:

SCENE SAFETY – Yours? Patients? HAZMAT needed? Universal precautions?


• Treat as needed: OPA/NPA/ETT/Cricothyroidotomy/BVM/O2
• Do not move on to breathing until airway is controlled.


• Treat as needed: O2/BVM/Stabilize chest wall/Thoracentesis/Thoracostomy


• Treat as needed: O2/NS or LR/Direct pressure/Pressure dressings/Elevation/Tourniquets/MAST

DIAGNOSE & DECIDE - Is pt a Load & Go? Continued decompensation from respiratory & circulatory compromise? Difficulty with circulation (shock)? Decreased or decreasing LOC?

• Do initial Rx/Evacuate ASAP/Continue Rx. enroute

EXPOSE – Examine pt for additional injuries/Unknown etiology/Obtain initial history

SECONDARY SURVEY

VITAL SIGNS - Pulse, Blood Pressure, Respirations, Temperature, O2 Sat, EKG, BGL

PATIENT HISTORY – AMPLE & PQRST

Allergies
Medications
Past medical history (significant)
Last food/fluid intake
Events preceding the injury

Pain: What brought the pain on? How did it start? Is there anything that alleviates/worsens the pain
Quality: How does it feel? Describe it.
Region & Radiation: Where is the pain? Is it local/diffuse/pinpoint? Do you have pain anywhere else? Does it radiate? (Is pain referred?)
Severity: How bad is pain (scale of 1-to-10)? Can you compare it to anything else?
Time: How long have you had the pain? Is it constant or intermittent? Have you had this pain before?
HEAD-TO-TOE EXAMINATION – CSM, AVPU, PERLA, Glasgow Coma Scale

Circulation: Patient have distal pulses? Capillary blanch in finger in and toes?

Sensory: Patient feel touch of fingers and toes? Does unconscious patient respond when you pinch fingers and toes?


Alert: Patient is A & O person/place/date/time

Verbal: Patient responds properly to verbal stimuli

Pain: Patient responds to painful stimuli (withdraws from stimulus)

Unconscious: Patient is unresponsive

Pupils
Equal
Reactive
Light
Accommodating

Perform field treatment of findings from secondary exam.

Continuously monitor the patient. Be prepared to correct ABCs if they deteriorate.

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**SCORE OF 8 OR LESS, OR DETERIORATING SCORE INDICATES SERIOUS HEAD INJURY.**

ADDITIONAL NOTES:
SHOCK

Shock is defined as tissue perfusion that is not adequate to meet metabolic needs. There are several types of shock; but all are based on the underlying mechanism causing inadequate perfusion. **The major types of shock that Pararescuemen are concerned with are:** HYPOVOLEMIC, CARDIOGENIC, ANAPHYLACTIC, SEPTIC, AND NEUROGENIC.

HYPOVOLEMIC/HEMORRHAGIC SHOCK

**Guidelines & Considerations:** The treatment of hemorrhagic shock with large amounts of fluids in the field is controversial. **Hemorrhage control** takes precedence over starting fluid administration. In cases where bleeding is internal (abdominal or chest wounds), fluid resuscitation prior to surgical control of bleeding may actually make things worse. In cases of internal bleeding, fluid resuscitation should be titrated to a blood pressure between 90-100 mmHg systolic. In cases where the bleeding has been controlled (for example extremity wounds), then fluid resuscitation to higher blood pressures is acceptable.

**Signs & Symptoms:**
- Apprehensive/restlessness
- Hyperventilation
- Muscle weakness and fatigue
- Decreased level of consciousness
- Cool, pale moist skin
- Weak, rapid, thready pulse
- Decreasing blood pressure
- Narrowing pulse pressure less than 30mmHg

**Rapid field estimate of BP:**
- Palpable radial pulse = Minimum of 90 mm Hg systolic
- Palpable femoral pulse = Minimum of 60 mm Hg systolic
- Palpable carotid pulse = Minimum of 40 mm Hg systolic

**Treatment:**
1. Assess Airway, Breathing and Circulation. **CONTROL BLEEDING.**
2. Start Large Bore IV's with Normal Saline or Ringers Lactate.
   - Saline lock with a large bore IV catheter is also acceptable.
3. Administer oxygen 4 to 8 LPM.
4. Place patient is shock position.
5. Keep warm and covered.
6. Monitor V.S. q 5-15 minutes.
7. Adjust IV flow rate to maintain systolic blood pressure between 90-100mmHg and/or minimal BP necessary to maintain a good carotid pulse.

CARDIOGENIC SHOCK

**Signs & Symptoms:**
- **Abnormal pulse:** Irregular, rapid and/or weak pulse
- Decrease in blood pressure 30mmHg or more from normal (less than 90mmHg systolic)
- Chest pain
• Nausea and vomiting
• Pallor, cold clammy skin
• Muscular weakness

**Treatment:**
1. Assess airway and circulation status first, treat appropriately.
2. Complete rest.
3. Administer oxygen 4 to 8 LPM.
4. Start IV and titrate to maintain 90-100 mm Hg systolic BP.
5. Monitor Vital Signs q 15 minutes to 1-4 hours PRN. Auscultate lungs with every 250 cc's of fluids administered IV.
6. Evacuate ASAP.

**ANAPHYLACTIC SHOCK**

**Signs & Symptoms:**
• Hives
• Apprehension
• Hyperventilation
• Laryngeal edema
• Reddened skin or numerous blotchy red areas
• Itching
• Angio-edema
• Tachycardia
• Wheezing
• Respiratory distress
• Hypotension
• Airway obstruction/shock

**Treatment:** SEE ANAPHYLAXIS PROTOCOL, PAGE 115

**SEPTIC SHOCK (HYPERDYNAMIC & HYPODYNAMIC)**

**HYPERDYNAMIC SHOCK** (Early, Warm)

**Signs & Symptoms:**
• Fever
• Altered mentation
• Shaking, chills
• Rapid bounding pulse
• Blood pressure increase-normal-decreases
• Decreased urinary output

**HYPODYNAMIC SHOCK** (Late, Cool)

**Signs & Symptoms:**
• Skin cold, clammy
• Blood pressure decreases further
• Pulse raid, weak, irregular
• Edema
Treatment: (Septic Shock)
1. Start Large Bore IV with crystalloid solution
2. Administer oxygen 4-8L/min
3. Begin antibiotic therapy
4. Drain abscesses, clean and drain wounds. Debride as required
5. Adjust IV fluid rate to maintain a minimum BP of 90-100 mm Hg systolic

**NEUROGENIC SHOCK**

**NOTE:** Isolated head injuries do not cause shock. If shock is present in such a patient, search for other causes of shock.

**CAUTION:** Neurogenic shock may mask intra-abdominal, pelvic and lower extremity injury. A careful survey of the entire patient is mandatory in patients with this condition.

**Signs & Symptoms:**
- MOI consistent with probability of spinal cord injury
- Increased pulse (may also have normal pulse or bradycardia)
- Decreased blood pressure less than 80mmHg systolic
- Flaccid, paralysis
- Incontinent of urine and/or feces
- Abnormal reflexes
- Spasticity
- Paralysis and loss of sensation
- Point tenderness/pain, deformity of spine.

**Treatment:**
2. Start IV with normal saline or ringers lactate, titrate to maintain minimum BP of 100 mm Hg systolic.
3. Administer oxygen 4-8L/min
4. Institute other shock modalities as directed

**ADDITIONAL NOTES (SHOCK):**
SPINAL INJURIES

GUIDELINES AND CONSIDERATIONS:

NOTE: If patient is unconscious, assume spinal injury. The spine-injured patient, even if awake, may not complain of pain. Use correct technique (in-line stabilization) and enough people to move the patient without manipulating the C spine.

There are Five Basic Groups of Spinal Injuries:
1. Muscular or ligamentous strains or contusions (e.g., lumbosacral strain or cervical whiplash)
2. Intervertebral disc injuries
3. Vertebral fracture/dislocation without any involvement of the spinal cord
4. Vertebral fracture/dislocation with injury to the spinal cord
5. Penetrating injuries to the spinal cord and its surrounding tissue

Mechanism of Injuries (MOI):
- Direct trauma to head, neck, face
- Falls or dives into shallow water
- Acceleration/deceleration injuries
- Ejections
- Blunt trauma
- Penetrating injury
- Blast Injury

Treatment:
1. Maintain Airway.
2. Immobilize Neck - C-collar, spine board (do not restrict breathing).
3. Perform primary and secondary surveys.
4. Palpate entire spine for point tenderness.
5. Perform sensory/motor function check.
6. Oxygen 8 liters per minute.
7. IV normal saline or ringers lactate and titrate, or saline lock.
8. Clean and dress open wounds.
9. Urethral catheterization, monitor urine output.
10. Place NG tube if patient is unconscious. Consider NG even if patient is awake. CAUTION: Be prepared for vomiting, prevent aspiration.
11. Check neurological function q 15-30 min and record.
12. NOTE: Consider antibiotics if open wounds are associated with the injury and evacuation is delayed.

SOLU-MEDROL PROTOCOL FOR BLUNT (NON-PENETRATING) SPINAL CORD TRAUMA.
NOTE: This protocol is controversial, and should only be initiated after consultation with medical control.

Guidelines and Considerations: To be used only in cases of blunt trauma with signs and symptoms of spinal cord injury. It is most effective when started as soon as possible after the injury occurs.

Initial dose: 30 mg/Kg Solu-Medrol IV push, give over 1-2 minutes.
Maintenance dose: 5.4 mg/Kg/hour by continuous IV drip for 23 hours.
- If the protocol is started more than 6 hours after the original injury, continue the IV drip for 48 hours.
- All persons started on the Solu-Medrol protocol should also receive ulcer prophylaxis: Zantac, 50 Mg IV or IM every 6-8 hours, or 150 Mg orally every 12 hours.
Example Solu-Medrol Protocol Calculation: A 100 Kg person requires an initial bolus of 3 GRAMS of Solu-Medrol, followed by an IV drip giving 540 mg of Solu-Medrol per hour for the next 23-48 hours.

**Clinical Clearing of the Cervical Spine:** In some rescue or combat situations, the risks incurred by taking the time to do complete cervical spine immobilization, or of transporting an otherwise ambulatory patient with C-spine precautions are significant. In these situations, the following protocol can be used to determine if the patient requires c-spine immobilization.

1. **Combat or Rescue Situation:** **Note:** Accomplished when C-spine precautions will adversely affect the ability to accomplish the mission AND all of the following conditions are met and documented:

   a) The patient is fully awake and alert with no alcohol or medications on board that might alter his sensorium or level of consciousness.

   b) The patient has no painful ‘distracting’ injuries (such as femur fracture, pelvic fracture, and long bone fracture or significant chest/abdominal injury). No significant head or facial trauma.

   c) The patient has a completely normal motor and sensory neurological examination, and does not have any significant neck pain or any midline or paraspinous muscle spasm.

   d) There is no pain or tenderness to palpation of the posterior cervical spine, and no palpable step-offs of the cervical spine. No muscle spasm in midline or paraspinous muscles.

   e) The patient has no other injury that might require long-board immobilization (thoracic or lumbar spine injury, pelvic fracture).

   f) The patient has no pain on unassisted range of motion of the neck.

   g) Low suspicion of cervical spine injury based on mechanism of injury.

**Note:** This protocol does not fully clear the cervical spine. However, if properly done, this protocol will insure that the chance of missing a clinically significant cervical spine injury is minimal. **Caution:** Documentation of all of the above criteria being met is MANDATORY. If in doubt, immobilize the cervical spine.

2. **Combat Situations Only:** Penetrating trauma to the neck alone does not absolutely require C-spine immobilization. However, minimize motion of the neck as much as possible. **Do not stop to perform cervical spine immobilization while under direct fire.** (See Tactical Combat Trauma Care, page 9).
DERMATOME CHART

SENSORY LEVEL DETERMINATION:

DECORTICATE POSTURING: Arms flexed, Legs extended = lesion at or above upper brainstem.
DECEREBRATE POSTURING: Arms and legs extended = lesion in the brainstem
FLACCID PARALYSIS: Usually indicates spinal cord injury.

MOTOR LEVEL DETERMINATION:
HEAD INJURIES

GUIDELINES AND CONSIDERATIONS:
• All patients with significant Head/Face injuries have a spinal injury until proven otherwise.
• Use in-line stabilization & enough people to move pt w/out manipulating C -Spine.
• Maintain airway. Do not obstruct breathing.
• Maintain a high index of suspicion for cerebral insult until proven otherwise.
• The most important element in assessment of head injury is LOC and noted changes.
• Serial Glasgow Coma Scale readings should be accomplished on all head injury patients.

NOTE: Isolated head injuries do not cause shock. If shock is present in such a patient, search for other causes of shock.

PHYSICAL FINDINGS AND INDICATIONS

Primary Survey:
ABCs: An open and secure airway is critical.
• Patients with head injuries commonly vomit or patients tongue blocks airway.

Level of Consciousness: AVPU (see page 41)

Glasgow Coma Scale: (see page 42)

Vital Signs: Observe and record every 5 minutes.
• Observe Blood Pressure for: Increasing Intracranial Pressure (ICP); Increasing BP; Widening pulse pressure. If possible, maintain BP between 100-140 mmHg systolic.
  ● Pain and fear can also increase BP
• Observe Pulse for: ICP with decreasing pulse rate; slowing of pulse rate (strong/steady/bounding)
• Observe Respirations for: Increasing, decreasing and/or become irregular; Cheyne-Stokes
  ● Fear, hysteria, chest injuries, etc. also affect respiratory rate (not as reliable as other VS)
• Observe for Cushing’s Reflex: Slowing pulse rate, deep erratic respirations, and increasing blood pressure.

Secondary Survey:
1. Obtain a history if possible to determine the MOI.
3. Examine the scalp for evidence of bleeding, swelling and deformity.
4. Examine the nose and ears for blood and cerebral spinal fluid.
5. Gently palpate the skull (don't press on depressed areas or explore open wounds.)
6. Observe pupillary reaction
7. Record all findings and continue with remainder of secondary assessment.

Treatment:
1. Secure airway, ensure breathing and circulation
2. Maintain cervical spinal immobilization
3. Oxygen 4-8L/min (If evidence of increased intracranial pressure, see next section)
4. IV normal saline, titrate appropriately (If shock develops give adequate fluid volume to maintain systolic blood pressure at 100). Saline lock is an excellent alternative to having a running IV in place.
5. Gently dress all scalp wounds (If there is concern of underlying fracture, do not apply pressure)
6. Consider antibiotics (Rocephin) in an open skull injury if more than 4 hours to higher level care
7. Transport ASAP. If possible, elevate the head of the patient by raising the head end of the litter 1-2 feet higher than the foot end of the litter.
8. If bleeding from scalp wounds is not controlled by pressure, consider suturing with 0-nylon or use skin staples to close. **CAUTION:** If brain tissue is seen in the wound, **DO NOT** irrigate with dilute betadine solution: Irrigate with normal saline only.

**INCREASED INTRACRANIAL PRESSURE (ICP):** Increased ICP can be the result of several different types of intracranial processes. Some, such as subdural or epidural hematoma can only be managed definitively by surgical intervention. Diffuse brain injury causing swelling of the brain itself can be treated to some extent in the field. As the brain swells, a herniation syndrome can result, where the intracranial contents shift and herniate through the cranial foramen.

**Signs & Symptoms:**
- GCS less than or equal to 10, or deteriorating GCS.
- **Asymmetric Pupils:** Classically a large, fixed pupil suggests herniation, usually with the expanding mass on the same side as the fixed & dilated pupil. Typically, changes progress from sluggish pupil → odd-shaped pupil → fixed/dilated pupil. **Asymmetrical pupil size, responsiveness or size differences of 1.5 mm are considered pathological until proven otherwise.**
  - **NOTE:** Approximately 3% of the population have asymmetric pupils normally (anisocoria) and that some eye surgery can result in odd-shaped and fixed pupils.
- Motor examination showing decreased strength, localized weakness or abnormal motor posturing. (decorticate or decerebrate posturing).
- Abnormal cranial nerve examination (especially decreasing gag reflex), pupillary response or corneal reflexes.
- Decreasing LOC or other neurological deterioration in the setting of acute head injury.

**Treatment:**
1. Hypotension is rarely caused by isolated head injury. Regardless of cause, hypotension must be treated aggressively in the setting of acute head injury. Keep systolic BP above 95 mmHg by stopping bleeding and appropriate fluid resuscitation.
2. **CAUTION:** Prolonged Hyperventilation of the patient in the field is no longer appropriate treatment. Vasoconstriction resulting from hyperventilation can **INCREASE** cerebral damage by reducing cerebral blood flow.
3. **Mannitol:** This is an osmotic diuretic that can decrease cerebral edema. It takes effect within minutes of administration and can last 6-8 hours. Use mannitol **ONLY** if there is evidence of increased ICP. **NOTE:** Mannitol increases urine flow (making this an unreliable indicator of resuscitation) and causes dehydration. Increase IV fluids to compensate.
   - **GCS of 9 or below:** 1.0 mg/Kg not to exceed 100 grams IV bolus.
4. Elevate the patient’s head higher than his feet by 1-2 feet. The patient should be kept flat: Elevate the head of the stretcher/stokes litter to accomplish this.
5. **NOTE:** Steroids such as Solu-Medrol and Decadron are ineffective in treating **traumatically induced cerebral edema**, and should **NOT** be used in the setting of trauma-induced increased ICP.
6. Seizure in the setting of acute head injury is a serious sign, and should be treated aggressively. Insure the patient is being adequately oxygenated, and give **Diazepam**, 0.1 mg/Kg up to 5 mg IV every 5 minutes (up to a max dose total of 20 mg).
FACIAL AND EYE TRAUMA

AIRWAY OBSTRUCTION FROM:
Posterior Tongue Displacement:
  • Unconscious patient: Jaw thrust or chin lift.
  • Conscious patient: Most common cause is bilateral mandible fracture. Have patient bend forward (CAUTION: C-SPINE CONTROL) and pull tongue forward or insert airway adjunct.

Oropharyngeal Bleeding:
  • Rotate supine patient to the side. Allow for drainage. (CAUTION: C-SPINE CONTROL)
  • Suction & direct pressure if possible.

Edema:
  • Early intubation if possible
  • If unable to intubate, cricothyroidotomy may be needed

Blood Loss from Facial Trauma:
  • Pressure dressing to most areas of face.
  • Specific locations:
    • Severe Tongue Laceration: If pressure unsuccessful, a few sutures may be needed.
    • Gingiva, Floor of Mouth, Buccal Mucosa: Pressure dressing with roll of sterile gauze. Have patient bite on roll or hold in place with pressure.

Epistaxis (Nasal Bleeding):
  1. Direct pressure: Pinch anterior portion of nose between fingers for a minimum of 5 minutes.
  2. Packing: Anterior or Posterior. NOTE: All patients who have had nasal packing should be given antibiotics (Keflex, 500 mg q. 6 hours or Cefotan, 1 gram IV or IM q. 12 hours). CAUTION: DO NOT attempt to pack a nose if a cerebral spinal fluid (CSF) leak is suspected.
     • Anterior Pack: Layer strips of petrolatum gauze in one or both nostrils.
     • Posterior Pack: Used if bleeding persists in the nasopharynx after the anterior packing. NOTE: Observe patient closely. If the pack becomes loose it can easily obstruct the airway.
       a) Remove packing. Insert foley catheter through the nose until it is visualized in the pharynx.
       b) Inflate balloon with approx. 15cc of fluid. Put traction on the catheter, setting the balloon into the back of the nose. Once in place, pack around the catheter with petrolatum gauze and maintain traction.
       c) If there are no contraindications, patients who require a posterior pack should receive sedation.

OCULAR TRAUMA:
Guidelines and Considerations:
  1. Obtain history of injury, pre-existing conditions, i.e. contact lens use. If chemically induced, type of chemical, treatment, visual disturbance, pain, any other associated injuries.
  2. Time of injury.
  3. Obtain gross visual acuity and record. Visual acuity can be as simple as light perception, count fingers at three feet, read this book at 2 feet, etc.

NOTE: Always obtain a visual acuity with ocular injuries! (Before and after treatment, if possible)
CAUTION: In cases of chemical splash injury to the eye, begin irrigation immediately!
Physical Examination

Eyelids: **Assess for:** Edema, bruising, burns, movement and strength, ptosis, foreign bodies impacting the globe.

Orbital rim: **Gently palpate for:** Depressed fractures or loss of sensation to the skin above and below the globe.

Globe: Retract lids without applying pressure to globe. **Examine for:** Forward or retro displacement of the globe. **Assess for:** Normal movement and double vision at the extremes of gaze and integrity of the globe. **Examine for:** Foreign body or obvious damage.

Conjunctiva: **Assess for:** Signs of infection, evidence of subconjunctival air, hemorrhage, or foreign bodies.

Cornea: **Assess for:** Tears, abrasions and clarity.

Pupils: **Assess for:** Red light reflex, reactivity to light, and shape.

Anterior chamber: **Assess for:** Blood and dislocation of lens.

Lens: **Examine for:** Clarity and position.

Specific Injuries and Treatment:

**Lid:** **Examine for:** Foreign bodies. Invert lid to examine globe for laceration, penetrating injury, and impaled object. **Treatment:** Apply dressing and transport. **DO NOT** suture laceration.

**Corneal Abrasion:** **Examine for:** pain, foreign body sensation, and photophobia. **Treatment:** Instill antibiotic ointment, transport.

**Foreign Body:** **Examine for:** Pain, foreign body sensation. **Treatment:** Irrigate eye and treat as for corneal abrasion. If foreign body is still present instill antibiotic ointment. Patch both eyes to prevent eye movement. Transport. **CAUTION:** If it appears the foreign body has penetrated into the anterior or posterior chamber: Do not patch and do not use ointment. Shield eye and transport.

**Blood in Anterior Chamber (Hyphema):** A sign of possibly severe eye injury. **Treatment:** Keep patient as still as possible, maintain sitting position and immediate transport.

**Iritis:** **May present as:** Constricted, dilated or irregular pupil; hyphema or severe photophobia. **Treatment:** Rest and transport.

**Lens:** About the only lens injury you may be able to assess will be anterior dislocation. **Treatment:** Rest and transport.

**Vitreous:** Blood in the posterior chamber, interfering with light transfer through the vitreous may be assessed with a black rather than a red fundoscopic reflex. **Treatment:** Rest and transport.

**Globe:** Possible ruptured globe; Possible marked visual impairment. Vitreous may be seen extruding from the globe. Globe may be soft and anterior chamber flat or shallow. **CAUTION:** Palpation of globe may cause increased loss of vitreous. **Treatment:** Eye shield (no pressure applied to globe) and moist dressing. Immediate transport. **Cipro,** 500 mg b.i.d.
**Chemical Injuries:** History and physical examination. **Treatment:** Copious irrigation for at least 30 minutes prior to or during transport. Use water, normal saline or lactated ringers. **Note:** Any water will do in a pinch. **Caution:** If the victim has had an alkali compound (such as lye or ammonia) splashed into the eye, irrigation must begin **AT ONCE.** This is the only time you do not take the time to evaluate the visual acuity prior to starting treatment. Continue irrigation for a minimum of 60 minutes or until directed to stop by medical control.

**Traumatic Enucleation:** Globe displaced from orbit. **Treatment:** Protect globe with moist sterile gauze, shield globe and immediate transport.

**REDUCED SNEILLENS CHART**

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**Designation at side of line represents Visual Acuity in Snellen notation for 16” viewing distance**
CHEST TRAUMA

GUIDELINES AND CONSIDERATIONS

General Evaluation of Chest:
- Get history of breathing difficulties
- Expose chest and abdomen. **Observe for:** Respiratory rate, depth and symmetry.
- Examine anterior and posterior chest for injuries.
- Auscultate breath sounds in all lung fields to include axillae.
- **Listen for:** Symmetry, wheezes, rales and rhonchi
- **If breath sounds are not equal:** Percuss to determine different tones (hyperresonance-vs-hyporesonance).

**NOTE:** All severe chest injuries require urgent evaluation with special consideration for aeromedical evacuation.

**CAUTION:** In cases of abdominal and chest trauma, the role of fluid resuscitation in the pre-hospital environment is controversial. In cases of **uncontrolled** internal hemorrhage, administering large amounts of IV fluids prior to surgical control of bleeding may make things worse. In these cases, fluid resuscitation should be rendered with great care. **Monitor the patient closely:** A patient with suspected internal hemorrhage that is awake, alert and oriented, and producing urine does not necessarily need fluid resuscitation to a higher BP. **If the patient is unconscious:** Titrate the BP to between 90-100 systolic.

SPECIFIC INJURIES AND TREATMENT

**Fractured Ribs or Sternum**

**Signs and Symptoms:** Localized chest pain aggravated by breathing or coughing. Often there is decreased motion on the affected side. May be ecchymosis, localized tenderness to palpation; crepitus. Normal symmetrical breath sounds bilaterally.

**Treatment:** Semi-Fowler's (Semi-reclining position with head and torso inclined to 45-60 degrees, legs/knees extended). Encourage deep breathing and coughing. Pain medication PRN. **O₂** if condition deteriorates (suspect more serious problem). Evacuate.

**CAUTION 1:** Do not tape or strap fractured ribs in absence of paradoxical motion (flail chest). This contributes to pooling of secretions, atelectasis and pneumonia.

**CAUTION 2:** Fractures of lower three ribs may accompany splenic or hepatic injury with subsequent internal bleeding.

**CAUTION 3:** Numerous complications can accompany chest injury. Continuous re-evaluation is imperative.

**Flail Chest**

**Signs and Symptoms:** Localized chest pain aggravated by breathing or coughing. Rapid shallow respirations with compromised air exchange. Localized area of paradoxical chest movement.

**Treatment:** Immediately immobilize flail segment by placing hand over area to prevent further motion. Immobilize flail segment with tape (midline to midline). **NOTE:** If tape does not stick, immobilize flail segment with hand, sandbags, etc. or roll patient onto affected side. Semi-Fowler's position if there are no contraindications (Semi-reclining position, with head and torso inclined to 45-60 degrees, legs/knees extended). Oxygen and pain medication as required.

**NOTE:** Definitive treatment is usually intubation with mechanical ventilation.

**CAUTION 1:** Monitor respirations closely. **Monitor for underlying problems:** Pulmonary contusion, cardiac contusion, abdominal injuries or hemopneumothorax.

**CAUTION 2:** May need to assist ventilations with BVM. Intubation may be required.

**CAUTION 3:** Limit hydration. Over hydration may increase the incidence/severity of pulmonary contusion.
Pulmonary Contusion
Signs and Symptoms: MOI usually within last 24 hours (e.g., steering wheel trauma, deceleration injury, concussion waves following explosion) and history of progressive respiratory distress. Decreased breath sounds. Dullness to percussion over affected area. Hypoxia can occur leading to coma and death.

Pneumothorax
Treatment: In absence of severe symptoms, observe and **O₂ only**. **O₂. Evacuate.**
**NOTE:** In the presence of severe symptoms a thoracentesis or chest tube insertion is indicated.

Open Pneumothorax
Signs and Symptoms: History of penetrating injury. Rapid and/or gasping respirations. May hear sucking sound or see blood froth escaping from wound.
Treatment: Immediately seal wound with hand or available material. Replace temporary seal with a saline gauze dressing or Ascherman Chest Seal. Sterile saran wrap is an excellent material for making an occlusive chest dressing. **NOTE:** When taping dressing, leave one edge undone to function as a flap valve. Semi-Fowler's position. Oxygen. Evacuate.
**NOTE:** An alternative treatment is to apply an occlusive dressing without a flap, then **IMMEDIATELY** perform a needle thoracentesis followed by chest tube insertion.

Tension Pneumothorax
Signs and Symptoms: May or may not be from penetrating trauma. Chest pain. Difficulty breathing. Extreme dyspnea. Cyanosis. Hypotension. Diminished or absent breath sounds on affected side. Hyperresonance on affected side. Affected side may appear more prominent and move less with respiration. **The following may or may not be found:**
- Distended jugular veins
- Subcutaneous emphysema
- Tracheal shift
- Displaced apex beat of heart
Treatment: Needle thoracentesis. High flow oxygen. Evacuate while monitoring ventilation closely.

Massive Hemothorax
Signs and Symptoms: May or may not be due to penetrating trauma. Patient may be anxious and confused. S/S of hypovolemic shock. Respiratory distress. Decreased breath sounds on affected side. Dull to percussion on affected side.
Treatment: Secure airway. High concentration oxygen. IV x NS or NS. (hypovolemic shock). Close observation for developing tension hemopneumothorax. Decompress only if tension hemopneumothorax is suspected. Evacuate.

**ADDITIONAL NOTES (CHEST TRAUMA):**
ABDOMINAL TRAUMA

GUIDELINES AND CONSIDERATIONS

History: Symptoms in a conscious patient could include, but are not limited to: Nausea, vomiting, cramps, and localized pain. In some cases pain may seem to arise in an area or point other than at its origin (referred pain). Example, injury of the diaphragm is often manifested by pain in the shoulder.

Physical Exam: Examine for wounds, bruises, abrasions and abdominal distention (late finding). Any penetrating wound from the neck to the knees may involve the abdomen (dependant on trajectory, ricochet, missile fragmentation, etc.). Any chest or groin injury may involve abdominal contents. Auscultate all four quadrants for bowel sounds. Listen to chest during this exam (bowel sounds in the chest are indicative of ruptured diaphragm). Palpate for tenderness and rigidity. Perform genital and rectal examination.

CAUTION: In cases of abdominal and chest trauma, the role of fluid resuscitation in the pre-hospital environment is controversial. In cases of uncontrolled internal hemorrhage, administering large amounts of IV fluids prior to surgical control of bleeding may make things worse. In these cases, fluid resuscitation should be administered with great care. Monitor the patient closely: A patient with suspected internal hemorrhage who is awake, alert and oriented; and producing urine does not necessarily need fluid resuscitation to a higher BP. If the patient is unconscious: Titrate BP to between 90-100 mmHG.

SPECIFIC INJURIES

Penetrating Abdominal Injury
Signs and Symptoms: Patient may have multiple complaints or no complaints. May see very small to very large penetrating wound. Remember to look for additional wounds (such as exit wounds).
Treatment: Control external bleeding. Large-bore IV's NS or LR (see page 47 for cautions). Note: Large bore saline lock is an excellent alternative to an IV. Keep patient N.P.O. Insert an NG tube. Urinary catheterization (proceed gently due to possible bladder trauma, but only if rectal exam is normal, there is no blood at urethral meatus and no scrotal hematoma). ASAP evacuation. If evacuation is delayed greater than 2-4 hours, initiate antibiotic therapy.

Blunt Trauma & Blast Injury
Signs and Symptoms: Patient may have any number of physical complaints. May or may not see evidence of trauma. Do full abdominal exam. Much of the time you will have no idea the extent of damage, only that something is wrong.
Treatment: Monitor patient closely and treat symptomatically. Evacuate ASAP

Evisceration
Signs and Symptoms: Any protrusion of abdominal contents through a wound.
Treatment: Control hemorrhage. Large bore IV's NS or LR (see page 47 for cautions). Saline lock is acceptable. Sterile wet (saline) dressing, then cover with saran wrap. Keep patient NPO. NG tube. Urinary catheterization if rectal/penile/scrotal exam is negative. ASAP transport. If wound is grossly contaminated and evacuation delayed, dilute (1:10 dilution with normal saline) betadine solution may be used to soak the wound for 20 minutes, then replace with saline/saran wrap dressing. Initiate antibiotic therapy.
Injury to the Kidney

**Signs and Symptoms:** May be either penetrating or blunt. Pain (may confuse kidney pain with muscle pain). May have gross blood in urine.

**Treatment:** Normal wound care. IV NS or LR and titrate appropriately. Urinary catheterization.

Urethral Injury

**Signs and Symptoms:** Blunt or penetrating trauma to the suprapubic area. May or may not be blood at the urethral meatus. Signs of other injury. Assessment is based on whole patient. **NOTE:** Urethral injury is usually secondary to other types of trauma.

**Treatment:** If possible, catheterize carefully. **DO NOT** attempt catheterization if any blood at the meatus, high-riding prostate, and blood in the rectum or obvious trauma to the urethra. If unable to catheterize, decompress bladder with suprapubic-needle-cystotomy. Additional treatment per findings.

**NOTE:** Wounds of the external genitalia are dressed and bandaged. Avulsed tissue is transported with patient.

**Additional Notes (Abdominal Trauma):**
EXTREMITY TRAUMA

GUIDELINES AND CONSIDERATIONS

**General Treatment:** A hazardous environment or situation may alter or prevent any of these steps.

1. **Control hemorrhage and treat for shock.**
2. **Remove tight clothing, jewelry and footgear prior to splinting.** *NOTE:* Femur fractures require a traction splint.
3. **Unless fracture is significantly angulated,** do not manipulate if good circulation and nerve supply is present.
4. **If there is neurovascular compromise of the limb or significant angulation of the fracture:**
   - Stabilize the proximal portion of the fracture and use gentle long-axis traction to align the fracture (exact anatomic reduction is not necessary at this stage). Perform CSM check after any manipulation or splinting.
5. **If evacuation is delayed:** Debride wounds by irrigation and scrubbing.
6. **Pack and dress wounds with bulky sterile dressing.** Immobilize joint above and joint below fracture.
7. **Neurovascular check:** Perform neurovascular check before splint application, after application and q. 15-30 min thereafter.
8. **Consider analgesics for pain** if not contraindicated.
9. **Elevate and apply cool compresses** during the first 12 hours (if able).
10. **Consider antibiotics for open wounds** if evacuation delayed over 4 hours.

*NOTE:* Open fractures have a high incidence of infection and must be treated aggressively in the field. **In all cases of open fracture or suspected open fracture the use of IV antibiotics should be considered:**

**IN CASES WHERE EVACUATION TO HIGHER LEVEL CARE WILL TAKE 4 HOURS OR LONGER, TREAT AS ABOVE, PLUS:**
- Administer antibiotics. Rocephin, Cefotan or Mefoxin are acceptable antibiotics.
- If the skin over a fracture is abraded, clean the abrasion with betadine solution, irrigate with saline and dress the wound.
- If bone is visible in the wound and there is neurovascular compromise, re-alignment of the fracture in the field may be required. Irrigate the bone ends with a minimum of 1 liter of normal saline before re-alignment. Do not delay re-alignment for more than 5 minutes for irrigation. If normal saline is not available, use any other sterile fluid for irrigation.

**IN CASES WHERE EVACUATION TO HIGHER LEVEL CARE WILL TAKE 12 HOURS OR LONGER, TREAT AS ABOVE, PLUS:**
- If there is a laceration with no bone visible: Irrigate the wound with medium-pressure technique, using a minimum of 1 liter of normal saline (preferably 2-3 liters).
- **If bone is visible in the wound:** Irrigate as above and cover with a moist sterile dressing.
- **If dirt or other debris is impacted into the bone:** Clean out as best as possible before irrigation.

**SPECIFIC INJURIES**

**Clavicle**

**Signs and Symptoms:** Pain and tenderness over clavicle. Difficulty moving adjacent arm without discomfort.

**Treatment:** Sling and Swathe. Pain medication as needed. A “Figure 8” splint used to be the treatment of choice for this injury. It is currently out of favor for definitive care. However, use of a Figure 8 splint may provide better functionality in the field. Use of a Figure 8 splint is allowable, if it provides for better functionality of the patient. 

*NOTE:* Sharp or displaced loose fragments can damage underlying nerves, vessels, or lung. Always check neurological function in an upper extremity and examine closely for a pneumothorax.
Humerus (Proximal, Middle and Distal Shaft)

Proximal Fractures of the Humerus: Pain of upper arm and shoulder. Swelling and ecchymosis may be present. Angulation may be noted. May have appearance of dislocation or shoulder may appear normal with arm hanging loosely at side or held across the chest. Shortening of upper arm may be evident. Virtually the entire length of the humerus can be palpated by palpating from the axilla to the medial aspect of the elbow. Significant pain and/or crepitation on palpation is strongly suggestive of fracture. Treatment: Loose sling and swath (with no pressure under the elbow). Keep patient in seated position, if practical. Note: Fractures of the neck of the humerus can accompany shoulder dislocations.

Mid-Shaft Fractures of the Humerus: May have damage to the radial nerve, which spirals around the bone. Damage to the nerve is indicated by inability to lift the hand (wrist drop) and loss of sensation on the back of the hand. Treatment: Loose sling and swath (with no pressure under the elbow). Keep patient in seated position, if practical.

Fractures of the Distal Humerus: Fractures of the lower humerus can be difficult to differentiate from fracture/dislocations of the elbow in the field. If there is swelling, pain and crepitation on palpation around the elbow, it is best to assume a fracture and splint, sling and swath the arm with the elbow in 90 degrees of flexion.

Shoulder Dislocations

Signs and Symptoms: Anterior/Inferior dislocations are most common (95% of shoulder dislocations). Pain to shoulder region. Loss of contour of deltoid muscle when compared to unaffected side. Palpable defect where the humeral head should be. Test for loss of sensation in the deltoid region: This indicates injury to the axillary nerve and needs to be documented prior to any treatment. Patient will usually hold the affected arm away from the body and supported by the unaffected arm. Recurrent dislocations are common. Frequently the victim will be able to tell you what the problem is.

Treatment:
1. If within easy transport time/range to higher-level care, splint in the most comfortable position and transport.
2. If higher-level care is distant, early reduction can be attempted:

a) Palpate the entire length of the humerus. The entire shaft of the humerus can be palpated from the inner aspect of the upper arm. Presence of any significant point tenderness to palpation or crepitation indicates a fracture-dislocation. Fracture-dislocations are more common in high-speed injuries and in older persons. Note: Do not attempt field reduction if there is any suspicion of a fracture-dislocation: Splint in position of comfort and transport.
b) Test for sensation over the deltoid area, checking for injury to the axillary nerve. Document prior to any attempt at reduction.
c) Check circulation and neurological function of the affected arm and hand.
d) There are multiple methods of reducing shoulder dislocations. The key to reduction is to perform it early before significant muscle spasms can develop, and to do any required manipulation SLOWLY and GENTLY. It is NEVER appropriate to attempt to ‘jerk’ a shoulder back into place.
e) The patient may have to be sedated prior any procedure. Valium, 5-10 mg slow IV is usually effective and is also a good muscle relaxant.
f) Successful reduction is usually obvious with a sudden return of the shoulder external anatomy to normal, and significant reduction of pain.
g) Reassess the neuro/vascular status of the arm and hand, then sling/swath.
**Scapular Manipulation Method:** Have the patient sit upright or lay face down. If sitting, the affected arm is supported straight out from the body. If lying prone, the arm will be straight down. Apply 5-10 pounds of long-axis traction to the arm. The operator stands behind the patient and grasps the tip (inferior portion) of the scapula, rotating it inward (towards the spine) and superior (towards the head). Slow, gentle, and continuous motion is maintained.

**Scapular Manipulation Method of Shoulder Reduction**
See above for description of technique. Note the tip of scapula is rotated towards the midline and superior.

**Hand Fractures**
**Signs and Symptoms:** Usually obvious swelling and deformity of hand/fingers. Do not attempt re-alignment unless neurovascular compromise or significant angulation is noted.
**Treatment:** Splint in position of function (beer-can or duckbill splint). Buddy-taping to adjacent fingers can splint isolated finger injuries.

**Thumb/Finger Dislocations:**
**Signs and Symptoms:** Usually obvious from deformity of the thumb/finger at the joint.
**Treatment:** Reduction of phalange dislocation is accomplished by traction applied to the partially-flexed digit while pushing the base of the dislocated phalanx back into place. Reduction of a dislocated metacarpophalangeal joint (knuckle) of an index finger is usually unsuccessful, frequently requiring surgery. After reduction buddy-tape or splint the affected finger. If reduction is unsuccessful, splint the hand in position of function (beer-can or duckbill splint) and transport.
Reduction of Phalangeal Dislocation
See above for description of technique.

Pelvis
Signs and Symptoms: Pain in the pelvis, hips, groin or back. Pain is elicited when applying pressure to iliac crests or suprapubic area. Patient may be unable to lift legs while supine. The foot on the injured side may be turned outward.
Treatment: Place patient on a long board. MAST will help in stabilizing pelvic fractures and may help tamponade bleeding from pelvic structures. Initiate 2 x LB IV LR/NS or start large-bore saline lock. Pain medication as needed and evacuate.
NOTE: Foley catheter is contraindicated due to risk of damage to GU structures. It is recommended not to use the log roll technique to move a patient with a suspected pelvic injury.

Femur
Signs and Symptoms: Pain in the upper leg and/or deformity. Foot may be rotated inward or outward.
NOTE: Serious bleeding may occur into the thigh compartments without any visible blood loss.
Treatment: Apply traction splint. A properly applied traction splint will significantly decrease the patient’s pain and help control bleeding. LB IV LR/NS or saline lock, pain control and evacuate.

Knee Dislocations
Signs/Symptoms: Usually obvious, with the tibia/fibula either anterior or posterior to the distal femur.
Treatment: This is a devastating injury, frequently accompanied by vascular damage to the popliteal artery. Assume vascular damage in all knee dislocations even if pulses are present. Knee dislocations will frequently reduce themselves. If it has not, reduce by steady, gentle long-axis traction. Splint carefully and monitor distal pulses frequently.
Ankle Fracture-Dislocations

**Signs/Symptoms:** Usually obvious, with the foot shifted anterior or posterior on the distal tibia/fibula. Skin over the dislocation is frequently tented. Pulses in the foot may be absent and is a grave sign, requiring immediate reduction of the dislocation. Virtually all ankle dislocations involve fractures.

**Treatment:** Ankle dislocations should be reduced as soon as possible. Apply gentle and steady traction to the foot while supporting the heel and lower leg until the alignment of the ankle is approximately normal. Exact anatomic reduction is not necessary. No skin should be tented or tight over bone if the ankle has been properly reduced. Splint the ankle with a well-padded posterior and U-splint. Do not allow the patient to put any weight on the ankle or leg.

Ankle Sprains: See Ankle Sprain section in Patrol Medicine, page 79.

Other Lower Extremity Fractures/Dislocations

**Signs/Symptoms:** Pain, swelling and ecchymosis in area of injury.

**Treatment:** Unless grossly angulated or neurovascular compromise is noted, splint fracture/dislocation as it lies. If re-alignment is necessary, prepare to splint, then apply long-axis traction to re-align extremity. Check neurovascular status before and after re-alignment.

Compartment Syndrome: Occurs when bleeding in a closed space exerts pressure in surrounding non-elastic membranes. This pressure is transmitted to blood vessels and nerves, compressing them to the point of circulatory impairment and neurological compromise. This condition is usually found in either the forearm or the lower leg resulting from crushing injuries or fractures, but can manifest itself in the hand, forearm and foot.

**NOTE:** Compartment syndrome is addressed here as a complication of extremity trauma. Due to the delays in patient transfer that PJs routinely encounter it is important you are able to make this assessment.

**Signs & Symptoms of Compartment Syndrome may include, but are not limited to:**

- Pain that is out of proportion to the injury or physical findings. Pain is usually described as: Deep, excruciating, burning and unrelenting. Pain is usually difficult to localize and difficult to control with the normal analgesic regimen.
- Pain increased with passive stretching of the muscle group involved or with active flexion of involved muscles.
- Hyperesthesia or paresthesias of nerves that cross through the affected area.
- Tenderness, tenseness, or sensation of tightness of the compartment.

**CAUTION:** Some of the ‘classic signs’ of compartment syndrome (delayed capillary refill, lack of sensation distal to the injury site, paralysis, pallor and puselessness) occur late in the course of the syndrome and are not reliable for early diagnosis. If compartment syndrome is suspected immediate evacuation is required.

**Treatment:** Treat causative factor. Immobilize extremity. Closely monitor extremity and transport ASAP. Fasciotomy (page 37).

**NOTE:** Fasciotomy should only be performed under direct supervision of a physician.

**CAUTION:** Elevation of a limb above heart level, wrapping with ace wraps or compression dressings or application of cold packs are NOT an acceptable treatments for compartment syndrome. These procedures may actually exacerbate the situation.
**Crush Injuries:** Result from a patient being trapped under heavy object and either crushing part of the body or cutting off circulation (usually of the extremities). Crush injuries are usually the result of a structural collapse. Crush injuries of the head, neck and chest are usually rapidly fatal. Crush injuries/entrapment of the extremities, lower abdomen and pelvis can result in an awake, alert victim trapped in a collapsed structure.

**Signs and Symptoms:** Patient trapped with a section of the body caught under a heavy object. The patient can be awake, alert and in remarkably little pain, even though damage to the trapped portion is serious. If accessible, the trapped part of the body may be blue, cold and pulseless. Hyperkalemia and rhabomyolysis can result from this syndrome resulting in cardiovascular collapse or renal failure minutes to hours after extraction.

**Treatment:** This syndrome has a high mortality. Even though the patient may appear stable while trapped, once the entrapment has been released, the victim may go into complete cardiovascular collapse, from both the sudden flow of blood to the formerly entrapped part of the body and from accumulated metabolic waste products being shunted back into the central circulation. If an IV can be started prior to extrication, it is best to give the patient a fluid bolus just prior to release of the entrapped part of the body. If cardiovascular collapse occurs, standard resuscitation should be started. Crushed extremities should be irrigated with normal saline, dressings applied and splinted. Minimal or no debridement should be done at this stage. Rhabdomyolysis (breakdown of muscle tissue) can result from crush injury. The release of myoglobin can cause acute renal failure. Hydration with normal saline to insure brisk urine flow can help avoid this complication. Urine flow can be increased by use of Mannitol, 0.5-1.0 mg/Kg. This may be used if approved by medical control. Compartment syndrome (see above) can also result from crush injury.

**Additional Notes (Extremity Trauma):**
**BURNS**

**GUIDELINES AND CONSIDERATIONS**

1. Stop the burning process.
2. Assure airway and circulation are not compromised. In the event of airway injury (symptoms include hoarse voice, carbonaceous sputum, and singed nasal hair) early intubation may be necessary to prevent laryngeal edema from closing off the airway. **NOTE:** ALL victims inside a burning structure are presumed to have toxic inhalation (carbon monoxide poisoning) in addition to other accompanying injuries they might have. All burn victims should receive supplemental oxygen.
3. Establish baseline vital signs and document accordingly.
4. 2 x 16 gauge IV’s LR/NS.
5. **Calculate the amount of fluid resuscitation required:**

   **NOTE:** The 1st 24 hours of fluid resuscitation is crystalloids only.

   ____Kg(wt) x 4 cc’s x _____% BSA burned = Total fluid for first 24 hours.

   **NOTE:** Rate of IV Administration for 1st 24 hours:
   - 1/2 total - 1st 8 hrs (from time of burn)
   - 1/4 total - 2nd 8 hrs
   - 1/4 total - 3rd 8 hrs

6. Establish an accurate hourly intake and output record (barring renal dysfunction, urinary output reflects the competency of fluid resuscitation). Insert foley catheter if necessary.
7. Monitor lung fields for indications of fluid overload (pulmonary edema).
8. Monitor patient's vital signs q. 15min-1hr prn. **NOTE:** The use of any fluid replacement formula merely provides an estimate. The amount of fluid given should be adjusted according to the individual patient's response. Mental alertness, urinary output (30-50 cc/hr), and vital signs reflect the adequacy of fluid resuscitation.
9. Once the absence of respiratory compromise, head or spinal trauma has been determined, medicate patient for pain using IV route only. **NOTE:** Toradol is NOT recommended for pain control in burns.
10. Protect patient from the environment. Cover patient appropriately while performing physical examination.
11. Protect patient from infection with sterile dressings. If unable to evacuate within 24 hours, contact support for recommendation regarding antibiotics. If the patient requires antibiotic therapy for other injuries (such as open fractures) treat with the appropriate antibiotic for that injury if evacuation is delayed over 4 hours.

**GENERAL BURN CARE:**

1. Insert foley and record urine output.
2. Depending on patients condition and urine output, adjust fluid resuscitation prn.
3. In presence of paralytic ileus and/or if burn area is over 35% BSA, insert NG Tube.
4. Splint burns of the hand with fingers spread and with hand in the position of function (beer-can or duckbill splint). Separate fingers by placing kerlex or 4X4’s between the fingers.
5. Keep neck slightly hyperextended when burned.
6. Avoid vigorous scrubbing when cleaning facial burns. Place moist dressings over eyelids.
7. If the patient is able to drink and does not develop ileus, clear liquids can be given by mouth. Balanced salt solutions, oral rehydration salts or even sports drinks (diluted 50/50 with water), in small amounts (5-10 cc’s) should be administered frequently. This may help decrease the IV fluid requirement.
Note: Signs of a functioning GI tract include passing gas, presence of bowel sounds and ability to drink small amounts of fluid without nausea/vomiting.

8. Record fluid intake (oral & IV), fluid output (urine, emesis or diarrhea) and vital signs (including temperature) every 1-4 hours.

9. Do not give antibiotics to burn victims unless directed by medical control. **Note:** The exception to this is if the patient has an injury that normally requires antibiotics (i.e. open fracture). In this case, administer antibiotic and amount you would normally use if the patient were not burned.

10. Burn victims develop gastric ulcers very rapidly and should be given Zantac, 50 mg IV or IM q. 6-8 hours to prevent ulcer formation. If the GI tract is functioning, Zantac, 150 mg orally q. 12 hours can be used instead of the IM/IV preparation.

**Burn Treatment (1st, 2nd, & 3rd Degree):**

1st Degree: Submerge body part in cool water or apply cool compresses immediately (NOT ice water).

2nd Degree (Superficial): If 10% or less of BSA involved, submerge body part in cool water immediately if possible. Water immersion may intensify shock so it should be applied for only 10-15 min. for pain relief. **Note:** Do not submerge in ice water. Cover burn with loose, dry, sterile dressing.

If Evacuation is Delayed:
- Leave blisters intact unless they are larger than 2” in diameter. Large blisters should be drained with a sterile needle/syringe and then unroofed.
- Clean burn area and apply Silvadene. Silvadine dressing can be covered with saran wrap and then cover with a loose, dry, sterile dressing. Change every 12-24 hrs or as the dressing becomes saturated with exudates.
- When removing dressings, avoid removing dressings that have adhered to the skin. This can increase the damage to the underlying tissue. To ease removal of adhered skin, it may be necessary to soak dressings using sterile saline prior to removal.
- Consider giving analgesia before changing dressings.

Deep 2nd & 3rd Degree:
- **If Evacuation is Immediate with Rapid Transport Time:** Cover burn area with sterile dressing (if possible). If large area is involved cover with casualty blanket.
- **If Evacuation is Delayed:** Clean burn area with diluted (1:10) betadine solution using 4x4 gauze, then rinse with saline removing loose nonviable tissue during cleaning process. Apply Silvadine dressing as noted above. Gently clean and reapply Silvadene and fresh dressing every 12-24 hours. If the saran wrap dressing is used, change as the dressing becomes saturated with exudates. **Note:** Morphine should be considered prior to performing initial burn wound debridement. Administer analgesics one half hour before treating patient. However, use of morphine is contraindicated in head, chest or spinal trauma.

Circumferential Burns: If circulatory compromise or respiratory difficulty develops, be prepared to perform an escharotomy. **Note:** An escharotomy should be performed under physician control.

Chemical Burns (Acids, Alkalis, etc):
1. Immediately remove agent (brush off if powder, wash off if liquid).
2. Flood area with water.
3. Remove contaminated clothing.
4. Continue water irrigation of burn area as long as possible. **Note:** Do not attempt to "neutralize" with other chemicals.
5. If chemicals splash into the eye, irrigate the eye with a **MINIMUM** of 1 liter of fluid, but preferably several liters. **CAUTION:** If an alkali, such as lye or ammonia, is splashed into the eyes, continue irrigation for at least 60 minutes or until told to stop by medical control.

**WHITE PHOSPHOROUS (WP) BURNS:** WP will continue to burn as long as it is exposed to oxygen. The key to treating WP burns is to cut off oxygen to any WP fragments in the body and then remove them as soon as possible.

1. Completely submerge body part in water. Otherwise cover with wet dressing.
2. If possible, move patient to dark area and remove remaining particles (WP fragments glow faintly in the dark and should show up very well using NVG’s). If unable to debride particles out of tissue, keep wounds covered with wet dressings during transport.
3. A copper sulfate solution can be used to “extinguish” WP fragments in tissue, however it can occasionally result in copper toxicity. A freshly made solution of 5% sodium bicarbonate, 3% copper sulfate and 1% hydroxyethyl cellulose will allow soaking of a WP wound for 20 minutes without copper toxicity developing. Thoroughly rinse the solution off after use. Copper sulfate will cause the WP fragments to turn black, cutting off oxygen and allowing for easier identification and debridement.
4. WP fragments glow under ultraviolet light allowing easy debridement.

**BURN SUPPLIES:** Burn victims use a large amount of medical supplies in a very short period of time. When planning for a mission involving a burn victim the amount of extra supplies that may be needed should be taken into account. For example, in planning for a mission involving a 3-day transport of a 90 Kg victim with 30% BSA burns, the following should be taken into account:

- 72-hour transport with dressing changes q. 8-12 hours = 6-10 dressing changes.
- **Silvadine:** 5-7 grams per % BSA burned per dressing change = 150-210 grams per change
- **Kerlex:** 3-4 rolls per dressing change.
- **Morphine:** 15-20 mg IVP q. 4 hours
- **Normal Saline:**
  - 11 liters of IV in first 24 hours
  - 5-10 liters IV NS per day after the first 24 hours
  - 1 liter NS irrigation per dressing change
- **Zantac:** 50 Mg IV q. 8 hours.
- **Sterile gloves:** 2 pair per dressing change.
- **Plastic Wrap/Saran Wrap:** 6-8 feet of per dressing change.

Planning for this victim’s care would then include at least the following amount of supplies:

- **Silvadine:** 1500-2000 grams
- **Kerlex:** 30-40 rolls
- **Normal Saline:** 25-30 liters for IV use and 8-10 liters for irrigation
- **Morphine:** 360 mg (36 tubex’s)
- **Zantac:** 450 mg
- **Sterile gloves:** 20 pairs
- **Plastic wrap:** 60-80 feet
ADDITIONAL NOTES (BURNS):
**Burn Nomogram**: The burn nomogram is designed to assist with determining the amount of Body Surface Area (BSA) involved in a burn. Counting only the second and third degree burn areas, add up the total area (use age modifiers if necessary) to determine the total burn area.

**Note**: The size of the patients’ palm is approximately 1% of their body surface area.

### Rule of Nines (Adults only)

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>0</th>
<th>1</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: ½ of head</td>
<td>9.5</td>
<td>8.5</td>
<td>6.5</td>
<td>5.5</td>
<td>4.5</td>
</tr>
<tr>
<td>B: ½ of thigh</td>
<td>2.75</td>
<td>3.25</td>
<td>4.0</td>
<td>4.25</td>
<td>4.5</td>
</tr>
<tr>
<td>C: ½ of leg</td>
<td>2.5</td>
<td>2.5</td>
<td>2.75</td>
<td>3.0</td>
<td>3.5</td>
</tr>
</tbody>
</table>

% Second Degree Burn ______ + % Third Degree Burn ________ = % Total Burn _________

**Example of Burn Area Modification for Age**: 1 year old child, ½ half of head burned, all of left thigh burned: Head BSA= 8.5%, thigh = 3.25% and 3.25%. Total BSA = 15%
MEDICAL PROCEDURES

AIRWAY (MANAGEMENT AND CONTROL)

GUIDELINES AND CONSIDERATIONS:
- Indicated when airway is partially or completely obstructed/compromised.
- Cervical spine injury is assumed with: Deceleration trauma, blast injury and unconscious patients.
- Always evaluate the mechanism of injury (MOI) in unconscious patients to determine or rule out possible injuries.

JAW THRUST: Method of choice for trauma pt.
Procedure:
1. Place hands on either side of pt's neck to stabilize.
2. Use thumbs to push up at the angles of the jaw.
3. Secure airway with adjunct.
4. Use index finger to assess carotid pulse.

CHIN LIFT: Two rescuers required: One to stabilize neck and one to open airway.
Procedure:
1. Stabilize pt's head
2. Use thumb to grasp chin below lower lip while fingers are placed underneath the anterior chin.
3. Gently lift chin.
4. Secure airway with adjunct.

NASO-PHARYNGEAL AIRWAY (NPA): For use on conscious, unconscious, & semi-conscious pts.
NOTE: NPA is the preferred initial airway adjunct.
CAUTION: Never force the airway.
Equipment List:
- NPA & Water-soluble lubricant

Procedure:
1. Lubricate with water-soluble lubricant.
2. Insert the airway through the larger nostril, advance into the posterior pharynx.
3. If unable to insert through the larger nostril, attempt to place through the smaller nostril.

ORAL-PHARYNGEAL AIRWAY (OPA): For use on patients with NO intact gag reflex. NOTE: Patients who tolerate an OPA require intubation to protect their airway. Be prepared to handle vomiting during insertion of OPA.
Equipment List:
- Oropharyngeal airway
- Tongue blade
- Suction should be immediately available in case of vomiting

Procedure: (2 Methods)
1. Push tongue out of the way with a tongue blade & insert airway under direct visualization.
2. Alternate method of insertion is to insert with the tip towards the roof of the mouth, rotate airway 180 degrees into position when the tip of the airway falls off the hard palate onto the soft palate.
NOTE: If the airway is in the correct position, the end of the airway should be in front of the teeth, just outside the lips. Confirm proper placement by ventilating patient.
**Endotracheal Tube (ETT) Intubation:** For protection of the airway and/or as a means of ventilation in the apneic patient.

**Equipment:**
- Endotracheal tube with stylet, cuff checked for leaks (size 7.0-7.5 for adult)
- Laryngoscope (check operation of blade, bulb and batteries)
- Suction
- Syringe to inflate cuff & tape or other means of securing the ET tube once placed.

**Procedure:**
1. Hyperventilate patient with 100% oxygen for several minutes prior to intubation.
2. Assemble and test equipment while patient is being ventilated:
   a. Inflate cuff off ETT with 5-10cc of air and check for leaks. Remove air from cuff leaving syringe attached to tube. Insert stylet into ETT ensuring it does not protrude past the distal end of the ETT. Ensure that the stylet slides out the top of the ETT easily.
   b. Check light on laryngoscope.
   c. Assure availability of suction.
3. Lubricate distal end of tube with water-soluble lubricant (viscous lidocaine can be used).
4. Stop ventilations.
   a. Have an assistant stabilize the pt's head and apply cricoid pressure (Sellick's maneuver) while counting slowly to 30.
   b. Intubator takes a breath, holds it and then directly visualizes cords with laryngoscope. If unable to visualize chords within 30 seconds or when the intubator has to take a breath, remove laryngoscope and ventilate the patient for 1 minute. Repeat attempt to visualize the cords.
5. When chords are visualized, advance tube to a depth of 5cm beyond cords. Inflate cuff and ventilate.
6. Confirm proper tube placement by auscultating over stomach and both lung fields. Re-position or remove as necessary. Do not release Sellick's maneuver until proper position of the tube is confirmed and the cuff is inflated.
7. Secure tube once proper placement confirmed.
8. Re-confirm position of tube by auscultation every time the patient is moved.

**Nasotracheal Intubation:** Used when the patient's mouth cannot be opened or when the patient cannot be ventilated by other means or if patient is conscious but requires intubation, i.e. severe head trauma, respiratory distress.

- **Caution:** Do not attempt nasotracheal intubation if there are any signs of basilar skull fracture or cribiform plate fracture (Clear fluid from nose/ears, 'Raccoon eyes', Battle sign [bruising behind ears]). Do not use excessive force to pass ETT through nose. Nosebleeds are common with this type of intubation.
- **Warning:** Nasotracheal Intubation is contraindicated in fractures of the cribiform plate, basilar skull, or open skull fractures.

**Equipment List:**
- Endotracheal tube with stylet, cuff checked for leaks (size 7.0-7.5 for adult)
- Water-soluble lubricant (viscous lidocaine can be used)
- Tape or other means of securing ETT
- Syringe to inflate ETT cuff

**Procedure:**
1. Follow initial steps as for endotracheal intubation using a 7.0 or 7.5 mm ET tube.
2. With bevel against the floor of the septum of the nasal cavity, slip the ETT distally through the largest nostril. When the tube reaches the posterior pharyngeal wall, great care must be taken on "rounding the bend" and then directing the tube toward the glottic opening.
4. Listen and feel for the patient to inhale. When the patient inhales, advance the tube with a single smooth motion into the trachea.

5. **Observe neck at the laryngeal prominence:**
   a. Tenting of the skin on either side indicates catching of the tube in the pyriform fossa. This is solved by a slight withdrawal and rotation of the tube to the midline.
   b. Bulging and anterior displacement of the laryngeal prominence usually indicates correct placement.

6. Advance the tube until the balloon is past the vocal chords. Inflate cuff, confirm placement, and secure.

7. Re-check the position of the tube after every movement of the patient.

**Lighted Stylet Intubation:** Indicated when the need for ETT intubation exists, but a laryngoscope is not available or unable to visualize cords with laryngoscope.

**Equipment:**
- Endotracheal tube with cuff checked for leaks (size 7.0-7.5 for adult)
- Lighted stylet/ wand, batteries and bulb checked.
- Water-soluble lubricant (viscous lidocaine can be used)
- Syringe to inflate ETT cuff. Tape or other means of securing ETT.

**Procedure:**
1. Hyperventilate the patient with 100% oxygen. Check all equipment.
2. Insert lighted stylet through middle of endotracheal tube.
3. Insert stylet and ETT through patient’s mouth, and maneuver through the posterior pharynx to the glottis area.
4. Observe the position of the light on the patient’s neck. When the tube is in the correct position you should be able to clearly see the light at the tip of the stylet at the area of the voice box. Advance the stylet and ETT until the tip of the stylet is well past the voice box.
5. Holding the ETT stationary, remove the lighted stylet and inflate the ETT cuff. Check for proper position.
6. Secure the ETT once the position has been confirmed. Re-check after every movement of the patient.

**Tactile Intubation:** Utilized when need for ETT exists and no laryngoscope is available, or under denied-light conditions.

**NOTE:** Use of the ‘CombiTube’ airway device as an adjunct in a difficult airway situation is authorized if all personnel have had appropriate instruction and practice with the device.

**Equipment List:**
- Endotracheal tube with stylet and cuff checked for leaks (size 7.0-7.5 for adult)
- Lighted stylet/ wand, batteries and bulb checked.
- Water-soluble lubricant (viscous lidocaine can be used)
- Tape or other means of securing ETT
- Syringe to inflate ETT cuff
- Gloves

**Procedure:**
1. Hyperventilate patient with 100% oxygen, prepare endotracheal tube, insert stylet.
2. Insert gloved left hand into patient’s mouth, feeling for the epiglottis with the index and middle finger. Once epiglottis identified with left index and middle fingers, insert the ETT over the top of the fingers into the glottis.
3. Insert the tube deep enough so the balloon is past the vocal chords.
4. Inflate the balloon and confirm proper tube position.
5. Secure the tube once position has been confirmed. Re-check position after moving the patient.
**Cricothyroidotomy:** A cricothyroidotomy is indicated **ONLY** when an airway cannot be secured by other less-invasive means and the need for an emergency surgical airway exists.

**Note:** The PerTrach™ (percutaneous cricothyroidotomy) device is approved for use, if specific instruction on its proper use by a qualified physician has been accomplished and competence in the technique has been demonstrated and documented in OJT records.

**Caution:** Severe bleeding is possible with this procedure. Be prepared to suction the field, and provide direct pressure to control bleeding at the incision site.

**Equipment:**
- 6.0 shiley cuffed tracheostomy tube (may use 6.0-7.0 cuffed endotracheal tube if no tracheostomy tube is available)
- Syringe to inflate cuff
- Scalpel or sharp surgical scissors
- Umbilical tape or other means of securing tracheostomy or ETT
- 4x4’s to control bleeding
- 1-2% lidocaine, syringe and needle for local anesthesia, if patient is awake.

**Procedure:**
1. Expose anterior neck and prepare equipment.
2. Identify cricothyroid membrane, swab with betadine.
3. If patient is conscious, infiltrate area with lidocaine
4. Make 1-inch vertical incision in the skin overlying the cricothyroid membrane.
5. Holding the larynx between the thumb and middle finger with the index finger in the incision over the cricothyroid membrane, push scissors/blade over index finger into membrane.
6. After entering trachea, spread opening, insert tube, directed caudad (towards the lungs).
7. Inflate the balloon, check breath sounds, secure tube and dress.

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**Anatomic Identifiers for Cricothyroidotomy**
**Oxygen Therapy:** Indicated in the treatment of: Trauma, hypovolemia, shock and respiratory distress, chest pain, shortness of breath, asthma, anaphylaxis.

**Note:** Some patients with pre-existing lung disease (COPD), may become apneic if administered high-flow oxygen. In older (non-military) personnel with underlying lung disease, observe respiratory effort closely and support ventilations prn. **Do not withhold oxygen** from a patient in respiratory distress.

**Caution:** No open flames near oxygen systems.

**Methods of Delivery:**
- **Nasal Cannula (NC):** Flow rates from 1-6 LPM delivering between 24-44 percent oxygen.
- **Simple Face Mask (SFM):** Flow rates from 8-12 LPM delivering between 40-60 percent oxygen.
  - **Note:** To avoid the accumulation of expired CO2, no fewer than 6 LPM should be delivered through the SFM. A flow rate of 6-8 LPM is generally acceptable for pediatrics.
- **Non-Rebreather (NRB) mask with reservoir:** Flow rates from 10-15 LPM delivering between 80 100 percent oxygen.
  - **Note:** To avoid the accumulation of expired CO2, no fewer than 8 LPM should be delivered through the NRB.
  - **Caution:** Allowing the reservoir to completely deflate may result in patient suffocation.
- **Bag-valve-mask (BVM) with reservoir:** Flow rates from 10-15 LPM delivering between 60-100 percent oxygen.

**Needle Thoracentesis:** Indicated in the presence of:
- Tension pneumothorax.
  - **Note:** Needle thoracentesis is usually sufficient for rx. of tension pneumothrax.
- Severe respiratory distress
- Tracheal deviation
- Presence of distended neck veins
- Unexplained hypotension
- Unilateral absence of breath sounds
- Hyper tympanic percussion over affected side.

**Equipment:**
- 14 Gauge angiocath with one-way valve (may be improvised)
- Oxygen (if available)

**Procedure:**
1. Administer oxygen 12L/min per NRB or positive pressure with BVM.
2. Locate the 2nd intercostal space in the midclavicular line on the side of the pneumothorax.
3. Clean area with betadine. Re-identify 2nd intercostal space in the midclavicular line.
4. Insert 14-gauge catheter over the top of the rib into the pleural space.
5. Listen for a decompression air rush from the needle or aspirate as much air as necessary to relieve the patient's acute symptoms.
6. Leave the catheter in place and apply bandage or small dressing. A field-improvised one-way valve may be attached to the catheter.
7. Observe the patient and prepare for a chest-tube insertion if necessary.
**Thoracostomy (Chest Tube):** Indicated for the treatment pneumothorax or tension pneumothorax. **Note:** Tension pneumothorax should be treated by needle thoracentesis prior to considering or inserting a chest tube. Formal chest tube placement is rarely required in the pre-hospital environment. Needle thoracentesis is all that is usually required. A stable patient with a pneumothorax treated by needle thoracentesis should be observed closely: A chest tube should be placed only if the patient becomes significantly short of breath or has other signs of decompensation.

**Equipment:**
- Sterile gloves, chest tube (ETT may be substituted) and one-way valve (Heimlich valve)
- Scalpel, needle, 0-Silk suture, material for occlusive dressing
- Lidocaine
- Syringe
- Curved or straight Kelly clamp

![Anatomic Identifiers for Thoracostomy](image)

**Procedure:**
1. Locate 4th or 5th intercostal space at the nipple level just anterior to the mid-axillary line on the affected side.
2. If the patient is conscious:
   a. Inject the skin incision area with 1% or 2% lidocaine.
   b. Holding the needle at a 90-degree angle to the skin, insert the needle down to the rib infiltrating the periosteum of the rib.
c. Walk the needle up and over the top of the rib, injecting gently into the area of the pleura.

3. Make a 1-inch incision into the skin and subcutaneous tissue over the rib. Insert sterile gloved finger down to the intercostal muscle over the top of the rib bluntly dissecting down to the pleura.

4. Puncture the pleura with a closed clamp. Make an opening big enough to fit your finger into the chest cavity (CAUTION: Even with local anesthetic this part of the procedure may painful for the conscious patient). Sweep your finger around the incision feeling the chest wall feeling for any adhesions.

5. Insert tip of chest tube (or ETT) with clamp into the pleural space, directing the tip of the tube towards the upper/posterior area of the pleural space.

6. Fasten a one-way valve to tube and reinforce with tape. Suture incision closed and secure tube to the skin with a purse-string suture, using 0-silk suture.

7. Apply an occlusive dressing around the tube and incision.

CIRCULATION

INTRAVENTOUS INFUSION/ACCESS:

Equipment List:
• IV Catheter, IV Tubing and IV Bag (tubing flushed and prepped)
• Tourniquet
• Alcohol (or betadine) prep pad
• Tape, sterile dressing, antibiotic ointment

Procedure:
1. Clear entire IV tubing of air.
2. Apply TQ 2-6 inches above selected site & cleanse skin with alcohol swab. Allow to air dry.
3. Remove catheter/needle from guard.
4. Grasp patients arm so that thumb is approximately 2 inches from site and pull traction on skin.
5. Insert needle bevel up, through skin at 45-degree angle until vein is entered.
6. Lower the catheter to skin level and advance the catheter 1/4-1/2 inch into the vein.
9. Pull back on until needle separates from catheter and advance catheter into the vein.
10. If resistance is met: Stop, release TQ and carefully remove both needle and catheter. Attempt venipuncture with a new catheter.
11. Once successful, attach administration set to hub of catheter and adjust to proper infusion rate.
12. Place 1/2-inch strip of tape under hub of catheter, sticky side away from skin, criss-cross tape up over the catheter hub and secure to skin at an angle in the direction of the needle insertion.
13. Cover with sterile gauze. Loop tubing and secure to arm. Apply antimicrobial ointment to insertion site if desired.

Effectiveness of IV Therapy:
• Stable vital signs in normal range?
• Moist mucus membranes?
• Good skin turgor?
• Improved level of consciousness?
• Urine output 30cc/hr of greater?
Drip Rate Calculations:

- To Calculate the Volume of Drug to be Administered:

\[
\text{Volume Administered (X)} = \frac{(\text{Volume on Hand}) \times (\text{Desired Dose})}{\text{Concentration on Hand}}
\]

- To Calculate the Drip Rate:

\[
(\text{Volume to be Given}) \times \frac{\text{Drops/ml (type of IV set)}}{\text{Infusion time in minutes}} = \text{Drops/min (X)}
\]

To Calculate Drug Administration based on Patient Weight:

1. Convert pt. Weight to kilograms (Pt. Weight in pounds divided by 2.2 = pt wgt in kg)
2. Calculate the desired Dose (Pt wgt in kg) (Desired dose)
3. Calculate the volume to be administered

<table>
<thead>
<tr>
<th>QUICK REFERENCE - DRIP RATES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ML/HR</strong></td>
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<tr>
<td>30cc</td>
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<td>75cc</td>
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<td>150cc</td>
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<td>200cc</td>
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<td>300cc</td>
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</tbody>
</table>

Notes:
- Pressure IVs should always be monitored.
- Correct fluid temp: 70-100 degrees F.
- Continuous flow meds: "piggy back" through rubber port.
- Ensure "piggy back" is higher than primary IV bag.

Saline Lock:

Equipment List:
- IV Catheter, IV Tubing and IV Bag (tubing flushed and prepped)
- Tourniquet
- Alcohol (or betadine) prep pad
- Tape, sterile dressing, antibiotic ointment

Procedure:
1. Start IV as noted above.
2. Instead of attaching administration set, attach saline lock port to IV catheter. Flush saline lock with 10 cc’s of normal saline.
3. Flush saline lock q. 4-6 hours with 5-10 cc’s of NS. If catheter clots off, or does not flush easily, remove the catheter and re-start IV.
4. Flush saline lock with 10 cc’s of normal saline after giving any medication through the port.
**INTRAOSSEOUS INFUSION:** Indicated when vascular access required or inability to start standard IV.

**NOTE:** The sternal infusion device (“FAST1”) is approved for PJ use. Personnel using it must have been trained on the proper technique prior to its use.

**Guidelines and Considerations:**
- Higher incidence of infection with interosseous access than with IV access
- Painful
- Once needle in place, must protect it carefully
- Slow infusion rate compared to IV access
- Can give normal saline, blood, and most medications via IO infusion

**CONTRAINDICATIONS:** Infection at the site of puncture.

**Equipment:**
- Gloves, PPE
- Interosseous needle (16 gauge or larger for adult), syringe, & IV administration set
- Alcohol or betadine swab/wipe
- Tape, sterile dressing, antibiotic ointment

**Procedure:**
1. Select site. **Adult:** 2 cm above and slightly anterior to the medial malleolus or sternum. **Children:** Proximal tibia, 2 cm below the tibial tubercle on the anteromedial surface of the tibia.
2. Clean site w/ alcohol or iodine wipe/swab. Anesthetize skin and periosteum w/ lidocaine.
3. With obdurator (stylet) in place, angle needle slightly cephalad (towards the head), if the distal tibia is used or slightly caudad (towards the feet) if the proximal tibia is used.
4. Puncture skin with the needle. With firm pressure and a rotary motion, advance into the bone. (Entry into the marrow cavity is indicated by a sudden decrease in resistance).
5. Remove stylet from the needle and attach syringe to the now-hollow needle. (Confirmation of proper position is confirmed by aspiration of bone marrow [resembles dark venous blood] or blood).
6. Remove the syringe and attach IV tubing to needle. Pressure infusion may be required.
7. Apply a small amount of antibiotic ointment to the skin around the needle, place sterile dressing around needle.
8. Remove IO infusion needle as soon as a reliable IV access is obtained.

**DIAGNOSTICS AND PATIENT CARE**

**NASO-GASTRIC (NG) TUBE:** Indicated in the presence of: ileus, spinal injury, abdominal and genitourinary trauma; burns, electrocution, GI bleeding, unconscious patient, excessive vomiting, acute surgical abdomen and aeromedical evacuation of severe trauma patient.

**NOTE:** If a NG tube is needed it may be passed orally.

**WARNING:** NG tube is contraindicated in fractures of the cribriform plate, basilar skull, or open skull fractures.

**Equipment:**
- NG Tube and water-soluble lubricant (viscous lidocaine may be used)
- 5 cc syringe and tape
- 60cc syringe (for aspiration)
Procedure (NG Tube):
1. Using the NG tube: Measure the distance from the bottom of the xiphoid process, to the ear lobe, to the tip of the nose. This will determine length of NG to be inserted.
2. Have the patient breathe through his/her mouth. Insert lubricated NG tube through the right nostril (if necessary use left) with angle of tube horizontal and slightly downward.
3. Once distal end reaches posterior pharynx, slightly flex patient's neck (if C-spine precautions allow) and instruct to swallow quickly.
4. As patient is swallowing, continue to insert tube until predetermined length is reached.
5. After insertion, verify placement by inserting air into the tube while listening over the epigastrium with a stethoscope. If bubbling is heard, aspirate stomach contents, inflate cuff and secure with tape.

URETHRAL CATHETERIZATION (MALE & FEMALE): INDICATED IN THE PRESENCE OF: Inability to void due to spinal cord damage; rupture of bladder; distal urinary tract obstruction; burns of genitalia; depressed sensorium, shock, etc. Post-trauma patients may require a catheter for monitoring of fluid status.
WARNING: Catheterization is contraindicated in urethral transection, scrotal hematoma, pelvic fracture, high-riding or free-floating prostate.

Equipment:
• Sterile gloves, 4x4’s, betadine solution and 1-inch surgical tape.
• Water-soluble lubricating jelly
• 10cc syringe with a sterile fluid source
• Foley catheter and plastic bag to collect urine

Procedure: NOTE: Use sterile technique throughout the procedure.

Male Catheterization:
1. Check patency of catheter balloon.
2. Drape between patient's penis and scrotum (Can use glove wrapper as drape).
3. Grasp penis with 4x4 and retract foreskin. Clean head of penis from meatus outward with betadine. Repeat for total of 3 times.
4. Pick up catheter, lubricate tip up to five inches.
5. Holding penis at 60-degree angle, slowly insert the catheter until resistance is felt. Apply gentle but firm pressure pushing catheter through the bladder sphincter muscle. (Do not force catheter. It may be necessary to wait until sphincter relaxes). Have container ready to collect urine.
6. After there is a urine return, insert catheter to its full length and inflate balloon with 5-10cc of sterile fluid (do not use air). Gently pull the catheter out until slight resistance is felt. Secure catheter to right leg with tape.
CAUTION: Never attempt to inflate balloon until urine has started to flow through the catheter.
7. Do not give antibiotics prophylactically for urinary tract infection. Antibiotics are indicated if:
   • Patient develops fever and/or other signs of infection, or transport cannot take place within 48 hours.

Female Catheterization:
1. Check patency of catheter balloon.
2. Have patient spread her legs and flex knees.
3. Put on sterile gloves. Place sterile drape in groin and the glove wrapper on the pubic area.
4. Separate the labia majora and minora and clean the exposed area with 4x4 moistened with betadine solution. Wipe in a downward motion from the labia to the perineum. Repeat 3 times.
5. While keeping labia separated, grasp catheter 3” from tip and lubricate catheter. Locate opening of urethra.
6. Gently insert catheter into the urethra until urine starts to flow, then advance another 3-4 cm. If resistance is met retain gentle but firm pressure on catheter. Do not force catheter. Have container ready to collect urine.

7. Inflate balloon with 5-10cc sterile fluid. If resistance is met when inflating the balloon, advance catheter a bit further into the bladder before inflating. Secure catheter to right leg with tape.

8. Do not give antibiotics prophylactically for urinary tract infection. **Antibiotics are indicated if:**
   - Patient develops fever and other signs of infection or transport cannot take place within 48 hours.

**SUPRAPUBIC NEEDLE CYSTOTOMY:** **INDICATED WHEN:** Unable to catheterize patient and bladder becomes distended (evident by dull percussion sounds extending more than midway from the pubic bone to the umbilicus).

**Equipment Needed:**
- 18 gauge IV cannula, 25 gauge needle
- Betadine, 4 x 4 gauze, sterile gloves
- 5cc syringe
- Tape
- 30 inch IV extension tube and urine collection container
- Lidocaine

**Procedure:**
- a. Clean area directly over symphysis pubis with betadine (6 to 8 inches). Repeat three times.
- b. Don gloves and drape area.
- c. Anesthetize area where 18-ga needle will be inserted.
- d. Insert 18-ga needle directly (**must be exactly**) in midline on the upper edge of pubic bone. Keep needle at 90-degree angle to the skin. Insert slowly while pulling gently on plunger of the syringe. Stop insertion when urine begins to flow into the syringe.
- e. Continue negative pressure until syringe is filled. Remove syringe and needle leaving catheter in place. Secure catheter in place with tape.
- f. Attach 30 inch IV tubing to catheter and drain urine into container.
- g. After urine flow ceases, clamp off the IV tubing, and suture the catheter in place.
- h. Unclamp the IV tubing and drain the bladder every 4-6 hours or as needed.

**WOUND IRRIGATION:** **INDICATED FOR:** Cleaning of wounds prior to applying long-term-dressings.

**NOTE:** If a wound is bleeding heavily, controlling bleeding takes precedence over wound irrigation.

**CAUTION:** **DO NOT** irrigate wounds with hydrogen peroxide, betadine scrub solution, isopropyl alcohol, or other chemicals. The ‘Rule of Thumb’ is that you put into a wound only what you’re willing to put in your own eye.

**Procedure:**
1. Anesthetize the sound, if required.
2. Using medium pressure irrigation technique, irrigate the wound with NS, LR or other isotonic sterile solution.
   - If NS or LR is not available for wound irrigation, potable water may be used for wound irrigation.
   - Medium pressure irrigation can be accomplished by fitting an 18 gage angiocath to a 30-60 cc syringe and squirting the wound using strong pressure on the plunger of the syringe. **DO NOT** ‘inject’ the tissue of the wound with the catheter: It should be held about ½-1” from the wound.
3. Very dirty wounds can be irrigated with a solution of 1% betadine in NS (add 1cc of 10% betadine solution for every 9 cc's of NS), then given a final ‘rinse’ with plain NS.

4. Abrasions (such as ‘road rash’) may have to be scrubbed to free up dirt and imbedded debris.

5. Wounds should be irrigated with a minimum of 100 cc’s or until the wound is clean. Grossly contaminated wounds (such as an open fracture with dirt ground into the broken bones) may require physical debridement along with irrigation.

6. Use universal precautions when irrigating a wound. Proper wound irrigation technique will splash irrigating solution everywhere.

**DEBRIDEMENT:** For removal of devitalized tissue and/or debris. In most cases, simple bandaging is all that is required for field management of wounds. If evacuation to higher level of care is 1) > 12-14 hours, or 2) a grossly contaminated wounds with more than 8 hours to higher level care, debridement and delayed primary closure may be necessary.

**NOTE:** Work under adequate local anesthesia and with good exposure.

**CAUTION:** Work gently, precisely, and methodically. **DO NOT** cut any structure you cannot positively identify as: Skin, Muscle, or Fat.

**Procedure:**
1. Extend wound if necessary to allow adequate exploration.
2. Irrigate and explore wound with gloved finger. Remove any remaining foreign matter and drain entrapped accumulations of fluids or exudates.
3. Control bleeding by direct pressure or ligation.
4. Excise (cut) devitalized tissue preserving all vessels, skin, nerve and bone if possible.
5. Re-irrigate wound & control bleeding. Apply bulky dressing & monitor pt for re-occurring hemorrhage or signs of infection.

**DELAYED PRIMARY CLOSURE:** Technique of choice for management of dirty or contaminated wounds occurring in a combat environment that cannot be taken to higher level medical care within 12-14 hours. In most cases, the secondary closure will be done after extrication at a higher level of care.

**CAUTION:** Delayed primary closure should **NOT** be done on the face.

**Procedure:**
1. Anesthetize the wound and control any bleeding. Debride any necrotic tissue, removing all foreign bodies and debris.
2. Place a single layer of fine-mesh gauze into the wound, then loosely pack the wound with kerlex or fluffs.
3. Apply a kerlex bulky dressing around the wound, keep the dressing clean and dry.
4. Do not remove the dressing for 3 days, unless the patient develops fever, foul drainage or severe pain at wound site.
5. After three days, remove the dressing and inspect the wound. If the wound appears clean and has no apparent infection, debride the wound again, then close with sutures.

**ESCHAROTOMY:** For relief of circulatory and/or respiratory compromise due to burns. Rarely required in the field.

**NOTE:** Extensive bleeding is common during escharotomy. Be prepared to control bleeding with pressure and ligation.

**CAUTION:** An escharotomy should be accomplished under direct physician supervision.
Equipment:
- Lidocaine, syringe and needle; and scalpel
- Sterile gloves and sterile dressings

Procedure:
1. Irrigate & debride prn. Outline where escharotomy is to be performed.
2. Sterile prep of incision area, anesthetize with lidocaine prn. (conduct procedure under as sterile conditions as possible). Mentally outline where escharotomy is to be performed.
3. Using scalpel, cut through eschar until wet & bubbly edematous SubQ tissue is exposed. Continue line of incision extending entire length of eschar on opposite sides of extremity or chest (posterior/anterior or lateral/medial), exercising care, to not extend cut to underlying fascia (fibrous tissue layer) or muscle tissue.
   **NOTE 1:** DO NOT extend cut to underlying fascia (fibrous tissue layer) or muscle tissue.
   **NOTE 2:** Extensive bleeding is common during escharotomy. Be prepared to control bleeding with pressure and ligation.
4. After procedure completion, check for improved respiratory/circulatory status.
5. Apply bulky dressing & immobilize extremity.
6. Monitor for signs of hemorrhage, loss of CSM and infection.
**Fasciotomy:** For relief of vascular compromise due to Compartment Syndrome (crush injuries). Rarely required in the field.

**Guidelines and Considerations:** The anatomic area most commonly involved in Compartment Syndrome is the anterior compartment of the lower leg.

**Note:** Extensive bleeding is common during fasciotomy. Be prepared to control bleeding with pressure and ligation.

**Caution:** Should be accomplished under direct physician supervision. Elevating a limb above heart level; wrapping with ace wraps or compression dressings; or application of cold packs **are not** acceptable treatments for compartment syndrome. These procedures may exacerbate the situation.

### Equipment:
- Lidocaine, syringe and needle
- Scalpel
- Sterile gloves and sterile dressings

### Procedure:
1. Irrigate & debride prn. Outline where fasciotomy is to be performed.
2. Sterile prep of incision area, anesthetize with lidocaine prn. (conduct procedure under as sterile conditions as possible). Mentally outline where fasciotomy is to be performed.
3. Incise the skin down to the fascia layer, controlling bleeding as required.
4. Identify fascia overlying swollen muscle. Incise the fascia with a longitudinal incision. Muscle will bulge through incision.
5. After procedure completion, check for improved circulatory status.
6. Apply bulky dressing & immobilize extremity.
7. Monitor for signs of hemorrhage, loss of CSM and infection.

### Amputations:
Every effort should be made to save a limb, but rare circumstances may occur where amputation must be accomplished. They are done to save life and done at the lowest possible level of viable tissue to preserve limb length.

**Caution:** Should **only** be accomplished under direct physician supervision.

### Military Anti-Shock Trousers (MAST):
**Indicated for:** Stabilization of pelvic fractures and assistance in splinting of lower extremity fractures.

**Note 1:** The use of MAST in hypovolemic shock is highly controversial. Do not use in such patients without direct physician guidance.

**Note 2:** Do **not** trust ‘pop-off’ valves on MAST to control pressure. These valves have been known to freeze in the closed position, resulting in too much pressure in the suit.

**Warning:** Re-check inflation and adjust if necessary during ascent or descent in aircraft, or with significant environmental temperature changes.

**Contraindications:**
- **Absolute:** Pulmonary edema
- **Conditional:**
  - Pregnancy
  - Protruding viscera (abdomen)
  - Penetrating chest wound with diaphragmatic hernia
  - Intrathoracic hemorrhage
  - Head Injury with possibility of increased ICP
  - Cardiogenic Shock
Equipment:
• MAST and BP Cuff

Procedure:
1. Complete primary survey. BP cuff in place and prepare MAST for application.
2. If indicated perform MAST survey:
   a. Quickly examine: abdomen, pelvis, legs, and check neurovascular to lower legs/feet
3. Obtain and record baseline Vital Signs and lower extremity neurovascular check.
4. Treat (cover) all wounds which will be covered by MAST in an expedient manner
5. Slide pants underneath patient (if a backboard is indicated, drape MAST pants over the board and slide backboard with MAST under patient)
8. Position pants appropriately, keeping MAST below xyphoid process.
9. Secure MAST using Velcro straps:
   a. Left leg, groin to ankle
   b. Right leg, groin to ankle
   c. Abdominal compartment
10. Attach tubing and confirm placement.
11. Listening for crackle of Velcro inflate legs first and then inflate abdominal section.
   NOTE: Do not inflate abdomen if patient is in respiratory distress, neurogenic shock or cardio respiratory arrest.
12. Recheck and record patient's Vital Signs, recheck vascular
13. Listen to lungs and check for adequacy of ventilation
14. Once inflated, MAST pants remain inflated until delivered to medical facility

EXTENDED CARE AND TRANSPORT

GUIDELINES AND CONSIDERATIONS
• Tactical, weather or terrain considerations may delay transport of patients for extended periods of time. PJs must be comfortable with supplying long-term care in these circumstances. If the patient is unconscious, they will need to be turned every 2 hours in order to prevent pressure necrosis. Prop the patient with parkas, blankets, poncho liners or whatever is handy.
• Pad stretchers, stokes litters, or backboards as much as possible.
• Vital signs should be taken at least every 4 hours and recorded
• Give the patient clear liquids by mouth if he/she is able to swallow and protect their airway, and there are no abdominal injuries.
• Patients with a normally functioning GI tract and no abdominal injuries may eat as long as they can protect their airway. Patients on backboards should be watched carefully during eating or drinking, as this position increases the danger of choking.
• Medications may be given by mouth if the patient is awake, alert and has a functioning GI tract.
• For unconscious patients baseline fluid requirements can be calculated by the following formula: 4 cc/Kg/hr for the first 10 Kg of body weight, plus 2 cc/Kg/hr for the next 10 Kg of body weight plus 1 cc/Kg/hr for the rest of the patients body weight.
   Example: 60 Kg adolescent. 10Kgx4cc/hr = 40 cc/Hr, plus 10 Kg x 2 cc/hr= 20cc/hr, plus 40 Kg x 1 cc/hr= 40 cc/hr. 40+20+40= 100 cc/hr for baseline fluid requirements. This can be given orally, via NG tube or via IV, preferably a balanced salt solution such as NS. Increase or decrease fluid intake to keep urine output at 50-70 cc/hr, or 0.5-1 cc/Kg/hr.
• NG tube for delivery of medications: Medication can be given by mouth, or crushed and suspended in water and administered via NG tube. Make sure the NG tube is flushed with water after giving any suspension. Sugar water, pain medication, crushed oral antibiotics or crushed and suspended food can be administered by this method. Hydration can be accomplished by giving 3-5 cc's of fluid per minute via NG tube (180-300 cc's per hour).
**Triage & Mass Casualty Incidents (MCI)**

Triage, French for sorting, is the screening and classification of sick, wounded or injured persons during combat or other disasters. The goal is to determine the priority of needs and direct medical treatment where it will do the most good for the greatest number of patients. Triage is a dynamic process that is conducted whenever the number of patients exceeds the number of providers or the capacity for evacuation. Each patient is initially triaged and categorized then re-triaged at each level of care. Individual patients are re-evaluated periodically and may be re-categorized as their condition changes. Pararescuemen dealing with personnel recovery utilize 3 basic types of staging:

1. Initial Patient Contact
2. Patient Transfer Points
3. Casualty Collection Points

**Team Leader (TL) Responsibilities & Considerations:** The ultimate success of triage in a MCI is determined by the proper action of the TL. During a MCI the TL is the on-scene medical director, establishing a Casualty Collection Point (CCP). The TL is the "center of authority and direction," to whom all team members report their findings and requirements. The team leader then determines which patients have priority for transportation and allocates further resources to areas of greatest need. **Responsibilities and considerations of the TL include, but are not limited to:**

1. Dividing the MCI into sectors & assign team members to specific areas of coverage.
2. Insure no patient is missed and duplication of effort is avoided.
3. Establish the CCP & determine patient priority.
4. Limits of medical supplies and equipment and best location for backup supplies to allow general access.
5. Extent of means of transportation to definitive medical care.
6. Number of available medical facilities, their proximity to scene, and capability of each facility for handling patients.
7. Number of non-medical personnel available and how they can be best organized to function the most efficiently as litter bearers and prevented from interfering with proper medical treatment.
8. Communication control so that reports of the situation and requests for supplies, personnel and transportation are coordinated and consistent to avoid confusion and inefficiency.
9. Establishment of a central point for carrying out ongoing essential care and loading for transportation.

**Team Member Responsibilities:**

1. Extent of covered area (scan for number of patients, where patients may be hidden)
2. Set pattern for finding and evaluating patients so none are missed. **Note:** Patients with obvious life-threatening conditions should be approached first (e.g., respiratory distress, active bleeding).
3. Pt’s triage assessment should be completed in less than 60 seconds. **Note:** Remember: Life, Limb, Function, Cosmesis.
SEQUENCE OF ACTIVITY

1. VERBALIZE:

"Anyone that can walk, move over to the (designated location)."

2. REMAINING PATIENTS ARE TRIAGED ACCORDINGLY:

<table>
<thead>
<tr>
<th>EACH PATIENTS TRIAGE ASSESSMENT SHOULD BE COMPLETED IN LESS THAN 60 SECONDS</th>
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<tbody>
<tr>
<td><strong>CATEGORY I: IMMEDIATE (RED)</strong></td>
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<tr>
<td>Examples:</td>
</tr>
<tr>
<td>• Airway obstruction</td>
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<tr>
<td>• Flail chest</td>
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<tr>
<td>• Tension pneumothorax</td>
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<td>• Hemorrhage</td>
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| **CATEGORY II: DELAYED (YELLOW)**                |
| Examples:                                        |
| • Fractures                                      |
| • Soft tissue injuries w/out active hemorrhage   |
| • Head trauma                                    |
| • Open abdominal wounds                          |

| **CATEGORY III: MINIMAL (GREEN)**                |
| Examples:                                        |
| • Minor abrasions, burns, lacerations            |
| • Moderate anxiety                               |
| • Open/closed fractures w/out complications      |

| **CATEGORY IV: EXPECTANT* (BLACK)**              |
| Examples:                                        |
| • Massive head or spinal injury                  |
| • Third degree burns > 70% BSA                   |
| • Injuries incompatible with life                |

*Expectant category is ONLY used in combat operations. In peacetime, it is assumed that all patients have a chance of survival.

ADDITIONAL NOTES (MEDICAL PROCEDURES):
OPERATIONAL AND ENVIRONMENTAL EMERGENCIES

DIVING EMERGENCIES

GUIDELINES AND CONSIDERATIONS:
• Many of the following emergencies are first aid measures the diver should undertake himself. Insure your divers are familiar with these disorders and self-aid measures they can take prior to your arrival at the scene.
• Transport rapidly to nearest hyperbaric chamber at or below the pressure altitude of the point of departure. If possible administer 100% oxygen by demand-valve mask during transport.
  NOTE: Transportation by air at an altitude up to 200 feet above the point of departure may be entertained without major risk of worsening the symptoms, but should NOT be considered when ground transportation is readily available and would not take much longer.
• When in doubt consult your DMO/HMO/DMT.

DIVING OPERATIONS: NON-TRAUMA
1. In the case of a diving accident the victim and swim buddy will be brought on board the medic's boat. If the victim and swim buddy come up on the beach, medic will transit to beach.
2. Medic will administer 100% oxygen and perform a physical/neurological assessment to determine if treatment is required.
3. Diving supervisor will recall the divers. Once all divers are on the surface and off dive status, a muster will be taken and the diving supervisor releases medic to transport vehicle.
4. If medic determines that the diver requires recompression, the diving officer will contact the chamber to initiate primary chamber recall, and activate EMS (if available).
5. Medic administers medical treatment as necessary to stabilize victim for transportation. If patient needs to be brought to the beach, medic's boat can be beached.
6. Victim will be loaded into EMS vehicle if available. If EMS is not available in appropriate time span, the diving officer's vehicle will be used for transport to the recompression facility. Patient's swim buddy will accompany to the chamber.
7. Diving officer will accompany emergency vehicle to chamber. NOTE: The DMO will notify person Who stayed in area to contact chain of command and inform them of the situation.
8. Back at the dive site, all divers will be recovered by the boats left on the scene or can be directed to turtle-back (off dive status) to the beach. Gear will be loaded and divers transported from area.
9. Diving supervisor will contact the Diving Officer when all divers have been recovered and again when they have returned to the area.

DIVING OPERATIONS: TRAUMA
1. The victim and the swim buddy will be brought on board the medic's boat. If the victim and swim buddy come up on the beach, medic will transit to the beach.
2. Medic will administer 100% oxygen and perform physical exam to determine if treatment is necessary.
3. If medic determines that the victim has a life/limb/sight threatening injury, the diving officer will call 911 via cellular phone to contact EMS. Diving officer will inform operator of situation.
4. Diving supervisor recall divers.
5. Medic administers treatment to stabilize the victim for transport. If patient need to be brought to beach, medic's boat can be beached.
6. Victim will loaded into the EMS vehicle. If EMS is not readily available, the diving officer's vehicle will be used for emergency transport. When all divers are on the surface, off dive status, and a muster has been accomplished, the diving officer, medic, victim, and the swim buddy will transit to the appropriate facility or designated area by EMS.
**NOTE:** In cases requiring trauma care and recompression, transport patient to hospital with a chamber. This can be via ambulance or Life-Flight™ (or equivalent), depending upon patients condition. If Life-Flight™ is required, the diving officer will designate a qualified person to prepare the LZ.

7. Back at the site, all divers will be recovered by boat left on the scene, or will turtle-back off dive status to the beach.

8. Diving supervisor will contact the diving officer when all divers have been recovered and again when they have returned to the area.

**NOTE:** The diving officer will notify the chain of command to inform them of the situation.

### OPEN CIRCUIT DIVING EMERGENCIES

**PULMONARY OVERINFLATION INJURIES (POI):** Characterized by a sudden onset occurring immediately, during or after ascent (unconsciousness or other neurological symptoms within 10 min). Injuries include subcutaneous emphysema, mediastinal emphysema, pneumothorax and arterial gas embolism (AGE). May have respiratory arrest.

**Signs & Symptoms:** Crepitation and swelling of the neck, voice change, dyspnea, difficulty swallowing. Syncope, shock, shortness of breath, dizziness, blurred vision, vertigo, paralysis or weakness of extremities, loss of sensation and chest pain.

**NOTE:** Some patients with AGE may exhibit a ‘lucent interval’, where the symptoms will improve for a short time after initial onset. Do not delay evacuation in such cases.

**Treatment:**
1. ABCs / High flow O2 / IV NS/LR KVO
2. Begin resuscitation if required.
3. 100% O2 (or highest concentration available) via tight fitting aviator’s mask and demand valve.
4. If pneumothorax identified, treat accordingly.
5. Arrange for immediate evacuation and recompression.

**DECOMPRESSION SICKNESS (DCS):** DCS is usually seen after surfacing, with the majority of cases occurring within 3 hrs after completion of dive. Signs & Symptoms can occur immediately or after a sustained period, however onset of symptoms after 24 hours is highly unusual.

**DCS is Divided Into Type I and Type II:**
- Type I DCS usually affects the muscular-skeletal system (pain only), cutaneous system (rashes, hives, itching) or the lymphatic system (blotching, pain, discomfort).
- Type II DCS usually manifest itself in the joints or CNS.

**NOTE:** 15-30% of Type I DCS will progress to Type II if symptoms occur immediately after surfacing or if left untreated.

**Mechanical Effects of DCS are Divided Into Two Categories:** Intravascular and Extravascular.
- **Intravascular** effects of bubbles include blockage, pain and obstruction of blood supply.
- **Extravascular** effects cause pain, tissue distortion and disruption.

**Signs & Symptoms:**
- **Skin:** Localized or spreading prickly, itching, tingling or burning sensation; Rash and/or blotching.
- **Pain:** Pain in joints of arms and/or legs; Pain may grow in intensity, particularly with activity; Chest pain or SOB (The Chokes).
- **CNS:** Cranial Nerve deficits (vision, eye movements, smell, taste, hearing, speech); ear (The Staggers); hemiparesis, personality changes, amnesia, unconsciousness.
- **Spinal Cord:** Paraplegia, paresthesia, muscle weakness, bladder paralysis, urinary and fecal incontinence and radiating pain.

**CAUTION:** Chokes in the presence of DCS is a rare but grave sign. Most commonly seen in aviators from rapid decompression or from emergency ascents during saturation dives.
Treatment:
1. ABCs / High flow O2 / IV NS/LR KVO
2. Begin resuscitation if required.
3. 100% O2 (or highest concentration available) via tight fitting aviator’s mask and demand valve.
4. Perform a complete neurological exam.
5. Evacuate ASAP for recompression.

**BAROTRAUMA: ** **EAR SQUEEZE, MIDDLE EAR SQUEEZE, SINUS BAROTRAUMA, REVERSE SQUEEZE, DENTAL BAROTRAUMA**

**EAR SQUEEZE**
**Signs & Symptoms:** Pain not relieved by valsalva. Hemorrhage and/or edema in ear canal. In severe cases the tympanic membrane (TM) may rupture.
**Treatment:**
1. Stop descent and attempt to equalize.
2. If above fails: Ascend to shallower depth and attempt to equalize.
3. If above fails: Abort dive, clear obstruction and clear ear canal. Keep ear canal dry. No diving until ear is healed. No ear drops if TM ruptured. Consider antibiotics if damage to TM is moderate to severe.

**MIDDLE EAR SQUEEZE**
**Signs & Symptoms:** Ear feels full or blocked, tinnitus, pain (relieved immediately if TM ruptures), hemorrhage in middle ear or possible vertigo.
**Treatment:**
1. If in water, stop descent/ascent and return to comfortable depth. Continue as for ear squeeze.
2. Continue slowly until equalized or abort dive.
3. Decongestants. No ear drops if TM ruptured. Consider antibiotics if damage to TM is moderate to severe.

**SINUS BAROTRAUMA**
**Signs & Symptoms:** Pain over affected sinus on descent (pain will subside with equalization), blood or mucus from the nose on ascent.
**Treatment:**
1. Symptomatic pain relief.
2. Decongestants. Antibiotics if infected.

**DENTAL BAROTRAUMA**
**Signs & Symptoms:** Gum Abscess: Dull pain on ascent. Root Abscess: Dull pain on descent.
**Treatment:**
1. Analgesics PRN.
2. Dental repair.

**REVERSE SQUEEZE:** May be external ear, sinus or dental.
**Signs and Symptoms:** Sharp pain on ascent (pain is relieved by descending a few feet [bouncing]); bloody discharge in mask.
**Treatment:**
1. Bounce 5-10 feet as needed to relieve pressure.
2. Decongestants. No ear drops if TM ruptured. Consider antibiotics if damage to TM is moderate to severe.
CLOSED CIRCUIT DIVING EMERGENCIES

02 TOXICITY: PULMONARY AND CNS
Pulmonary: Results from long exposures to elevated O2 partial pressures characterized by lung irritation with coughing and painful breathing. Symptoms become increasingly worse as long as elevated levels of O2 are breathed.
CNS: Signs and symptoms may be convulsive or non-convulsive.
Convulsive:
1. Diver unable to carry on effective breathing.
2. Period of unconsciousness or CNS impairment following convulsion may be similar to AGE.
3. No attempt should be made to insert any object between the clenched teeth of the diver.
4. There may be no warning of an impending convulsion to provide the diver the opportunity to surface. Buddy lines are essential!
Non-Convulsive: May occur suddenly and dramatically. May have a gradual onset. Think VENTID:
Visual: Tunnel vision (a decrease in peripheral vision) or blurred vision.
Ear symptoms: Tinnitus.
Nausea and/or vomiting
Twitching: Generally involves the facial muscles, but can involve arms/legs.
Irritability: Change in diver’s mental status.
Disability: Sudden neurological deficit.

UNDERWATER CONVULSIONS
1. Assume position behind victim and release victims weight belt unless wearing a dry suit.
2. Leave mouthpiece in the victims mouth. If not in mouth do not attempt to replace it. If time permits switch mouthpiece to surface position.
3. Grasp diver around chest above Underwater Breathing Apparatus (UBA) or between the UBA and divers body. If difficulty in gaining control is experienced, use whatever means necessary.
4. Making a controlled ascent, maintain pressure on victim’s chest to assist exhalation.
5. If additional buoyancy is required, activate the victim’s life jacket. The rescuer should not release their weight belt or inflate their life jacket.
6. Once on the surface, inflate victim’s lifejacket, remove the victim’s mouthpiece and switch the mouthpiece valve to surface to prevent the rig from flooding and weighing the diver down.
7. Signal for emergency pick-up.
8. Once the convulsion has subsided open the airway by tilting the head back slightly.
9. Ensure breathing. Do rescue breathing if needed.

HYPERCARBIA (CO2 BUILDUP): Generally results from inadequate ventilation or failure of absorbent canister to remove CO2 from exhaled gas. May also result from flooding of the canister.
Prevention:
1. Perform dip test on UBA before dive.
2. Do not exceed canister duration limits for the water temperature.
3. Ensure one-way valves in the supply and exhaust hoses are present and work.
4. Swim at a relaxed and comfortable pace.
5. Avoid skip breathing-Skip breathing does not save gas in a closed circuit unit.
Signs & Symptoms:
1. Increased respiratory rate and depth of breathing.
2. Labored breathing
3. Headache
4. Confusion
5. Unconsciousness
NOTE: The presence of a high partial pressure of O2 may reduce the early symptoms of CO2 buildup. Elevated levels of CO2 may result in an episode of CNS toxicity on a normally safe dive profile.
Treatment:
1. Increase ventilation (if skip breathing is a cause) and decrease exertion level.
2. Abort dive, return to surface and breathe air.
3. **During Ascent**: While maintaining a vertical position the diver should activate the bypass valve to add fresh gas to his UBA. If related to canister flood out the vertical position will reduce chance of caustic cocktail.
4. If unconscious follow procedure for underwater convulsion.

**CAUTION**: If CO\textsubscript{2} toxicity is suspected the dive should be aborted even if symptoms dissipate at the surface. The decrease in symptoms may be a result of the reduction of partial pressure of CO\textsubscript{2} as the diver ascends and will reappear upon return to depth.

**HYPOXIA**: Caused by the partial pressure O\textsubscript{2} being too low to meet metabolic needs. In closed circuit diving, cause is the result of too much inert gas (nitrogen) in the breathing loop due to an inadequate purge.

**Signs & Symptoms:**
1. Frequently no warning signs prior to loss of consciousness.
2. Other symptoms include confusion, uncoordination, dizziness and convulsions.

**NOTE**: If symptoms of unconsciousness or convulsions occur at the beginning of a closed circuit dive, hypoxia, not O\textsubscript{2} toxicity is the most likely cause.

**Treatment:**
1. If unconscious or incoherent at depth the dive buddy should add O\textsubscript{2} to the stricken diver’s UBA.
2. Bring diver to the surface. Remove mouthpiece and allow diver to breathe fresh air. If unconscious, check breathing and circulation, maintain an open airway and administer 100% O\textsubscript{2}.

**CHEMICAL INJURY**: The introduction into of a caustic alkaline solution into the upper airway is the result of water leaking into the canister and coming in contact with CO\textsubscript{2} absorbent. Generally occurs when diver is in a horizontal or head down position.

**Signs & Symptoms:**
1. Rapid breathing or headache related to buildup of CO\textsubscript{2}.
2. Choking, gagging, foul taste and burning of the mouth and throat, will begin immediately.

**Treatment:**
1. Immediately assume an upright position.
2. Depress the manual bypass valve continuously and make a controlled ascent to the surface, exhaling through the nose to prevent over-pressurization.
3. Should signs of system flooding occur during underwater purging, abort the dive.
4. Rinse mouth out several times with fresh water. Several mouthfuls should then be swallowed. If only seawater is available, rinse mouth, do not swallow.

**NOTE**: Do not use acid solutions or induce vomiting. Uncontrolled ascent is common. Monitor for AGE.
RAPID FIELD NEUROLOGICAL EXAMINATION: This examination is designed to detect suspected problems in the CNS and serves as a monitor for changes in neurological functions resulting from DCS or POI’s. The exam should be conducted on any diver who experiences pain, discomfort, alteration in sensation or body function, or any other symptom within 24 hours of completion of a dive. The exam should be repeated every 30-45 minutes and if a diver’s condition deteriorates.

Neurological Examination Checklist

Patient's Name: ______________________ Date/Time: __________
Description of Symptoms: ________________________________

Patient History
Type of dive last performed? _____ Depth? _______How long? ________
Number of dives in last 24 hours? ______
Was symptom noted before, during, or after dive? ______
If during, was it while descending, on the bottom, or ascending? _______________
Has symptom increased or decreased? __________
Have any other symptoms developed? __________
Has pt had a similar symptom before? _____ When? ________________

Has pt ever had DCS or air embolism before? ______ When? ________________

Mental Status Examination:
1. Is patient orientated to time, place, person, and recent events?
2. Evaluate speech for clarity and appropriateness.

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<th>STRENGTH (1-5 scale)</th>
<th>REFLEXES (1-4 Scale)</th>
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<pre><code>                          | Shoulder:            |                     |
                          | Ankle:               |                     |
                          | Toes:                |                     |
</code></pre>

Sensory Exam: Normal light touch/pressure sensation to: Fingers, hands, forearm, upper arm, legs, toes and trunk. (see dermatome chart, page 43).
## Table 9-5, Navy Diving Manual:

**Required Surface Interval Before Ascent to Altitude After Diving**

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**Exceptional Exposure:**

- Wait 48 Hours Before Flying

**Note 1:** When using Table 9-5, use the highest repetitive group designator obtained in the previous 24-hour period.

**Note 2:** Table 9-5 may only be used when the maximum altitude achieved is 10,000 feet or less. For ascents above 10,000 ft, consult NAVSEA 00C for guidance.

**Note 3:** The cabin pressure maintained in commercial aircraft is maintained at a constant value regardless of the actual altitude of the flight. Though cabin pressure varies somewhat with aircraft type, the nominal value is 8,000 ft. For commercial flights, use a final altitude of 8,000 ft to compute the required surface interval before flying.

**Note 4:** No surface interval is required before taking a commercial flight if the dive site is at 8,000 ft or higher. In this case, flying results in an increase in atmospheric pressure rather than a decrease.

**Note 5:** No repetitive group is given for air dives with surface decompression on oxygen or air. For these surface decompression dives, enter the standard air table with a sea level equivalent depth and bottom time of the dive to obtain the appropriate repetitive group designator to be used.

**Note 6:** For ascent to altitude following a non-saturation helium-oxygen dive, wait 12 hours if the dive was a no-decompression dive. Wait 24 hours if the dive was a decompression dive.

**Note 1:** For Non-Special Tactics personnel, flying after diving rules are as follows:
- Do not fly for 24 hours after a no-decompression dive.
- Do not fly for 48 hours following a decompression dive.

**Note 2:** Special Tactics flying after diving regulations reflect the current recommendations for flying after diving in the US Navy Diving Manual. As per AFSOC Policy, the flying after diving rules for Pararescue and Combat Controllers assigned to Special Tactics Teams is given in Table 9-5, Navy Diving Manual. **Exception:** Flying is allowed immediately after a 100% oxygen (LAR-V) dive, if no other breathing mixture was used.

**Caution:** These rules apply for OPERATIONAL MILITARY DIVES ONLY. Longer surface intervals before flying are safer, and should be used in training and recreational dives.
**ADDITIONAL NOTES (DIVING):**

USAF/SAM, Hyperbaric Medicine Division, San Antonio, TX
Commercial: (512) 536-3278 (LEO-FAST).
During Duty Hours: DSN 240-3881.
After Duty Hours: DSN 240-3278.
http://www.brooks.af.mil/web/hyper/

Travis AFB Hyperbarics: DSN 799-3987 or Commercial (707) 423-3987.

Diving Alert Network (Duke University): (919) 684-8111
http://www.diversalertnetwork.org/

**Submersion Injury (Near-drowning):** Injuries due to immersion are mainly due to hypoxia: The most critical action in any submersion injury is to provide: Airway, Breathing and Oxygen.

**Treatment:**
1. Open the airway, provide ventilations with 100% oxygen. Occult C-Spine injuries are relatively common in persons diving into shallow water: **Protect the C-Spine.**
2. CPR if no pulses.
3. Vomiting is common, be prepared to suction the airway.
4. If unconscious, intubate ASAP.
5. ACLS at earliest opportunity.
6. Evacuate ASAP.
7. In cases of hypothermic submersion injury, successful resuscitation may be accomplished even after prolonged submersion, especially in small children. Continue resuscitation until directed to stop by medical control.
8. If patient recovers during resuscitation evacuate with close observation.
9. **ALL** patients with submersion injuries must be evaluated by a physician prior to being released from care. Delayed symptoms, such as pulmonary edema may occur up to 12-24 hours after submersion injury.
10. There is no functional difference between fresh and salt water aspiration, both will cause pulmonary edema and hypoxia.
11. Use of Positive End Expiratory Pressure (PEEP) in an intubated patient, or a PEEP mask is approved, if available. Amount of PEEP should be directed by medical control.

**HIGH ALTITUDE ILLNESS (AMS, HACE, HAPE)**
### Acute Mountain Sickness (AMS) Mild, Moderate, Severe:

**Guidelines and Considerations:**
- An acute illness characterized by headache, fatigue, loss of appetite, dehydration and irritability.
- Usually occurs with rapid unacclimatized ascent from below 5,000 ft to above 8,000 ft, although abrupt ascent to very high or extreme altitude can also induce it.
- Incidence and severity of AMS can depend on speed of ascent, altitude attained, time at altitude, level of exertion at altitude and individual susceptibility.

**Signs & Symptoms:** Headache, fatigue, loss of appetite, dizziness and irritability (symptoms frequently mimic a bad hangover). Dry cough is common. Dyspnea at rest is not common and frequently precedes or indicates High Altitude Pulmonary Edema (HAPE).

**Caution:** Ataxia is not common with AMS alone: A person who has AMS and ataxia probably has High Altitude Cerebral Edema (HACE) and requires urgent evacuation to a lower altitude.

**Mild AMS:** Headache, anorexia, nausea and malaise.

**Moderate AMS:** Severe headache, vomiting, decreased urine output.

**Severe AMS:** Dyspnea at rest, ataxia, decreased level of consciousness and +/- pulmonary rales.

**Treatment:**
**Mild AMS:** Descend minimum of 1000 ft., rest and acclimatize. **Diamox**, 250mg b.i.d. or 500mg QD (sustained release form). Mild analgesia (Tylenol) for headache or phenergan if significant nausea.

**Moderate AMS:** Descend immediately a minimum of 1000 ft. Oxygen 2-4 LPM by mask. **Acetazolamide** as above. Consider **Decadron**, 4 mg, PO, IM or IV q. 6 hrs (does not speed acclimatization, but will reduce symptoms). Hyperbaric therapy (Gamow bag or equivalent) if descent is delayed or impossible.

**Severe AMS:** Same as for moderate, but **IMMEDIATE** descent is mandatory. If descent is delayed, hyperbaric therapy while awaiting descent or evacuation.

**Note 1:** DO NOT use sleeping medication or other sedating drugs to treat sleep disturbances at altitude. Use of these medications is thought to increase the incidence of HACE. Sleep disturbances usually resolve with proper acclimation. **Acetazolamide** may be helpful.

**Note 2:** **Diamox** (acetazolamide), a carbonic-anhydrase inhibitor/diuretic, can speed acclimatization to altitude and decrease symptoms of AMS. The dose is 125-500 mg q. 24 hours, preferably starting 1-2 days prior to ascent, and continuing for at least one day after ascent. This is a sulfabased medication, and should not be given to patients allergic to sulfa.

**Note 3:** **Decadron** (Dexamethasone) 4 mg PO, IM or IV q. 6 hours may prevent AMS if deployment to altitude is required without time for acclimatization. Note this does NOT speed acclimatization, but reduces the symptoms of AMS. Best used in quick in/out operations where altitude exposure is transient.

**High Altitude Cerebral Edema (HACE):** A severe form of AMS characterized by alterations of consciousness, ataxia, confusion, drowsiness, stupor, coma and death. Progression from AMS to
HACE usually occurs over 12-72 hrs. HACE and High Altitude Pulmonary Edema (HAPE) can and frequently do appear at the same time in the same patient. **CAUTION:** A person who has symptoms of AMS and develops an altered mental status or ataxia is most likely in the early stages of HACE and requires immediate treatment. **Signs & Symptoms:** Similar to severe AMS. Ataxia, confusion, impaired mentation and severe lassitude. Patients with AMS who are not improving within 24 hours should be suspected of having early HACE. **CAUTION:** A person with AMS who develops ataxia most likely has early HACE, and needs emergency descent. **Differential Diagnosis:** Hypothermia, carbon monoxide poisoning, stroke, HAPE. **Treatment:** Emergency descent by a minimum of 1000 ft but preferably more (the lower the better). Hyperbaric bag while awaiting descent or evacuation. Oxygen 2-4 LPM by mask. If an IV is started, run at KVO. **Decadron**, 4 mg PO, IV or IM every 6 hrs. **WARNING:** Do not delay descent while awaiting evacuation. If possible, have evacuation aircraft meet you at a lower elevation.

**Hight Altitude Pulmonary Edema (HAPE) Mild, Moderate, Severe:** HAPE is more common in young and healthy individuals, usually occurring 2-4 days after getting arriving at altitude, and most commonly on the second night at altitude. Rarely occurs below 8,000 ft. An individual that does not seem to be acclimatizing to altitude, or has AMS symptoms increasing after being on the mountain for 36 hrs or more, must be suspected of having HAPE.

**Signs and Symptoms:**

- **Mild HAPE:** Dyspnea on exertion, easily fatigability, especially with uphill travel, +/- rales in lung bases.
- **Moderate HAPE:** Dyspnea, weak, fatigue with travel on level ground, raspy cough, possible nail bed cyanosis, headache, decreased appetite, +/- rales (usually bilateral).
- **Severe HAPE:** Dyspnea at rest, productive cough (frothy, occasionally blood tinged sputum), extreme weakness, orthopnea, cyanosis, rales.

**Differential Diagnosis:** Bronchitis, pneumonia, asthma, AMS, HACE.

**Treatment:** Oxygen, high flow if possible. Immediate emergency descent. Hyperbaric bag if not able to descend immediately.

**NOTE:** Use of Lasix and/or Morphine in HAPE is controversial, **DO NOT** use without direct physician order.

**CAUTION:** The definitive treatment for HAPE is descent to lower altitude. **Descend as soon as the diagnosis is suspected.**

**Use of Nifedipine in HAPE:** Use of the calcium-channel blocker, nifedipine, has been advocated as an adjunct treatment for HAPE. While it appears to be effective, this medication has significant side effects, most notably severe hypotension which may preclude ambulation. **Dose of nifedipine is 10 mg sublingually, followed by 30 mg of the slow-release formulation every 12-24 hours, or 10 mg sublingually every 4 hours, titrated to response.** Do not use this medication without direct physician order. **Nifedipine is an adjunct for treatment of HAPE and does not substitute for oxygen and descent.**

**UV Keratitis (Snow Blindness):** Ultraviolet burn of the cornea caused by intense UV and reflected UV light at altitude. Can also be caused by prolonged exposure to UV light in an arctic/snow environment.

**Signs & Symptoms:** Pain to the eyes (feels as if there is sand in the eyes), usually starting 4-6 hrs after UV exposure. Light sensitivity, tearing, and headache.

**Differential Diagnosis:** Foreign body in eyes, conjunctivitis, acute close-angle glaucoma, iritis.

**Treatment:** Usually a self-limiting problem resolving within 12-24 hrs. Remove contact lenses if
present. Eyes will be very sensitive to light. Protect from light to tolerance. Oral medications for pain control. 

**Prevention:** Wear sunglasses with good UV blocking lenses, preferably with side shields.

**Additional Notes (High Altitude Injuries):**
COLD WEATHER OPERATIONS

GUIDELINES AND CONSIDERATIONS

Individual Related Risk Factors: Characteristics that are generally accepted to be risk factors for cold injury include: Fatigue, alcohol use, dehydration, inadequate nutrition, lack of cold weather training and experience and tobacco use.

- Some of the individual risk factors for cold injury are common consequences of operating in the field. Fatigue, inadequate nutrition and dehydration are encountered in every deployment. Assuring adequate rest, complete consumption of meals and forced hydration, controls these factors.

Environmental Risk Factors: Cold exposure can occur on land, in water or in aircraft. Cold land environments are generally classified as either wet-cold or dry-cold.

- Wet-cold environments have ambient temperatures above freezing to about 60° F with wetness ranging from fog to heavy rain and are associated with non-freezing peripheral injuries, such as trench foot. Usually, many hours to days of exposure are required to cause injury.
- Dry-cold environments have ambient temperatures below freezing. Precipitation, if present, is in the form of dry snow. Dry-cold environments are associated with freezing peripheral injuries, which can develop in a few minutes to hours.

FROSTBITE (1ST, 2ND, 3RD, 4TH DEGREE): Frostbite is the most common cold induced injury encountered in the field. Clusters of cases occur during cold weather operations, frequently from poor planning or inattention.

Clinical Manifestations: Initially, all frozen tissue has the same appearance: Cold, hard and bloodless. Digits, ears and exposed facial skin are the most commonly injured areas.

1st Degree:
1. Limited in extent involving skin that has had a brief contact with very cold air or metal.
2. Skin is initially white, thaws quickly becoming wheal-like, red and painful.
3. Area may become edematous but will not blister.

2nd Degree:
1. Initial appearance as 1st degree.
2. Freezing involves deeper layers of skin and occurs with prolonged exposure.
3. Limitation of motion appears early.
4. Thawing is rapid with return of mobility and appearance of pain.
5. Blisters form over the affected area.
6. Cold sensitivity may persist.

3rd Degree:
1. Initially the frozen tissue is stiff and restricts mobility.
2. After thawing, mobility is restored briefly, but the affected skin swells rapidly and bloody blisters develop.
3. Significant skin loss follows thawing through mummification and sloughing.
4. Residual cold sensitivity is common.

4th Degree:
1. Frozen tissue has no mobility.
2. Thawing restores passive mobility, but the intrinsic muscle function is lost.
3. Skin perfusion is poor.
4. Blisters and edema do not form.
5. Affected area shows necrotic changes.
6. Significant permanent anatomic and functional loss is the rule.

Management:
1. Early detection is essential in cold injury management.
   - Frostbite injuries are insidious. Injured tissue, which was painful while getting cold, is anesthetic when frozen and is often covered by a glove or boot.
2. Protect injured area from further exposure and trauma by the best means available.
3. Active warming of frozen tissue should be deferred until there is no risk that the tissue will be re-exposed to freezing cold.
   - Refreezing a frostbite injury aggravates the injury so severely that current practice recommends that frozen parts not be actively re-warmed until protection from refreezing can be assured.
   - The frozen part should not be deliberately kept frozen by packing in snow or continued cold exposure.
4. Expeditious evacuation and protection of the patient is required.
5. If refreezing can be prevented, the frozen tissue may be warmed passively by placing injured area in groin or axilla, however active rewarming is the preferred treatment, if possible.
   - Active rewarming is best accomplished by immersing the frostbitten tissue in warm water (102-103°F). The tissue must not be exposed to temperatures in excess of 102-103°F.
   - Rewarming is very painful. Morphine may be required for pain control.
6. Every frostbite casualty must be thoroughly examined for hypothermia, traumatic injuries, dehydration and hypovolemia.
7. Dry bulky dressing to the rewarmed area. Splint prn. With hand injuries, splint in position of function (beer-can or duckbill splint). Make sure that the fingers are separated with kerlex or 4X4’s.
8. Give Motrin, 400 mg PO every 8-12 hours (for prostaglandin inhibition, not necessarily for pain control). Topical aloe vera gel (if available) may be applied to the skin for topical prostaglandin inhibition.
9. If blisters form, leave intact. If the blisters rupture, cover with antibiotic ointment and apply a bulky dressing.

**Non-freezing Cold Injury:** Non-freezing cold injury results from prolonged exposure of the extremities to wet-cold, but above freezing conditions. The feet are the most common areas of injury: Trench Foot and Immersion Foot. Trench foot occurs during ground operations and is due to the combined effects of sustained cold exposure and restricted circulation. Immersion foot is caused by continuous immersion of the extremity in water. **In both cases, the key to prevention is to clean and dry the feet, and put on dry socks at least once every 24 hours.**

**Clinical Manifestations:** The injured tissue is pale, anesthetic, pulseless and immobile, but not frozen. Trench foot or immersion foot can be diagnosed when these signs do not change after re-warming. The skin is frequently macerated and slightly edematous.

**Note:** Initially, despite rest and warmth, the injured part remains pale, anesthetic and pulseless. After several hours, a marked redness develops associated with severe burning pain and reappearance of sensation proximally, but not distally. Edema and large blisters develop in the injured areas as blood flow returns. Persistence of pulselessness in an extremity after 48 hrs suggests severe deep injury and high probability of substantial tissue loss.

Management
1. First essential of management is detection.
2. Foot inspection and care every eight hours under cold-wet conditions and **dry socks!**
3. If suspected, priority evacuation is appropriate.
4. Patient must be moved by litter and extremity protected as in frostbite.
5. Dry covering of injured part and protection from cold may permit spontaneous re-warming.
6. If warming does occur, severe pain will develop, provide adequate pain relief.
7. **CAUTION:** Do not massage the injured area.

**HYPOTHERMIA (MILD, MODERATE, SEVERE):** Hypothermia is the clinical syndrome that results from reduced core temperature. By definition, hypothermia is considered to be present when the core temperature is below 95°F. Hypothermia is the result of loss of heat to the environment in excess of the rate of heat production by the body. Operationally, hypothermia occurs as the result of either immersion in cold water or prolonged exposure in cold-wet ground environments.

**Mild Hypothermia:** Temperature between 90-95°F. Patient usually retains the ability to rewarm spontaneously and does not develop cardiac problems. Mental processes slow, errors in judgment are common! Shivering is common. **NOTE:** Bradycardia with PVC’s may occur, however this is physiologic and does not require treatment.

**Moderate Hypothermia:** Temperature above 86°F. Patient exhibits shivering, may be lethargic and dulled mentally, but is some cases may be fully orientated. Muscles may be stiff and uncoordinated, causing the patient to walk with a stumbling, staggering gait.

**Severe Hypothermia:** Temperature less than 86°F. Patient may be disorientated and confused and may proceed to stupor and coma. Shivering will stop and physical activity becomes uncoordinated. Muscles may be stiff and rigid. Significant cardiac arrhythmias may develop. **CAUTION:** If the patient appears cold and is not shivering, the patient has severe hypothermia until proven otherwise by measurement of body core temperature.

**Treatment: Mild to Moderate Hypothermia**
1. Remove all wet clothes.
2. Protect against heat loss and wind chill.
4. Avoid rough movement and excess activity.
5. Monitor core temperature.
6. Add heat preferentially to the patient's head, neck, chest and groin.
7. Oxygen, if available, 100% by mask. Heated, humidified oxygen, if available.
8. Provide warm oral fluids, and sugar sources **AFTER** uncontrollable shivering stops and the patient exhibits evidence of rewarming.

**Treatment: Severe Hypothermia with Vital Signs**
1. Same as mild to moderate.
2. Establish an IV of NS at 75cc/hr (warmed).
3. Heated, humidified oxygen, if available.
4. Evacuate ASAP.
5. Some hypothermia protocols (i.e., State of Alaska) suggest a fluid bolus of 10 cc/Kg of NS, followed by 5 cc/Kg/hour of NS. This is appropriate if there is no evidence of internal bleeding.

**Treatment: Severe Hypothermia with No Vital Signs**
1. Assess pulse and respiration for 1-2 min.
2. If pulse and respiration are absent, begin CPR.
3. Observe the cardiac rhythm. If VF, defibrillate immediately.
4. Ventilate with warmed humidified oxygen, if available.
5. Establish IV access and administer warmed saline.
6. Measure rectal (core) temperature.
7. **If temperature greater than or equal to 86°F:** Continue CPR and give resuscitative medications as indicated (but at longer intervals). Repeat defibrillation as temperature warms.
8. **If temperature is less than 86°F:** Continue CPR, withhold IV resuscitation medications, limit shocks to a maximum of three, and evacuate.
9. Rewarming should not be attempted in the field unless the patient is more than 30 minutes from definitive care.

**Immersion Hypothermia:** A subset of hypothermia, immersion hypothermia (hypothermia caused by immersion in cold liquid) has several unique aspects that must be taken into account:

- Immersion hypothermia rarely causes death by itself. The usual mechanism of death involves systemic hypothermia to the point where the victim is unable to keep their airway above water, followed by drowning.

**WARNING:** Immersion hypothermia victims must be hoisted out of the water in a horizontal position, to avoid a potentially-fatal drop in blood pressure. Use a vertical hoist only if a horizontal hoist (i.e. litter hoist) is tactically unsafe or unavailable. Once in the rescue vehicle, the victim should be kept supine. As with any hypothermia victim, it is vital to handle the victim as gently as possible to avoid provoking cardiac arrhythmias.

- Survival after prolonged submersion in cold water (submersion times up to an hour) has been reported, although it is not common. This usually requires sudden submersion in very cold water (usually 45°F or below), and appears to occur mainly in children. Airway submersion times of greater than 60 minutes are almost certain to be fatal, regardless of water temperature.

- **Immersion Syndrome** is a sudden cardiac arrest caused by massive vagal stimulation as a result of immersion in very cold water. This occurs within seconds of immersion. Rapid retrieval from the water and immediate CPR may save victims of this syndrome.

- The **gasp reflex** also can occur on sudden immersion in very cold water. This is an involuntary reflex gasp, followed by several minutes of hyperventilation. During this time, it will be very difficult for a victim to perform any self-rescue or survival procedures. Victims who are not wearing flotation are likely to have serious problems keeping their airway above water.

**Additional Notes (Cold Weather Operations):**
HEAT INJURIES

GUIDELINES AND CONSIDERATIONS: Heat injury is usually the result of inadequate fluid intake, poor acclimatization, increased workload or a combination of factors. PREVENTION OF HEAT INJURY IS THE RESPONSIBILITY OF ALL OPERATORS. Proper acclimatization, proper hydration, good work/rest schedules and proper nutrition go a long way to prevent heat illness. However, even with ideal circumstances, heat injury can occur. When working in hot environments, it is imperative to use the buddy system, and keep a close eye on your buddy.

- The microclimate (shade, humidity, wind, air circulation, body armor, MOPP gear etc) in the immediate working area may significantly alter heat stress conditions from one area to another.
- It is imperative to keep close tabs on your buddy when operating in high heat stress conditions.
- Forced hydration (1-2 quarts of water per hour) may be necessary in high heat stress conditions, along with rest breaks and adequate food intake. Full-strength sports drinks (Gatorade®, Power Aide®, etc) and sodas are too concentrated for adequate hydration. If sports drinks are available, they should be diluted 50/50 with water. Sodas should not be used for hydration!

Note 1: The GI tract of a normal adult can absorb approximately 20 cc’s of fluid per minute. Cool (but not cold) liquids are absorbed better than warm fluids. It is best to stay hydrated by taking small amounts of fluid frequently (10-20 cc’s every 1-2 minutes) than attempt to ‘catch up’ by drinking a liter or two of fluid every hour.

Note 2: Heat exhaustion and heat stroke are a continuum of heat disorders, rather than distinct clinical entities. In the setting of heat illness, any patient with CNS dysfunction should be assumed to have heat stroke until proven otherwise. The presence of sweating in a heat illness victim DOES NOT rule out heat stroke.

HEAT CRAMPS

Signs & Symptoms: Acute cramping pain, usually in legs and arms, nausea, dizziness. No alteration of consciousness. Treatment: Rule out heat stroke. Rest in shade, drink fluids with electrolytes, gradual return to activity with frequent rests until acclimated.

HEAT EXHAUSTION

Signs & Symptoms: Headache, nausea, vomiting, dizziness, anorexia, cramps and/or malaise. Body temperature normal or slightly elevated. MENTAL STATUS NORMAL.

Treatment: Oral fluids if patient can tolerate them, IV hydration with normal saline if not. Rest in cool area. Hydration should be continued until urine is completely clear.

HEAT STROKE

Signs & Symptoms: Bizarre behavior, confusion, delirium, ataxia, seizure and/or coma. Altered mental status in the setting of heat illness is heat stroke until proven otherwise. Body core temperature usually above 105° F. ALTERATION OF MENTAL STATUS.

Treatment: Cool patient by any means available (spraying liquid on patient and fanning him; immersion in water; cool packs to neck, axilla and groin.). Maintain airway and breathing control as needed. IV with NS or Ringers is indicated. If hypotension is present, give 10 cc/Kg bolus of NS/Ringers, and re-evaluate. Continue IV hydration until urine is clear. Monitor fluid intake and output. WARNING: Heat stroke is a true emergency and requires emergency evacuation ASAP.
**WATER INTOXICATION/HYponatREMIA (LOW SODIUM IN THE BLOOD)**

**Signs & Symptoms:** Similar to heat exhaustion, except that the patient usually has a history of forced hydration with large amounts of water (1-2 liters/hour) combined with high heat load conditions and lack of adequate salt intake from food. Patients have usually been urinating clear or near-clear urine. History of adequate water intake with poor food/electrolyte intake is the hallmark of this disorder. Prevented is aimed at consuming adequate food while in the field or by using electrolyte replacement drinks. Full-strength sports drinks (Gatorade®, Power Aide®, etc) contain too much carbohydrate for proper absorption and adequate hydration. If sports drinks are available, they should be diluted 50/50 with water.

**Treatment:** If the patient is able to drink fluids, administer small amounts of electrolyte replacement drinks (oral rehydration salts or diluted sports drinks.) frequently. The GI tract can absorb only about 20cc’s of fluid per minute (1200cc/hour), so giving 10cc’s of fluid every 30 seconds is the max oral intake. If the patient is unable to drink, start an IV with normal saline, give a 5cc/Kg fluid challenge over 15 minutes, repeat as necessary.

**NOTE:** This is for treatment of acute exertional hyponatremia only, NOT for treatment of long-standing hyponatremia (usually the result of long-term psychogenic water over consumption, use of diuretic medications or endocrine disease). If long-standing hyponatremia is present start an IV of normal saline at baseline rate and contact medical control.

**LIGHTNING INJURY**

**Prevention:** Avoid being the tallest object in an open area. Do not take shelter under single tall trees or next to metal/conducting objects. Stay clear of antennas/radios during thunderstorms. Inside an enclosed vehicle is relatively safe. Seek shelter in a grove of trees if possible. If caught in the open, crouch low with feet together. Team should spread out so a single strike will not hit all team members (hand grenade rules).

- Victims may be confused, paralyzed (especially lower extremity paralysis), have fluctuating blood pressure, be unconscious but have vital signs or be in cardiopulmonary arrest. Other injuries can include ruptured TM's, temporary blindness or deafness, altered mental status or have amnesia. Most symptoms will resolve by themselves over hours to days.

**NOTE:** Victims of lightning strike ARE NOT electrically charged and may be touched immediately after injury.

**CAUTION:** Remember scene safety: Lightning DOES strike twice in the same place.

**Treatment:**
- **Single Casualty:** CPR and ALS as required. Dress any burns and evacuate ASAP.
- **Multiple Casualties:** REVERSE TRIAGE (treat the most seriously injured/apparently dead personnel FIRST, rather than last). Patients who are awake, able to move or talk will likely survive. Patients in cardiopulmonary arrest may only need 1-2 minutes of CPR to regain pulse and respirations. Treat any blast injuries or burns and evacuate ASAP.

**ADDITIONAL NOTES (HEAT INJURIES):**
VENOMOUS INJURIES

REPTILES

GUIDELINES AND CONSIDERATIONS:

- There are five venomous snake families:
  1) Crotalidae. Uses hemotoxic venom. Includes all pit vipers (rattlesnake, copperhead, cottonmouth, etc.)
  4) Viperidae. Uses hemotoxic venom. True vipers. Includes puff adders, vipers and desert adders.

- The majority of snakebite victims survive.
- Not all bites from poisonous snakes involve injection of venom: Up to 50% of cobra bites and 30% of rattlesnake bites are ‘dry strikes’, meaning no venom is injected.
- Operators should be familiar with the types of venomous snakes found in their area of operation, and the recommended field treatment of bites.

**NOTE 1:** All snake venoms (and some large breed lizards) contain components that are neurotoxic and hemotoxic. You will see neurotoxic reactions to primary hemotoxic venoms and hemotoxic reactions to primary neurotoxic venoms.

**NOTE 2:** Bites from large breed lizards (Gila Monster, Komodo Dragon, Monitor, etc) carry a high incidence of infection. Debride aggressively and administer antibiotics.

**WARNING:** Snakebite is a true emergency, requiring fast action and emergency evacuation of the victim.

HEMOTOXIC ENVENOMATIONS: Most common with pit vipers (rattlesnakes, copperheads, cottonmouth moccasins, Fer-de-Lance and Bushmaster) and old world vipers.

**Signs & Symptoms:** Swelling and blistering at bite site; muscle fasciculation, weakness and syncope; nausea & vomiting; chills, hypotension, lymphangitis, and respiratory distress may occur; GI and GU bleeding may occur; **Bite site tends to ooze blood constantly.** Moderate to severe pain at the bite site, starting within a few seconds of the bite; perioral numbness and tingling; metallic taste in the mouth may occur.

NEUROTOXIC ENVENOMATIONS: Most common in bites from Elapids (cobras, coral snakes, kraits), sea snakes, and most snakes found in Australia.

**Signs & Symptoms:** Mild pain or painless bite site; Numbness or tingling of bite site; perioral numbness and metallic taste in mouth may occur. Muscle weakness, uncoordination, fasciculation’s; difficulty in swallowing and speaking may occur; Visual disturbances, ptosis, respiratory distress, hypotension and convulsions may occur. Respiratory paralysis may occur.

**NOTE:** Neurotoxic symptoms may take hours to appear and then progress rapidly.

**Treatment:**

1. **Extractor Pump:** The extractor pump (NSN 6545-01-281-1237) is known to be effective in pit viper envenomations and is likely to be effective in elapid envenomations, removing up to 30% of the injected venom load. It should be applied to the bite site as soon as possible after the bite (Pump is most effective if applied within 3 minutes). Empty the bell of the pump as it fills with fluid, and re-apply. Continue for 30-60 minutes.

**NOTE 1:** No incisions should be made.

**NOTE 2:** Mouth or rubber bulb suction is NOT a substitute for an extractor pump.
2. **Compression/Immobilization** (Used for neurotoxic-predominant bites): Apply an ace wrap and splint to the bitten extremity. Wrap proximal to distal and slightly tight. Wrap so the extractor pump/bite site is accessible. Do not remove wrap until at a medical facility.

3. **Proximal Constriction Band** (Used for hemotoxic-predominant bites): Use a 1” wide penrose drain or similar wide band. Place above the bite site, just tight enough to indent the skin (should be loose enough to slip one finger between the band and skin). Check proximal pulses frequently. If the band becomes too tight as a result of swelling, place a second band above the first before releasing the first band. Once a constriction band has been placed, do not remove until at a medical facility. **NOTE**: This is not a tourniquet!

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**UNIVERSAL SNAKE BITE FIRST AID PROTOCOL**

- Calm & reassure the victim
- Examine snake if examination can be accomplished safely
- Remove all constricting jewelry & clothing
- Apply extractor pump

Determine type of snake or evaluate clinical SxS

**ELAPID**

- Sea snake
- Coral snake
- Cobra
- Unknown snake with no significant local pain

- Compression/immobilization
- Splint at heart level

**PIT VIPER**

- Rattlesnake
- Copperhead
- Water moccasin
- Unknown snake with significant local pain

- Proximal constriction band
- Splint at heart level

- Support respirations as needed
- Start IV NS in unaffected extremity
- Monitor patient closely
- Evacuate ASAP
**Bees, Wasps, Hornets and Ants**

**Signs & Symptoms:** Initially will experience burning pain later followed with itching. If allergic, symptoms of anaphylactic reaction may develop. **Locally** reaction includes redness and swelling at site of bite. **Systemic** reaction occurs due to an allergic response: wheezing, urticaria, abdominal cramps, generalized edema, nausea, vomiting, dizziness, hypotension, confusion, and anaphylactic type reaction.

**Treatment:**
1. Local Reaction:
   a. If stinger is present: remove by scraping.
   b. Wash site with soap and water.
   c. Apply cold compress.
   d. Antihistamines may be useful if not contraindicated
2. Systemic Reaction: See Allergic Reaction/Anaphylaxis, page 115

**Arachnid and Arthropod Bites and Stings**

**Note:** This list is not inclusive. Investigate those types that are specific to your operation location and consult with a qualified medical officer for specific treatment.

**Scorpion Envenomation**

**Signs & Symptoms:** Local erythema and swelling may or may not be present. There can be increased sensitivity to the area, along with numbness and weakness. Multiple symptoms may develop to include anxiety, restlessness, muscle spasm, nausea, vomiting, excessive salivation, sweating, itching of the nose and throat, hyperthermia, blurred vision, pseudoseizures, hypertension, hemiplegia, syncope, cardiac arrhythmias, or respiratory distress. Symptoms can occur over 24 hrs, or respiratory arrest can occur within 30 min.

**Note:** The less dangerous the species, the more local the reaction will be. The more dangerous the species, the less the local reaction will be.

**Treatment:**
1. Ice application to the area.
2. IV access in unaffected extremity.
3. Monitor airway, breathing and circulation.
4. Arrange for immediate evacuation if possible.
5. IV Diazepam can be given to control seizures and muscle spasm.

**Caution:** Narcotic analgesics and barbiturates have been reported to increase the toxic effects of some scorpion venoms. Consult with medical control before using medications this type in scorpion envenomation.

**Black Widow Spider Envenomation**

**Signs & Symptoms:** Pinprick sensation followed by minimal swelling and erythema; Fang marks may be noted; Sometimes the bite is not felt. Dull crampy pain may develop at sign of bite and later spread to entire body. Generally, the pain is spread to the chest from upper extremity bites and to the abdomen from lower extremity bites. Abdominal cramping may be severe and mimic appendicitis. Other symptoms include dizziness, restlessness, nausea, vomiting, diaphoresis, and cramping in all muscle groups. The patient may become hypertensive.

**Treatment:**
1. Ice application to the area.
2. IV access in unaffected extremity.
3. Monitor airway, breathing and circulation.
4. If significant symptoms, consider immediate evacuation.
5. IV Diazepam can be given to control muscle cramping.
**BROWN RECLUSE SPIDER BITE**

**Signs & Symptoms:** Initial burning at site of bite, most notably within 3-4 hrs. White area then forms from local vasoconstriction followed a central blister with surrounding erythema. The blister then darkens as necrosis appears. Patient may exhibit or complain of fever, rash, chills, nausea, vomiting, malaise and weakness.

**Treatment:**
1. Clean area with soap and water.
2. Transport as needed.

**VENOMOUS MARINE ANIMALS (NEMATOCYSTS AND STINGING ANIMALS)**

**NEMATOCYSTS (PORTUGUESE MAN-O-WAR, FIRE CORALS, SEA WASPS, SEA NETTLES, JELLY FISH, ETC.)**

**Signs & Symptoms:** Severe burning sensation and erythematous welts. Depending on the species and the number of nematocysts involved symptoms may progress to include: nausea, vomiting, chest pain, muscle cramps, dyspnea, convulsions and diarrhea.

**Treatment:**
1. Remove the victim from the water.
2. Spray the sting area with vinegar; remain on the skin for 5 minutes
3. Wash the area with seawater. (Avoid fresh water or alcohol, which cause stinging cells to discharge)
4. Remove tentacles with a gloved hand or forceps.
5. Area **should not** be rubbed with sand.
6. Spray the sting area with vinegar again.
7. Dust the area with talcum powder or cover with shaving cream, and then gently scrape off with a knife or safety razor.
8. Wash with sea water and apply a steroid cream.

**STINGS (Sea Urchins, Cone Shells, Stingray, Bony Fish)**

**Sea Urchins**

**Signs & Symptoms:** Pain. Small, possibly discolored puncture wounds in area of contact. The spines generally break off in the wound causing more problems with infection that with a toxic reaction. Burning pain and discoloration. Usually no systemic symptoms.

**Cone Shells**

**Signs & Symptoms:** Depending on the species, patient may or may not experience pain. Severe envenomation may cause double vision, slurred speech, numbness, weakness, paralysis, and respiratory arrest.

**Stingray**

**Signs & Symptoms:** Wound is jagged and bleeds freely. Victim experiences severe pain. Systemic symptoms may include increased salivation, nausea, vomiting, syncope, muscle cramping, and dyspnea.

**Bony Fish**

**Signs & Symptoms:** Severe pain that quickly involves the entire extremity associated with swelling and ischemia. Systemic symptoms include cyanosis, hypotension, sweating and syncope.

**Treatment:**
1. Monitor airway breathing and circulation.
2. Remove the stinger with forceps if possible.
3. Submerge the extremity in water as hot as the patient can tolerate (not over 115°) for 30-90
minutes. This will usually denature the venom.
4. Treat the wound. Antibiotic of choice (if needed) is Cipro (see page 16).

**ADDITIONAL NOTES (VENOMOUS INJURIES):**
PATROL MEDICINE

GUIDELINES AND CONSIDERATIONS: Normal pararescue medical practice does not include 'sick call' medicine. The following conditions are problems that can occur during long-duration patrols/searches where medical care may not be available. Pararescuemen are to treat these conditions only during real-world missions, and then only in cases where it is a question of treating the condition or aborting the mission to evacuate the ill/injured person. In all cases, the patient should be referred to a medical provider as soon as possible, regardless of the outcome of treatment.

NOTE: Pararescuemen are not "medics" and normally do not treat patients in garrison.

FEVER IN TROPICAL AREAS: Fevers occurring in tropical areas can have multiple causes. History should include how long the patient has been in the area and any associated symptoms (headache, sore throat, chest pain, cough, urinary tract pain, chills, backache, etc). In general, little can be done for tropical fevers in the field. Definitive diagnosis of the cause of tropical fevers requires lab facilities. In general, treatment of tropical fevers in the field is limited to symptomatic treatment with evacuation ASAP.

MALARIA: Must be the first diagnosis suspected in any fever occurring in a malaria zone. Symptoms of malaria, especially in early stages are notoriously nonspecific, ranging from flu-like symptoms of body aches and headache, to nausea/vomiting or diarrhea, to the more classic presentation of sudden fever spike alternating with shaking chills. Renal failure, pulmonary edema and coma can also occur. Incubation of malaria ranges from 1-2 weeks after arrival into the malaria zone.

NOTE 1: Prevention of mosquito bites (the vector of the malaria parasite) is the best way of avoiding the disease. Use repellent on exposed skin, treat uniforms with permethrin and sleep under mosquito netting. In some cases, presumptive treatment of malaria may be needed in the field. In this case, the specific medications and instructions for use must be supplied by medical control in-theatre.

NOTE 2: Fever after returning from a malarial zone is malaria until proven otherwise; even if it occurs weeks after leaving the zone. Seek medical care at once if this occurs and make sure the medical personnel know you have been in a malaria zone.

FEVER ASSOCIATED WITH PETECHIAL RASH: Fever associated with a petechial rash (pinpoint, non-raised round, purplish-red rash that does not blanch when pressure is applied over it) is associated with many serious bacterial and viral disease. In such cases, medical control should be contacted immediately, as immediate administration of antibiotics could be necessary.

OTHER CAUSES OF TROPICAL FEVER INCLUDE: Typhoid fever, dengue fever, multiple forms of viral hemorrhagic fever and many others. Treatment is generally aimed at making the patient comfortable, kept well-hydrated and evacuation ASAP.

CELLULITIS: A superficial bacterial infection of the skin and skin structures. Common in tropic regions.

Signs & Symptoms: Skin is red, hot and tender to the touch. Patient may have a mild/moderate fever. No abscess is palpated in the SubQ tissue.

Treatment: Keflex, 250-500 mg every 6 hours. Alternative include: Cipro, 500 mg b.i.d. or Rocephin, 1 gram IV or IM every 24 hours. Warms soaks may help decrease symptoms. Evacuate if symptoms do not improve within 24 hours of initiating treatment, if any high fever develops or if rash continues to spread despite treatment.
SKIN FUNGAL INFECTIONS: Superficial infection of the skin caused by fungus. Various types of infections include athlete’s foot, jock itch, etc. Should only be treated in the field if the condition affects the ability of the patient to perform his/her normal job.

Signs & Symptoms: Red, irritated skin in affected area (usually on feet on in inguinal area). Can have bright red rash (usually yeast infection) or slightly red and raised scaly patches. Usually NOT painful to the touch or warm/hot to the touch.

Treatment: Apply antifungal cream (such as Lamisil Cream or Mycelex Cream) to the affected area twice per day. Keep affected area clean and dry as possible. Avoid use of close-fitting or confining underwear in tropic areas.

NOTE: The best treatment should be aimed at prevention. Left untreated, fungal infections can become debilitating.

DYSENTERY: See Infectious Diarrhea (pg 91).

ANKLE SPRAINS (MILD, MODERATE, SEVERE): Injury to the lateral (outer) aspect of the ankle caused by inversion of the foot. Ligaments are damaged, but usually no fracture is involved. MOI is usually a result of rolling the foot inward at the ankle and stretching/tearing the ligaments of the lateral aspect of the ankle.

Signs & Symptoms: Pain and swelling of the lateral aspect of the affected ankle.

• Moderate to severe sprains frequently show bruising and ecchymosis of the ankle.
• Palpate the entire lower leg as part of the physical exam. Any tenderness in the knee or middle section of the lower leg may indicate a complicated injury. Treat as a severe sprain.
• Mild sprains can usually be walked on immediately after injury, but become painful and swollen within a few minutes to hours after injury.
• If the patient has significant pain upon attempting weight bearing, the ankle should be treated as a severe sprain or a fracture.
• If the patient is able to bear weight on the ankle, perform an anterior drawer test of the ankle:
  a) With the patient supine, cup the heel of the affected foot in one hand and grasp the leg just above the ankle with the other.
  b) Attempt to pull the foot forward while holding the leg stable. If there is any motion of the foot forward on the ankle, the ankle is unstable (grade 3 sprain).
• Any tenderness/swelling of the anterior or the medial aspect of the ankle may indicate a complicated injury. This must be treated as a severe sprain.
• Point tenderness of the lateral malleolus at the inferior tip or posterior aspect may indicate a chip fracture of the lateral malleolus. Treat as a severe sprain.

Treatment (Minor, Moderate and Severe Sprains):

• Minor Sprains (minimal swelling, no bruising/ecchymosis, able to bear weight): R.I.C.E. – Rest, Ice, Compression, Elevate. Limit weight bearing if possible. Motrin or Toradol prn.
  NOTE: An ace wrap around the ankle may help control swelling, but does nothing to stabilize the ankle. A ‘stirrup tape’ or ‘basket tape’ (see below) of the ankle will help provide stability to an injured ankle. If the ankle becomes seriously painful during ambulation, treat as a moderate/severe sprain.
• Moderate to Severe Sprains (any evidence of fracture, unable to bear weight without significant pain): R.I.C.E. – Rest, Ice, Compression, Elevate. Ace wrap and splint the ankle. Do not allow weight bearing. Give Motrin or Toradol prn. Evacuate ASAP.
Stirrup Taping of the Ankle:
1. Clean the foot, ankle and lower leg. Benzoin tincture (if available) may be used as a skin adherent, however this will make it difficult to remove the tape.
2. Using 1-inch silk tape, apply anchor strips about 4 inches above the ankle, and the instep of the foot. Anchor strips should not be circumferential, leave a 2-inch gap on the lower leg, and a 1-inch gap on top of the foot.
3. Hold the foot at a 90 degree angle in relation to the leg
4. Apply a long strip of tape from one side of the ankle under the heel to the other side in stirrup manner.
5. Apply a short strip of tape from one side of the foot around the posterior heel to the other side of the foot.
6. Alternate long and short strips as above, overlapping the previous strips by 50-75%. Use about 5-6 strips of tape in each direction
7. No tape strip should be circumferential around the foot or leg; There should be at least a 1-2 inch gap on the foot and leg to allow for swelling.
8. If the taping is done properly, it will be difficult to passively invert the ankle
9. Check the taping every 30 minutes for two hours, and hourly after that. Remove the taping if any neurovascular compromise to the foot or ankle occurs.

Stirrup Tape of the Ankle

ADDITIONAL NOTES (PATROL MEDICINE):
WEAPONS OF MASS DESTRUCTION

THE BEST PROTECTION AGAINST CHEMBIO AGENTS IS YOUR GROUND CREW DEFENSE ENSEMBLE (GCDE), CURRENT IMMUNIZATIONS, AND PHYSICAL FITNESS/HEALTH

CHEMICAL WARFARE AGENTS: Divided into two categories: Casualty Agents and Incapacitating Agents. Casualty Agents (Choking, Nerve, Blood, and Blister) have the ability to cause severe and permanent injury, or even death. Incapacitating Agents (vomiting and tearing agents) are usually not lethal, produce no permanent injury and require no special medical treatment.

WARNING: Blood agents will damage filters in the gas mask. Replace after exposure or suspected exposure to blood agents.

CHOKING AGENTS

Phosgene (CG): A colorless fog-like gas that characterized by the smell of new-mown hay or green corn. **Protective Measures:** Protective mask. **Persistency:** Will dissipate within 20 min in open terrain, but may persist for up to 10 hrs in shaded areas, low terrain and in temperatures below 68° F. **Signs & Symptoms:** Immediate symptoms if high concentration or delay of 3 hrs if low concentration. Eye irritation, throat, lung irritation, cough and dyspnea. Most deaths will occur within 24 hrs. **Treatment:** No treatment available in field. Oxygen may help dyspnea. **Decontamination:** Aeration for confined area. None in the field.

NERVE AGENTS

Tabun (GA): A colorless to brownish liquid that emits a colorless vapor. Tabun is odorless in pure concentration, but emits a fruity odor in impure concentrations. **Protective Measures:** Protective mask and clothing. **Persistency:** Persists 1-2 days under average conditions. **Signs & Symptoms:** Difficulty breathing, drooling, nausea, vomiting, cramps, involuntary defection and urination, twitching, seizures, staggering, headache, drowsiness, coma, constricted pupils. Very small skin dosages sometimes causes local sweating and tremor with little other effects. **Treatment:** See Nerve Agent Exposure Treatment. **Decontamination:** See Nerve Agent Decontamination

Sarin (GB): A colorless liquid, which emits a colorless vapor. Sarin is odorless in pure concentrations and has a slightly fruity odor in impure concentrations. **Protective Measures:** Same as GA. **Persistency:** Highly volatile. Evaporates at approximately the same rate as water. **Signs & Symptoms:** Same as GA. **Treatment:** See Nerve Agent Exposure Treatment. **Decontamination:** See Nerve Agent Decontamination

Soman (GD): A colorless liquid that emits a colorless vapor. Soman has a fruity odor in pure concentrations and a camphor (Vicks Vapor Rub®, mothballs, or strong pine pitch) odor in impure concentrations. **Protective Measures:** Same as GA. **Persistency:** Persists for 1-2 days under average conditions. **NOTE:** This agent ‘ages’ rapidly, resulting in an irreversible agent-AChE (acetylcholinesterase) bond. Use of pyridostigmine bromide (PB) tabs prior to exposure to this agent can ‘preserve’ functional AChE. Use of PB tabs is a command decision, with input from the Medical section and Intel section.
**Signs & Symptoms:** Same as GA.
**Treatment:** See Nerve Agent Exposure Treatment.
**Decontamination:** See Nerve Agent Decontamination.

**V-Agents:** A colorless to amber liquid, which emits a colorless vapor. V-Agents are odorless when in pure concentration.

**Protective Measures:** Same as GA.

**Persistency:** Persists for long periods of time under average weather conditions.

**Signs & Symptoms:** Same as GA.
**Treatment:** See Nerve Agent Exposure Treatment.
**Decontamination:** See Nerve Agent Decontamination.

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### NERVE AGENT EXPOSURE TREATMENT

#### VAPOR EXPOSURE:

<table>
<thead>
<tr>
<th>Mild/Moderate Exposure</th>
<th>Severe Exposure</th>
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</table>

#### Eyes
- Miosis (small/pinpoint pupils)
- Dim Vision
- Miosis (small/pinpoint pupils)
- Dim Vision

#### Nose
- Rhinorrhea
- Rhinorrhea

#### Mouth
- Salivation
- Salivation

#### Lungs
- Dyspnea
- Dyspnea
  - Severe breathing difficulty or cessation of respiration

#### CNS
- Headache
- Headache
  - Generalized muscular twitching, weakness or paralysis
  - Convulsions
  - Loss of consciousness
  - Loss of bladder/bowel control

#### Time of Onset:
- Seconds to minutes after exposure
- Seconds to minutes after exposure

#### Treatment:
- 1 Mark 1. Repeat if symptoms do not decrease
- 3 Mark 1’s and diazepam immediately.
- 10 mg IM if by auto injector (CANA auto injector) or
- 10 mg IM/IV if by carpoject

**Note:** A Mark 1 unit is actually two separate auto injectors: One containing 2 mg of atropine and the other containing 600 mg of 2-PAM chloride. Giving “One Mark 1” unit means administering BOTH the atropine and the 2-PAM auto injectors.

**Warning:** Seizures associated with exposure to nerve agents indicate serious and possible lethal exposure. Seizures due to nerve agent exposure must be treated aggressively and prevented if possible. Note that giving CANA is automatic if 3 Mark 1 units are used on a victim, even if seizure activity is not present.
LIQUID EXPOSURE (Liquid on Skin):

**MILD/MODERATE EXPOSURE**
- Muscle twitching at site of exposure
- Sweating at site of exposure
- N & V, feeling of weakness

**SEVERE EXPOSURE**
- Muscle twitching at site of exposure
- Sweating at site of exposure
- N & V, feeling of weakness
- Severe breathing difficulty or cessation of respiration
- Generalized muscular twitching, weakness or paralysis
- Convulsions
- Loss of bladder/bowel control

**Time of Onset:**
- 10 minutes to 18 hrs after exposure
- Minutes to an hour after exposure

**Treatment:**
- 1-2 Mark 1’s depending on severity of symptoms
- 3 Mark 1’s and diazepam immediately

**WARNING:** Use diazepam at once if 3 or more Mark 1 units are used, or if any seizure activity is noted.

**LONG TERM CARE OF THE NERVE AGENT CASUALTY:**

1. Continue giving atropine injectors every 5 minutes as long as symptoms are present or until IV atropine is available.
2. Suction and ventilate the patient as needed.
3. When possible, safely remove chemical protective gear and perform complete evaluation of the patient.
4. If hypoxia is NOT present, give 1-2 mg (0.02-0.05 mg/Kg) of atropine IV every 10-15 minutes until signs of atropinization occur (secretions stop, muscle fasciculation’s stop, and patient become easy to ventilate)
   **CAUTION:** DO NOT use pupil dilation as a sign of endpoint of atropine therapy: It is unreliable in nerve-agent poisoning.
5. If hypoxia is present or cannot be ruled out, continue giving atropine 2 mg (0.02-0.05 mg/Kg) IM every 10-15 minutes until signs of atropinization occur.
6. Administer pralidoxime:
   a) If 3 Mark 1’s have been given (600 mg of pralidoxime each, total of 1800 mg), then begin an IV drip of 10-20 mg/Kg per hour of pralidoxime, to a max dose of 500 mg/hour.
   b) If no Mark 1’s have been given or the 2-PAM injectors were not used: Administer an initial IV bolus of 1-2 grams of pralidoxime (25-50 Mg/Kg, max of 2 grams) IVPB over 15-20 minutes, then begin an IV drip at 10-20 mg/Kg per hour as above.
   c) Continue the pralidoxime drip for 12 hours, or as directed by medical control.
7. If signs of nerve agent poisoning reoccur, treat with atropine and pralidoxime as above.
8. Symptoms may reoccur up to 24 hours after exposure/treatment.
DECONTAMINATION:
1. Bleach slurry or dilute alkali solutions (equipment).
2. In confined areas use steam and ammonia or hot, soapy water (equipment).
3. M13 individual Decontamination kit.
5. Warm soapy water for skin decontamination if the above are not available.

BLOOD AGENTS
WARNING: Blood agents will damage filters in the gas mask. Replace after exposure or suspected exposure to blood agents.


Signs & Symptoms: Irritation to the eyes and skin, low levels cause weakness, headache, disorientation, nausea and vomiting. Increased dosages result in loss of consciousness.

Treatment: Complex, multi-step process. Requires specialized medications, advanced level of care. If patient is still alive after exposure, Decontamination, and evac, treating ABC’s on route.

Decontamination: Aeration under confined conditions. For complete decontamination, use caustic soda with steam. No decontamination in the field.


Signs & Symptoms: Highly irritating to the eyes and upper respiratory tract. Low levels cause weakness, headache, disorientation, nausea and vomiting. Increased levels causes loss of consciousness.

Treatment: Treat ABC’s, oxygen and evacuate.

Decontamination: Same as AC.

BLISTER AGENTS

Distilled Mustard (HD): An amber-brownish liquid that produces low-lying colorless vapor with a garlic-like odor. Protective Measures: Protective mask. Permeable yet protective clothing is sufficient for vapor and small droplets. Impermeable clothing is required for larger splashes and smears. Persistency: 1-2 days under average weather conditions. A week to several months under cold conditions

Signs & Symptoms: Conjunctivitis or inflammation of the eyes, redness of the skin followed by blistering or ulceration, inflammation of the nose, throat, trachea, bronchia and lung tissue. Vapors will cause temporary blindness. Symptoms may be delayed 4-6 hrs after exposure.

Treatment: Use skin decontamination pads in M13 and M258 kits. Strong bleach solutions and caustic soda.

Decontamination: Strong bleach solutions and caustic soda for terrain. Live steam for buildings and substructures. Fire may be used in the field for expedient decontamination, but be mindful of explosive hazard.
Levinstein Mustard (H): An amber-brownish liquid, which produces a low-lying colorless vapor with a sulfur odor. **Protective Measures:** Protective mask, MOPP. **Persistency:** 1-2 days under average weather conditions. A week to several months under cold conditions. **Signs & Symptoms:** Symptoms may be delayed up to 12 hrs after exposure. Skin lesions. Irritation to the nose and throat, hoarseness, loss of voice and persistent cough. Ingestion may cause diarrhea, nausea and vomiting. **Treatment:** Same as HD. **Decontamination:** Same as HD.

Nitrogen Mustard (HN-1, HN-2, HN-3): A pale-to-amber liquid, which produces a colorless vapor. **HN-1** emits a fishy or musty odor. In low concentrations, **HN-2** emits a soft soap odor and in high concentrations a fruity odor. **HN-3** is odorless. **Protective Measures:** Same as HD. **Persistency:** **HN-1** and **HN-2** persists up to a day or two in moderate climate and less in dry arid conditions. **HN-3** persists considerably longer than **HN-1** and **HN-2**. May last for up to a week under cold conditions. **Signs & Symptoms:** Irritation to the eyes, nose and throat. Hoarseness, loss of voice and persistent cough. Ingestion may cause diarrhea, nausea and vomiting. Cumulative poison with symptoms delayed up to 12 hrs after exposure. **Treatment:** Same as HD. **Decontamination:** Same as HD.

Phosgene Oxime (CX): May be crystalline solid or clear liquid. The crystalline solid is colorless, while the clear liquid has a sharp penetrating and disagreeable odor or pepperish smell. **Protective Measures:** Same as HD. **Persistency:** Liquid form 1-2 days under average weather conditions. A week to several months under cold conditions. Crystalline form may lasts for several months in dry, arid and cold conditions. **Signs & Symptoms:** Symptoms: Red circle from area of contact. Causes immediate pain from prickly sensation to severe bee sting. Irritates the mucus membranes of the eyes and nose. Effects are instantaneous. **Treatment:** No treatment available. **Decontamination:** Flush with warm water to dissolve the agent. Bleaches and strong oxidizers will break down the compound. Use strong alkali solutions (sodium hydroxide) with live steam to decontaminate large ground and structural areas.

**BIOLOGICAL AGENTS**

**THE BEST PROTECTION AGAINST CHEM BIO AGENTS IS YOUR GROUND CREW DEFENSE ENSEMBLE (GCDE), CURRENT IMMUNIZATIONS, AND PHYSICAL FITNESS/HEALTH**

**GUIDELINES AND CONSIDERATIONS**
- Biological warfare agents are difficult to detect, but relatively easy to protect against. Most biological agents capable of being weaponized require inhalation of the agent for infection. **A properly fitting chemical protective mask with war filters in place will protect against virtually all BioWarfare agents.** However, full MOPP should be worn if there is any possibility of biowarfare agent attack.
- Immunizations against specific biowarfare agents may be required. Keep immunizations current.
- Avoid water that hasn’t been properly purified and food from the local area if possible.
- Decontamination for most biowarfare agents is done with 5% sodium hypochlorite solution (Clorox bleach out of the bottle is 5% hypochlorite) for equipment, and 0.5% hypochlorite solution for skin (dilute the Clorox solution 1:10 with water). Allow the solution to dry on the equipment and skin. **NOTE:** For most biological agents, washing with warm soapy water is just as effective for skin decontamination as a bleach solution is.
**NUCLEAR CONTAMINATION:** Nuclear/radiation exposure can be divided into several different categories. In all cases, it is important to recognize that the patient themselves **DO NOT** become radioactive from exposure to radiation (only neutron bombardment can do this, which is highly unlikely outside the core of a nuclear reactor). **NOTE:** In some cases, patients can become contaminated with dust or other material that has radioactive material in it. Once this is removed, the patient is cared for in the normal manner.

**GUIDELINES AND CONSIDERATIONS**

**Radiation Protection for the Pararescueman:** Prevention of exposure depends on the type of threat in the area. In all cases, remember that radiation protection is dependent on: 1) **TIME OF EXPOSURE,** 2) **DISTANCE FROM THE SOURCE,** and 3) **SHIELDING.** So spend the shortest time in the area, as far from the source as you can. If possible keep some shielding (dirt, rocks, whatever) between you and the source. If you have to work in an area contaminated with radioactive material in dust or particulate form, wear the chemical protective mask to prevent inhalation of dust, and wear a disposable overgarment (MOPP suit works well) with hood and gloves. Discard this in the decontamination area.

- **For a fixed radiation source that is not in particulate form:** It is best to limit exposure during rescue. Move the patient as rapidly as possible, keeping as far away from the radiation source as possible.

- **For a particulate radiation source with external contamination** (dust/debris containing radioactive material is on the patient): Wear a chemical protective mask with war filters in place to prevent inhalation of dust. Wear an overgarment that can be discarded after leaving the contaminated area. Decontaminate the patient by removing all clothing and washing off any dust.

- **For a patient with internal contamination** (radioactive material either ingested or driven into wounds): Wear protective clothing as noted above. Once out of the contaminated area, Decontaminate the patient as above. Debride the wounds to remove any particulate matter, if possible. Cover the wounds and Evac the patient, making sure the next echelon of medical care knows that an internally contaminated patient is on the way. Patients who have inhaled, or ingested radioactive material should be evacuated to the next echelon of care.

**ADDITIONAL NOTES (WEAPONS OF MASS DESTRUCTION):**
MEDICAL EMERGENCIES

CHEST PAIN: All non-traumatic chest pain must be evaluated to rule out cardiac ischemia. A thorough history of events is needed, including onset of pain, severity, and duration of pain. Other history includes association with activity, previous history of cardiac problems, hypertension, diabetes, hypercholesterolemia, smoking and family history of cardiac disease.

GUIDELINES AND CONSIDERATIONS

CHEST PAIN OF CARDIAC ORIGIN: Determining if chest pain is due to cardiac ischemia or not is a difficult process, often requiring considerable clinical skill and experience. Classically, chest pain of cardiac origin has the following characteristics:

- Dull and diffuse pain, often described as a ‘weight’ on the chest, a heavy sensation or a squeezing sensation. The pain can radiate to the left arm (or less commonly, right arm), neck or jaw.  
  **Note:** A sharp, well-localized chest pain is less likely to be cardiac in origin if the pain is reproduced by palpation at the painful area; by taking a deep breath; or twisting the torso.
- Chest pain of cardiac origin is frequently accompanied by associated symptoms, such as shortness of breath, diaphoresis, nausea, dizziness, feelings of dread, and verbal denial.
- Patients with a history of cardiac chest pain (angina) can be asked if this pain is similar to their previous episodes of angina. Angina usually lasts less than 5 minutes. Any angina-like pain that has lasted longer than 5-10 minutes must be treated as a possible heart attack.
- Asking the patient to rate their pain on a scale of 1-10 (1= no pain, 10= worst pain they have ever had) is a simple method of following the success of any treatments.
- Don’t be overconfident: Cardiac chest pain can be a subtle, difficult diagnosis, even under ideal conditions. Patients with diabetes are especially prone to having unusual presentations of cardiac pain. When in doubt, treat for a cardiac event, and evacuate the patient as soon as possible.

MANAGEMENT OF SUSPECTED ISCHEMIC CHEST PAIN

1. Place patient at rest to reduce anxiety
2. Administer 100% Oxygen, place on cardiac monitor, if available.
3. Initiate IV with normal saline
4. Obtain vital signs
5. Give 325 mg of aspirin PO if patient is not allergic, and no recent GI bleeding or stroke.
6. Nitroglycerin 0.4 mg sublingually every 5 minutes X3. Do not give if systolic BP below 100.  
  Check BP after every dose, and just before giving next dose. Record any changes in intensity of pain associated with administration of nitroglycerin.
7. Morphine Sulfate, 4mg bolus then titrate every 2-4 minutes by 2mg until pain relief.  
  **Note:** If resuscitative equipment is available and individual is ACLS qualified, refer to specific cardiac algorithms for further direction. See pages 94-112.

PULSELESS ELECTRICAL ACTIVITY (PEA): PEA may be a result of trauma necessitating a thorough evaluation of potential causes and rapid correction. Consider the following:

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<tr>
<th>CONDITION</th>
<th>CLUES</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. HYPOVOLEMIA</td>
<td>History, flat neck veins</td>
<td>Volume expansion</td>
</tr>
</tbody>
</table>
| 2. HYPOXIA | Cyanosis, pulse oximetry | Airway establishment  
Ventilation with 100% O2 |
3. **CARDIAC TAMONADE**  
   History of MOI; No pulse with CPR  
   Neck vein distention, hypotension,  
   Low pulse pressure; change from  
   tachycardia to bradycardia as a  
   terminal event.  
   Pericardiocentesis

4. **TENSION PEUMOTHORAX**  
   No pulse with CPR, neck vein  
   distention, tracheal deviation.  
   Needle decompression

5. **HYPOTHERMIA**  
   History of cold exposure  
   See hypothermia  
   Algorithm

**DIABETES:** There are two life threatening diabetic conditions that the pararescueman needs to be  
aware of: **Hypoglycemia** and **Hyperglycemia**. Diagnosis and treatment is extremely limited in the  
field environment.

**HYPOGLYCEMIA** (**INSULIN SHOCK**): Extremely low levels of circulating glucose. Often a result of excess  
insulin or inadequate glucose intake to meet metabolic needs.  
**Signs & Symptoms:** Weak rapid pulse, cold clammy skin, weakness/uncoordination, headache,  
irritability, may appear intoxicated, decreased level of consciousness.  
**Treatment:**
   1. Maintain ABCs  
   2. Establish IV with normal saline  
   3. If patient is unconscious, administer **50 cc's of 50% Dextrose** solution IV, if available (consult  
      medical control if possible)  
   4. If patient is conscious, administer PO sugar solution or dextrose paste if available.  
   5. If patient is unconscious and IV Dextrose is unavailable, insert NG tube and administer sugar  
      slurry via the NG tube.

**HYPERGLYCEMIA** (**DIABETIC COMA** / **DIABETIC KETOACIDOSIS**): Elevated levels of circulating glucose  
often the result of concurrent disease; excessive intake of glucose; decreased effective insulin or  
excessive alcohol consumption.  
**Signs & Symptoms:** Polyuria, polydypsia, nausea and vomiting, tachycardia, deep, rapid  
respirations, warm, dry skin, fruity odor on breath, decreased level of consciousness, hypotension.  
Dry mouth, intense thirst, and abdominal pain.  
**Treatment:**
   1. Maintain ABCs  
   2. Establish IV with normal saline (Note: If medical control is not available, infuse normal saline 1  
      liter bolus, followed by infusion of 500 cc/hr not to exceed a total of 2 liters.  
   3. Administer 100& oxygen.  
   4. If patient is a known diabetic, and unconscious, 50% Dextrose may be given under physician  
      direction.  
   5. If patient is unconscious, administer naloxone 2mg IV (may repeat X1 in 5 minutes if no result)  
   6. Insulin, if available, is only to be given under direct medical control

**COMA:** In general only two mechanisms produce coma: 1) structural lesions that depress  
consciousness by destroying or encroaching on the ascending reticular activating system (RAS) in  
the brain stem and 2) toxic metabolic states that involve the presence of circulating toxins or  
metabolites or the lack of metabolic substrate (i.e., glucose or oxygen). Preserved pupillary
response suggest that the origin is toxic, whereas unresponsive or asymmetrical pupillary responses point to a structural cause.

**Treatment:** In general, treatment is directed at support of patient’s vital functions, prevention of further deterioration and treatment of reversible causes.

1. If respirations are slow or shallow or if cerebral edema is suspected, hyperventilate at 24-30 breaths/minute with 100% oxygen.
2. If no gag reflex, intubate.
3. Establish IV with normal saline or start saline lock.
4. If hypoglycemia is suspected, refer to hypoglycemia treatment (above).
5. Naloxone 2mg IV, repeat X1 in 5 minutes if no response
6. If medical control is available, thiamine 50-100 mg IV may be considered. This should be given prior to any dextrose.

**Seizures:** A temporary alteration in behavior or consciousness caused by abnormal electrical activity in the brain. **May result from multiple factors:** stroke, head trauma, hypoxia, infection, hypoglycemia and drug overdose. Aim of treatment is to address correctable causes and reduce or eliminate additional seizure activity. MOST SEIZURES ARE SELF-LIMITING and will stop once underlying causes are corrected. If seizure activity persists for greater than 3-5 minutes, intervention may be required. **Note 1:** If a patient has multiple seizures without fully recovering between episodes, intervention is required. After a seizure has stopped, it is normal for the patient to be drowsy, incoherent and/or disoriented. This is referred to as the postictal period. The patient will usually recover from this within 15-20 minutes. **Note 2:** If the patient has another seizure before the end of the postictal period, then treatment for the seizure is needed.

**Treatment:**
1. Prevent patient from sustaining physical injury. **Note:** Do not restrain patient nor should objects be forced between the patient’s teeth to maintain an airway.
2. Place in a lateral recumbent position to allow drainage of oral secretions and facilitate suctioning if needed.
3. Supplemental oxygen should be administered with a non-rebreather mask.
4. Consider intubation during flaccid period if there is no gag reflex. Provide 100% oxygen and ventilation support.
5. Establish IV access with normal saline and secure with tape and elastic bandage.
6. If hypoglycemia is suspected, administer 50% Dextrose, if available (only under physician direction.).
7. If prolonged seizure activity or repeated episodes, give Diazepam 5mg IV and repeat every 5-10 minutes until seizure stops. Do not exceed 20 mg of diazepam.

**Asthma:** A reversible obstruction to airflow caused by bronchial smooth muscle contraction, hypersecretion of mucus resulting in bronchial plugging and inflammatory changes in the bronchial walls.

**Signs & Symptoms:** Obvious respiratory distress with rapid and loud respirations, audible wheezing may be present. In severe cases hypoxic signs may be present (i.e., lethargy, exhaustion, agitation, and confusion). Other severe signs include: diaphoresis and pallor, abdominal and intercostal retractions, inability to speak, tachycardia greater than 120, tachypnea greater than 30, pulseless paradoxus greater than 20 mm Hg and altered mental status.

**Treatment:**
1. Assure ABCs
2. Administer 100% oxygen via non-rebreather mask.
3. Establish an IV with normal saline, run at 250 cc/hr and monitor closely for S&S of pulmonary edema.
4. **Epinephrine** 1:1000 administer .01cc/lb subcutaneously and repeat every 5 minutes for 3 doses.
5. Do not exceed 0.3cc per dose (by physician direction only).
6. Administer **Albuterol** via nebulizer, 0.5ml in normal saline for a total volume of 3cc, repeat treatment every 15-10 minutes X3, under the direction of a physician.
7. Albuterol metered-dose inhaler (MDI) can be used instead of the nebulizer as noted in #5 above.
8. Dose is 2 puffs every 10-15 minutes x 3.

**NOTE:** If available, albuterol is the preferred treatment for asthma, as versus giving epinephrine. Use epinephrine if albuterol is not available. Solu-Medrol or Decadron may be given for severe asthma attacks, however this should only be done under direct medical control.

**INFECTION**

**Diarrhea:** Defined as watery stool, associated with bloody stool, mucus, and/or fever.

**Treatment:**
1. Encourage oral clear fluids, electrolyte replacement if available.
2. If tilt positive, Establish an IV with normal saline, and give 2 liter bolus of saline, then run 250 cc/hr.
   - Do not exceed 3 liters.
3. **Phenergan** 12.5 mg IV if significant abdominal cramping or nausea and vomiting.
4. **Imodium** 2mg caps initially, then 2mg after each loose stool, not exceed 10 mg/24hrs.
   - **NOTE:** Do not give Imodium unless ciprofloxin is given first.
5. **Ciprofloxin** 500 mg bid X 5 days.

**STOOL GUIAC TESTING:** The presence of obvious blood in the stool (bloody diarrhea) is usually indicative of infectious diarrhea. In some cases, blood in the stool may not be obvious. In cases of diarrhea, testing the stool with a guiac card may show the presence of occult (hidden) blood. In cases of diarrhea with a positive stool guiac, treat as infectious diarrhea. This test can also be used to detect small amounts of blood in the stool of trauma victims.

**Procedure:**
1. Place a small sample of stool on the front of the guiac card. Close the cover.
2. Open the back side of the card and put 1-2 drops of guiac developer on the card.
3. Place a drop of the developer on the ‘control’ section of the card.
4. Any blue color, or a color that resembles the color of the ‘control positive’ part of the card is a positive stool guiac, indicating the presence of occult blood.

**ADDITIONAL NOTES (MEDICAL EMERGENCIES):**
CARDIAC CARE GUIDELINES AND ALGORITHMS

• The following Emergency Cardiac Care protocols have been attached for reference (source: International Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiac Care, Circulation 2000, Aug 22 102(8 suppl)). Remember that these protocols are guidelines, NOT ‘standards’. Modifications in treatment may be necessary depending on the tactical or rescue situation at hand. Remember, the goal in cardiac resuscitation is prevention of ischemic brain injury while restoring normal circulatory action of the heart.

• BE PREPARED: When evaluating a possible cardiac patient, begin supplemental oxygen, initiate cardiac monitoring and start an IV as early as possible. Have your resuscitation medications and equipment set up and ready to go. That way if the patient goes into arrest you can take the appropriate action with a minimum of confusion.
• Pediatric algorithms are included for reference in the event you need to treat children.

SPECIFIC ALGORITHMS:
• Universal Algorhythm for Adults
• Unconscious/Unknown Algorithm for Adults
• Hypothermia Treatment Algorithm
• Cerebral Vascular Accident
• Acute Myocardial Infarction/Chest Pain
• Asystole
• Bradycardia
• Tachycardia Overview
• Narrow-Complex SVT
• Stable V-Tach
• Synchronized Electrical Cardioversion
• Pulseless Electrical Activity
• V-Fib-Pulseless V-Tach
• Pediatric Medication Chart
• Pediatric Pulseless Arrest
• Pediatric Bradycardia
• Pediatric Tachycardia-Good Perfusion
• Pediatric Tachycardia-Poor Perfusion
• Unconscious/Unknown

CHEST PAIN OF CARDIAC ORIGIN: Determining if chest pain is due to cardiac ischemia or not, is a difficult process, often requiring considerable clinical skill and experience. Classical chest pain of cardiac origin has the following characteristics:
• Dull, diffuse pain, often described as a ‘weight’ on the chest, a heavy sensation or a squeezing sensation. The pain can radiate to the left arm (or less commonly, right arm), neck or jaw. Sharp, well-localized chest pain, especially when the pain is reproduced by palpation at the painful area, or by taking a deep breath, or twisting the torso is less likely to be cardiac in origin.
• Chest pain of cardiac origin is frequently accompanied by associated symptoms, such as shortness of breath, diaphoresis, nausea, dizziness, feelings of dread, and verbal denial.
• Patients with a history of cardiac chest pain (angina) can be asked if this pain is similar to their previous episodes of angina. Angina usually lasts less than 5 minutes. Any angina-like pain that has lasted longer than 5-10 minutes must be treated as a possible heart attack.
• Asking the patient to rate their pain on a scale of 1-10 (1= no pain, 10= worst pain they have ever had) is a simple method of following the success of any treatments.
• Don’t be overconfident: Cardiac chest pain can be a subtle, difficult diagnosis, even under ideal conditions. Patients with diabetes are especially prone to having unusual presentations of cardiac pain. When in doubt, treat for a cardiac event, and evacuate the patient as soon as possible.

**ADDITIONAL NOTES (EMERGENCY CARDIAC CARE ALGORITHMS):**
UNIVERSAL ALGORITHM FOR ADULTS

Responsive
- Observe
- Treat as indicated

Not Responsive
- Activate EMS
- Attach Defibrillator
- Assess ABC’s

Breathing
- Place in recovery position if no trauma

Not Breathing
- Give 2 slow breaths
- Assess circulation

Pulse
- Rescue Breathing
- Oxygen
- IV
- Vital Signs
- ETT
- History
- Physical Exam
- Monitor, 3-Lead

Suspected Cause

Hypotension/Shock/ Pulmonary Edema
- Go to appropriate algorithm

Acute MI
- Go To Algorhythm

Arrhythmia

Too Slow
- Go to Bradycardia

Too Fast
- Go to Tachycardia

Start CPR

Is VF / VT Present on defibrillator?

No

Yes

Is Electrical Activity?

Yes

No

PEA
- Go to PEA

Asystole
- Go to Asystole

Ventricular Fibrillation / Ventricular Tachycardia
- Intubate
- Determine rhythm & cause
- Go to VF / VT
**Unconscious/Unknown Algorithm**

- Assess Unresponsiveness
- AVPU

**Ensure Spinal Immobilization**

- ABC’s
- Oxygen
- IV
- EKG Monitor

**Glasgow Coma Scale**

- Intubate Patient
- Go to appropriate Protocol

**Is GCS score > 8**

- No
- Yes

**Perform Glucose Check**

- Low
  - 100 mg Thiamine IV
  - 25 gm 50% Dextrose IV
  - Continue Supportive Care
  - Transport to nearest medical facility

- Normal
  - 2 mg Narcan IV; repeat prn

**Go to appropriate Protocol**
**Hypothermia Treatment Algorithm**

### Actions for all patients
- Remove wet garments
- Protect against heat loss/wind chill
- Maintain horizontal position
- Avoid rough movement & excess activity
- Monitor core temperature
- Monitor cardiac rhythm

### Assess responsiveness, breathing, & pulse

#### Pulse/Breathing Present

**What is core temperature?**
- 90°F-95°F (mild hypothermia)
  - Passive rewarming
  - Active external rewarming

#### Pulse/Breathing Absent

**What is core temperature?**
- 86°F-90°F (moderate hypothermia)
  - Passive rewarming
  - Active external rewarming of truncal areas only

- <86°F (severe hypothermia)
  - Active external rewarming of truncal areas only
  - Active internal warming (see below)

**Active internal rewarming**
- Warm IV fluids
- Warm, humid oxygen
- Evacuate ASAP

- Continue rewarming until core temperature > 95°F
- Resuscitative efforts cease

**What is core temperature?**
- Continue CPR
- Withhold IV medications
- Limit shocks for VF/VT to max 3 shocks
- Evacuate ASAP

**What is core temperature?**
- Start CPR
- Defibrillate VF/VT up to total of 3 shocks
- Ventilate with warm, humid oxygen
- Establish IV
- Infuse warm NS

**What is core temperature?**
- Continue CPR
- Give IV medications prn
- Repeat defibrillation for VF/VT as core temperature rises
- Evacuate ASAP

**What is core temperature?**
- Continue CPR
- Withhold IV medications
- Limit shocks for VF/VT to max 3 shocks
- Evacuate ASAP

### Assess responsiveness, breathing, & pulse

**Actions for all patients**
- Remove wet garments
- Protect against heat loss/wind chill
- Maintain horizontal position
- Avoid rough movement & excess activity
- Monitor core temperature
- Monitor cardiac rhythm
CEREBRAL VASCULAR ACCIDENT

- Assess ABCs & vital signs
- O2 via nasal cannula
- EKG Monitor
- IV TKO

- Check Blood Glucose Level.
  Treat as appropriate

- Protect patient from further injury
- Obtain thorough medical history
- Perform thorough physical exam and neurological assessment. Note deficiencies.
- Consider thrombolytic therapy if onset < 3hrs

- Alert nearest medical facility of possible stroke patient and transport
- Continue supportive care
ACUTE MYOCARDIAL INFARCTION

- ABCs, O2, EKG Monitor, and vital signs
- Obtain thorough history

Does monitor show a treatable rhythm?

Yes

Go to appropriate algorithm

No

Aspirin, 325mg PO

Is Blood Pressure Stable?

Yes

Nitroglycerin, 0.4mg
SL q. 5 min x3

If no relief, Morphine, 2-5mg IV q. 5 min prn

Supportive care & transport to nearest medical facility

No

- Attempt to stabilize
- Supportive care & transport to nearest medical facility

Supportive care & transport to nearest medical facility
**ASYSTOLE**

**Primary ABCD Survey**

**Focus:** Basic CPR & Defibrillation
- **Check** responsiveness
- **Activate** emergency response system
- **Call** for defibrillator

A  **Airway:** Open the airway  
B  **Breathing:** Provide positive pressure ventilations  
C  **Circulation:** Give chest compressions  
C  **Confirm:** True asystole  
D  **Defibrillation:** Assess for VF & pulseless VT; shock if indicated

**Rapid scene survey:** Any evidence personnel should not attempt resuscitation?

**Secondary ABCD Survey**

**Focus:** More advanced assessments & treatments

A  **Airway:** Place airway device as soon as possible  
B  **Breathing:** Confirm airway device placement  
B  **Breathing:** Secure airway device; purpose made tube holders preferred  
B  **Breathing:** Confirm effective oxygenation & ventilation  
C  **Circulation:** Confirm true asystole  
C  **Circulation:** Establish IV access  
C  **Circulation:** Identify rhythm → monitor  
C  **Circulation:** Give appropriate medications for rhythm & condition  
D  **Differential Diagnosis:** Search for & treat identified reversible causes.  
- **Consider:** hypoxia, hyperkalemia, hypokalemia, pre-existing acidosis, drug overdose, hypothermia, and hypovolemia

**Transcutaneous pacing**  
If considered, perform immediately

**Epinephrine,** 1 mg IV push, repeat q. 3-5 minutes

**Atropine,** 1mg IV,  
Repeat q. 3-5 minutes  
Up to a total of 0.04mg/kg

**Asystole persists**  
Withhold or cease resuscitation efforts?  
- Consider quality of resuscitation  
- Atypical clinical features present?  
- Support for cease efforts protocols in place?
BRADYCARDIA

- **Slow** (absolute bradycardia = rate < 60 bpm)
- **Relatively slow** (rate less than expected relative to underlying condition or cause)

Primary ABCD Survey
- Assess ABCs
- Secure airway non-invasively
- Ensure monitor/defibrillator is available

Secondary ABCD Survey
- Assess secondary ABCs (invasive airway management needed?)
- O2, IV access, monitor, fluids
- Vital signs, pulse oximeter, monitor BP
- Obtain and review EKG
- Problem focused history
- Problem focused physical examination
- Consider causes (differential diagnoses)

Serious signs or symptoms?
Due to bradycardia?

No

Type II Second Degree AV Block or Third Degree AV Block?

No

Observe

Yes

Intervention sequence:
- **Atropine**, 1mg
- **Transcutaneous pacing**, if available
- **Dopamine**, 5 to 20 mcg/kg/min
- **Epinephrine**, 2 to 10 mcg/min

No

Prepare for TCP
- If symptoms develop, use TCP until transvenous pacer placed

Yes
Tachycardia Overview

Evaluate patient
- Is patient stable or unstable?
- Are there serious signs & symptoms?
- Are signs & symptoms due to tachycardia?

Stable

Stable patient: No serious signs or symptoms
- Initial assessment identifies 1 of 4 tachycardias

Unstable

Unstable patient: Serious signs or symptoms
- Establish rapid heart rate as cause of signs & symptoms
- Rate related signs & symptoms occur at many rates, but seldom <150 bpm
  - Prepare for immediate cardioversion (see algorhythm)

1 Atrial Fibrillation
   Atrial Flutter

2 Narrow-complex tachycardias

3 Stable wide-complex tachycardia: unknown type

4 Stable monomorphic VT and/or polymorphic VT

Stable wide-complex tachycardias

Stable monomorphic VT

Stable monomorphic and/or polymorphic VT

Treatment of SVT
(See narrow-complex tachycardia algorhythm)

Treatment of Confirmed stable VT
Wide-complex tachycardia of unknown type

Treatment of Confirmed SVT
Wide-complex tachycardia of unknown type

Treatment of stable monomorphic and/or polymorphic VT
(See stable VT; monomorphic and polymorphic algorhythm)

Evaluate patient
- Is patient stable or unstable?
- Are there serious signs & symptoms?
- Are signs & symptoms due to tachycardia?
NARROW-COMPLEX SUPRAVENTRICULAR TACHYCARDIA (STABLE)

Attempt Therapeutic Diagnostic Maneuver
- Vagal stimulation
- Adenosine

Junctional Tachycardia

EF <40%, CHF

Paroxysmal Supraventricular Tachycardia

EF <40%, CHF

Ectopic or Multifocal Atrial Tachycardia

EF <40%, CHF

PRESERVED

PRESERVED

PRESERVED

- No DC Cardioversion!
- Amiodarone
- Beta Blocker
- Ca2+ Channel Blocker

Priority Order:
- Ca2+ Channel Blocker
- Beta Blocker
- Digoxin
- DC Cardioversion
- Consider: procainamide, amiodarone, sotalol

Priority Order:
- No DC Cardioversion!
- Digoxin
- Amiodarone
- Diltiazem

Priority Order:
- No DC Cardioversion!
- Ca2+ Channel Blocker
- Beta Blocker
- Amiodarone

Priority Order:
- No DC Cardioversion!
- Amiodarone
- Diltiazem
**Stable Ventricular Tachycardia**

**MONOMORPHIC OR POLYMORPHIC?**

- **MONOMORPHIC VT**
  - Is cardiac function impaired?

- **POLYMORPHIC VT**
  - Is QT baseline interval prolonged?

**Note! May go directly to cardioversion**

**Normal Function**

- Normal Baseline QT Interval

  - **Normal Baseline QT Interval**
    - Treat Ischemia
    - Correct Electrolytes
    - **Medications:** any one
      - Beta blockers or
      - Lidocaine or
      - Amiodarone or
      - Procainamide or
      - Sotalol

  - **Long Baseline QT Interval**
    - Correct Abnormal Electrolytes
    - **Medications:** any one
      - Magnesium or
      - Overdrive Pacing or
      - Isoproterenol or
      - Phenytoin or
      - Lidocaine

**Poor Ejection Function**

- Prolonged Baseline QT Interval (suggests Torsades)

  - **Prolonged Baseline QT Interval**
    - **Medications:** any one
      - 150 mg IV bolus over 10 minutes
      - **Amiodarone**, or
      - **Lidocaine**
    - 0.5 to 0.75 mg/kg IV push
    - Then use
      - Synchronized Cardioversion
**Synchronized Cardioversion**

**Tachycardia**
- With serious signs and symptoms related to tachycardia

If ventricular rate is >150 bpm, prepare for **immediate cardioversion**. May give brief trial of medications based on specific arrhythmias. Immediate cardioversion is generally not needed if heart rate is <150 bpm.

**Have available at bedside:**
- Oxygen saturation monitor
- Suction device
- IV Line
- Intubation Equipment

**Premedicate whenever possible**  

**Synchronized Cardioversion:**  
- Ventricular Tachycardia  
  - 100 J, 200 J
  - 300 J, 360 J
  - monophasic energy dose (or clinically equivalent biphasic energy dose)
- Paroxysmal Supraventricular Tachycardia
- Atrial Fibrillation
- Atrial Flutter

**Steps for Synchronized Cardioversion**
1. Consider sedation
2. Turn on defibrillator (monophasic or biphasic)
3. Attach monitor leads to patient (“white to right, red to ribs, what’s left over the shoulder”) and ensure proper display of patient’s rhythm.
4. Engage the synchronization mode by pressing the “synch” control button.
5. Look for markers on R wave.
6. If necessary adjust monitor gain until synch markers occur with each R wave.
7. Select appropriate energy level.
10. Announce to team members: "Charging defibrillator-Stand Clear!"
11. Press "charge" button on apex paddle (right hand).
12. When the defibrillator is charged, begin the final clearing chant. State firmly in a forceful voice the following chant before each shock:
  - “I am going to shock on three. One, I’m clear.” (check to make sure you are clear of contact with the patient, stretcher and equipment)
  - “Two, you are clear.” (make a visual check to ensure that no one continues to touch the patient, stretcher or equipment. In particular, do not forget about the person providing ventilations. That person’s hands should not be touching the ventilatory adjuncts, including the tracheal tube.)
  - “Three, everybody’s clear.” (check yourself one more time before pressing the shock buttons.)
13. Apply 25 lbs pressure on both paddles.
14. Press the “discharge” buttons simultaneously.
15. Check the monitor. If tachycardia persists, increase the joules according to the electrical conversion algorithm.
16. **Reset the synch mode after each synchronized cardioversion because most defibrillators default back to unsynchronized mode.** This default allows an immediate defibrillation if the cardioversion produces VF.

**Notes:**
1. Effective regimens have included a sedative (e.g., diazepam, midazolam, barbiturates, etomidate, ketamine, methohexital) with or without an analgesic agent (e.g., fentanyl, morphine, meperidine). Many experts recommend anesthesia if service is readily available.
2. Both monophasic and biphasic waveforms are acceptable if documented as clinically equivalent to reports of monophasic shock success.
3. Note possible need to resynchronize after each cardioversion.
4. If delays in synchronization occur and clinical condition is critical, go immediately to unsynchronized shocks.
5. Treat polymorphic ventricular tachycardia (irregular form and rate) like ventricular fibrillation: see ventricular fibrillation/pulseless ventricular tachycardia algorithm.
6. Paroxysmal supraventricular tachycardia and atrial flutter often respond to lower energy levels (start with 50 J)
**PEA Algorithm**

**PEA Present?**
- **PEA** = Rhythm on Monitor **without** Detectable Pulse

---

**Primary ABCD Survey**
**Focus:** Basic CPR & Defibrillation
- **Check** responsiveness
- **Activate** emergency response system
- **Call** for defibrillator

**A** **Airway:** Open the airway
**B** **Breathing:** Provide positive pressure ventilations
**C** **Circulation:** Give chest compressions
**D** **Defibrillation:** Assess for and shock VF & pulseless VT

---

**Secondary ABCD Survey**
**Focus:** More advanced assessments & treatments
**A** **Airway:** Place airway device as soon as possible
**B** **Breathing:** Confirm airway device placement by exam plus confirmation device
**B** **Breathing:** Secure airway device; purpose made tube holders preferred
**B** **Breathing:** Confirm effective oxygenation & ventilation
**C** **Circulation:** Establish IV access
**C** **Circulation:** Identify rhythm → monitor
**C** **Circulation:** Administer drugs appropriate for rhythm & condition
**C** **Circulation:** Assess for occult blood flow ("pseudo-EMT")
**D** **Differential Diagnosis:** Search for & treat identified reversible causes.

---

**Review for most frequent causes:**
**(H-Five, T-Five)**
- Hypovolemia
- Hypoxia
- Hydrogen Ions (acidosis)
- Hyperkalemia/Hypokalemia
- Hypothermia
- Tablets (drug OD, accident)
- Tamponade, cardiac
- Tension Pneumothorax
- Thrombosis, coronary
- Thrombosis, pulmonary (embolism)

---

**Epinephrine**, 1 mg IV push, repeat q. 3-5 minutes

---

**Atropine**, 1 mg IV,
Repeat q. 3-5 minutes
Up to a total of 0.04mg/kg
**Ventricular Fibrillation/Pulseless VT Algorithm**

### Primary ABCD Survey
**Focus:** Basic CPR & Defibrillation

- **Check** responsiveness
- **Activate** emergency response system
- **Call** for defibrillator

#### A Airway:
- Open the airway

#### B Breathing:
- Provide positive pressure ventilations

#### C Circulation:
- Give chest compressions

#### D Defibrillation:
- Assess for and shock VF & pulseless VT up to 3 times (200 J, 200 to 300 J, 360 J, or equivalent biphasic) if necessary

---

**Rhythm after First 3 Shocks?**

---

**Persistent or recurrent VF/VT**

---

### Secondary ABCD Survey
**Focus:** More advanced assessments & treatments

#### A Airway:
- Place airway device as soon as possible

#### B Breathing:
- Confirm airway device placement by exam plus confirmation device
- Secure airway device; purpose made tube holders preferred
- Confirm effective oxygenation & ventilation

#### C Circulation:
- Establish IV access
- Identify rhythm → monitor
- Administer drugs appropriate for rhythm & condition
- Assess for occult blood flow ("pseudo-EMT")

#### D Differential Diagnosis:
- Search for & treat identified reversible causes.

---

**Epinephrine**, 1 mg IV push, repeat q. 3-5 minutes

**Or**

**Vasopressin**, 40 U IV, single dose, 1 time only

---

**Resume attempts to defibrillate**
- 1 x 360 J (or equivalent biphasic) within 30 to 60 seconds

---

**Consider Antiarrhythmics:**
- Amiodarone (IIb), lidocaine (indeterminate), magnesium (IIb if hypomagnesemic state), procainamide (IIb for intermittent/recurrent VF/VT).

**Consider Buffers**

---

**Resume attempts to defibrillate**
<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage (Pediatric)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenosine</td>
<td>0.1 mg/kg&lt;br&gt;Repeat Dose: 0.2 mg/kg&lt;br&gt;Maximum Single Dose: 12 mg</td>
<td>Rapid IV/IO bolus&lt;br&gt;Rapid flush to central circulation&lt;br&gt;Monitor EKG during dose</td>
</tr>
<tr>
<td>Amiodarone for Pulseless VF/VT</td>
<td>5 mg/kg IV/IO</td>
<td>Rapid IV bolus</td>
</tr>
<tr>
<td>Amiodarone for Perfusing Tachycardias</td>
<td>Loading Dose: 5 mg/kg IV/IO&lt;br&gt;Maximum Dose: 15 mg/kg/day</td>
<td>IV over 20 to 60 minutes&lt;br&gt;Route use in combination with drugs prolonging QT interval is not recommended. Hypotension is most frequent side effect.</td>
</tr>
<tr>
<td>Atropine Sulfate*</td>
<td>0.02 mg/kg&lt;br&gt;Minimum Dose: 0.1 mg/kg&lt;br&gt;Maximum Single Dose: 0.5 mg in child, 1.0 mg in adolescent. May repeat once.</td>
<td>May give IV, IO, or ET&lt;br&gt;Tachycardia and pupil dilation may occur but not fixed dilated pupils.</td>
</tr>
<tr>
<td>Calcium Chloride 10%-100mg/ml (=27.2 mg/ml Elemental Ca)</td>
<td>20 mg/kg (0.2 ml/kg) IV/IO</td>
<td>Give IV slow push for: Hypocalcemia, hypermagnesemia, calcium channel blocker toxicity. Preferably via central vein. Monitor heart rate: Bradycardia may occur.</td>
</tr>
<tr>
<td>Calcium Gluconate 10%-100mg/ml (=9 mg/ml Elemental Ca)</td>
<td>60-100 mg/kg (0.6-1.0 ml/kg) IV/IO</td>
<td>Give IV slow push for: Hypocalcemia, hypermagnesemia, calcium channel blocker toxicity. Preferably via central vein.</td>
</tr>
<tr>
<td>Epinephrine for Symptomatic Bradycardia*</td>
<td>IV/IO: 0.01 mg/kg (1:10,000, 0.1 ml/kg)&lt;br&gt;ETT: 0.1 mg/kg (1:1000, 0.1 ml/kg)</td>
<td>Tachyarrhythmias and hypertension may occur</td>
</tr>
<tr>
<td>Epinephrine for Pulseless Arrest*</td>
<td>First Dose:&lt;br&gt;• IV/IO: 0.01 mg/kg (1:10,000, 0.1 ml/kg)&lt;br&gt;• ETT: 0.1 mg/kg (1:1000, 0.1 ml/kg)&lt;br&gt;Subsequent Doses: Repeat initial dose or may increase up to 10 times (0.1 mg/kg, 1:1000, 0.1 ml/kg)&lt;br&gt;• Administer epinephrine every 3 to 5 minutes&lt;br&gt;• IV/IO/ETT doses as high as 0.2 mg/kg of 1:1000 may be effective.</td>
<td>Tachyarrhythmias and hypertension may occur</td>
</tr>
<tr>
<td>Glucose (10% or 25% or 50%)</td>
<td>IV/IO: 0.5-1.0 g/kg&lt;br&gt;• 1-2 ml/kg 50%&lt;br&gt;• 2-4 ml/kg 25%&lt;br&gt;• 5-10 ml/kg 10%</td>
<td>For suspected Hypoglycemia; Avoid Hyperglycemia</td>
</tr>
<tr>
<td>Lidocaine*</td>
<td></td>
<td>Rapid bolus 10-25 ml/kg/hr of 120 mg/100ml solution</td>
</tr>
<tr>
<td>Lidocaine Infusion (start after a bolus)</td>
<td>IV/IO/ETT: 1 mg/kg&lt;br&gt;IV/IO: 20-50 mcg/kg/min</td>
<td>Rapid bolus 10-25 ml/kg/hr of 120 mg/100ml solution</td>
</tr>
<tr>
<td>Magnesium Sulfate (500 mg/ml)</td>
<td>IV/IO: 25-50 mg/kg. Maximum dose: 2 g per dose.</td>
<td>Rapid IV infusion for torsades or suspected hypomagnesemia: 10-20 minute infusion for asthma that responds poorly to Beta-adrenergic agonists.</td>
</tr>
<tr>
<td>Magnesium Sulfate (500 mg/ml)</td>
<td>IV/IO: 25-50 mg/kg. Maximum dose: 2 g per dose.</td>
<td>Rapid IV infusion for torsades or suspected hypomagnesemia: 10-20 minute infusion for asthma that responds poorly to Beta-adrenergic agonists.</td>
</tr>
<tr>
<td>Naloxone*</td>
<td>• Less than or = 5 years or Less than or = 20 kg: 0.1 mg/kg&lt;br&gt;• Greater than 5 years or Greater than 20 kg: 2.0 mg/kg</td>
<td>For total reversal of narcotic effect. Use small repeated doses (0.01 to 0.03 mg/kg) titrated to desired effect.</td>
</tr>
<tr>
<td>Procainamide for Perfusing tachycardias (100 mg/ml and 500mg/ml)</td>
<td>Loading Dose: 15 mg/kg IV/IO</td>
<td>Infusion over 30 to 60 minutes: Routine use in combination with drugs prolonging QT interval is not recommended.</td>
</tr>
<tr>
<td>Sodium Bicarbonate (1mEq/ml and 0.5 mEq/ml)</td>
<td>IV/IO: 1 mEq/kg per dose</td>
<td>Infuse slowly and only if ventilation is adequate.</td>
</tr>
</tbody>
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* For endotracheal administration use higher doses (2 to 10 times the IV dose); dilute medication with normal saline to a volume of 3 to 5 ml and follow with several positive pressure ventilations.
Pediatric Pulseless Arrest Algorithm

- BLS Algorithm: Assess and support ABCs as needed
- Provide Oxygen
- Attach monitor/defibrillator

Assess Rhythm (EKG)

Not VF/VT (includes PEA and Asystole)

Attempt Defibrillation
- Up to 3 times if needed
- Initially: 2 J/kg, 2-to-4 J/kg, 4 J/kg

AtTEMPT DEFIBRILLATION

- Up to 3 times if needed
- Initially: 2 J/kg, 2-to-4 J/kg, 4 J/kg

During CPR

Attempt/Verify:
- Tracheal intubation and vascular access

Check:
- Electrode position and contact
- Paddle position and contact

Give:
- Epinephrine, q. 3 to 5 min
  (consider higher doses for second and subsequent doses)

Consider alternative medications:
- Vasopressors
- Antiarrhythmics (see box at left)
- Buffers

Identify and treat causes:
- Hypoxemia
- Hypovolemia
- Hypothermia
- Hyperkalemia/Hypokalemia
- Hydrogen Ions (acidosis) and other metabolic disorders
- Tamponade, cardiac
- Tension Pneumothorax
- Tablets (toxins/poisons/drugs)
- Tamponade, cardiac
- Tension Pneumothorax
- Thromboembolism

Attempt defibrillation with 4 J/kg* within 30 to 60 seconds after each medication.
- Pattern should be: CPR-Drug-Shock (repeat) or CPR-Drug-Shock-Shock-Shock (repeat)

Epinephrine
- IV/IO: 0.01 mg/kg
  (1:10,000; 0.1 ml/kg)
- ETT: 0.1 mg/kg
  (1:1000; 0.1 ml/kg)

Continue CPR up to 3 minutes

* Alternative waveforms and higher doses are Class Indeterminate for children

Attempt defibrillation with 4 J/kg* within 30 to 60 seconds after each medication.
- Pattern should be: CPR-Drug-Shock (repeat) or CPR-Drug-Shock-Shock-Shock (repeat)
**Pediatric Bradycardia Algorithm**

- **BLS Algorithm**: Assess and support ABCs as needed
  - Provide Oxygen
  - Attach monitor/defibrillator

**Is Bradycardia causing severe cardio respiratory compromise?**
(poor perfusion, hypotension, respiratory difficulty, altered consciousness)

**No**
- Observe
- Support ABCs
- Consider transfer or transport to ALS facility

**Yes**
- Perform chest compression.
  - If despite oxygenation and ventilation:
    - Heart rate <60/min in infant or child and poor systemic perfusion

**During CPR**
- **Attempt/Verify**:
  - Tracheal intubation and vascular access
- **Check**:
  - Electrode position and contact
  - Paddle position and contact
- **Give**:
  - **Epinephrine**, q. 3 to 5 min (consider higher doses for second and subsequent doses)
- **Consider alternative medications**:
  - Vasopressors
  - Antiarrhythmics (see box at left)
  - Buffers
- **Identify and treat causes**:
  - Hypoxemia
  - Hypothermia
  - Head injury
  - Heart Block
  - Heart transplant (special situation)
  - Tablets (toxins/poisons/drugs)

**Perform chest compression**
- **Epinephrine**
  - **IV/IO**: 0.01 mg/kg (1:10,000; 0.1 ml/kg)
  - **ETT**: 0.1 mg/kg (1:1000; 0.1 ml/kg)
  - May repeat q. 3 to 5 minutes at the same dose.

**Atropine**
- 0.02 mg/kg (minimum dose: 0.1 mg)
- May be repeated once

**Consider cardiac pacing**

*Give atropine first for bradycardia due to suspected increased vagal tone or primary AV block.*

*If pulseless arrest develops, see Pulseless Arrest Algorithm*
**Pediatric Tachycardia Algorithm**
(For infants and children with rapid rhythm AND adequate perfusion)

- **BLS Algorithm**: Assess and support ABCs as needed
- **Provide Oxygen**
- **Attach monitor/defibrillator**
- **Evaluate 12-lead EKG if practical**

**QRS duration normal for age** (approximately less than or = 0.08 seconds)

**Evaluate Rhythm**
- **Probable Sinus Tachycardia**
  - History Compatible
  - P Waves present & normal?
  - HR often varies with activity
  - Variable RR with constant PR
  - **Infants**: Rate usually <220 bpm
  - **Children**: Rate usually <180 bpm

- **Probable Supraventricular Tachycardia**
  - History Incompatible
  - P Waves absent and/or abnormal?
  - HR not variable with activity
  - Abrupt rate changes
  - **Infants**: Rate usually >220 bpm
  - **Children**: Rate usually >180 bpm

- **Consider Vagal Maneuvers**
  - Establish vascular access
  - Consider adenosine 0.1 mg/kg IV (maximum first dose: 6 mg)
  - May double and repeat dose once (maximum second dose: 12 mg)
  - Use rapid bolus technique
  - Consult pediatric cardiologist
  - Attempt cardioversion with 0.5 to 1.0 J/kg (may increase to 2 J/kg if initial dose ineffective)
  - With sedation prior to cardioversion
  - 12-lead EKG

**QRS duration wide for age** (approximately > 0.08 seconds)

**What is the QRS Duration?**
- **During Evaluation**
  - Provide oxygen and ventilation as needed
  - Support ABC's
  - Confirm continuous monitor/pacer attached
  - Consider expert consultation
  - Prepare for cardioversion, 0.5 to 1.0 J/kg (consider sedation)

- **Identify and treat possible causes:**
  - Hypoxemia
  - Hypovolemia
  - Hyperthermia
  - Hyperkalemia/Hypokalemia and metabolic disorders
  - Tamponade
  - Tension Pneumothorax
  - Tablets (toxins/poisons/drugs)
  - Thromboembolism
  - Pain

- **Consider alternative medications**
  - **Amiodarone**, 5mg/kg IV over 20 to 60 minutes (Do not routinely administer amiodarone and procainamide together) or
  - **Procainamide**, 15 mg/kg IV over 30 to 60 minutes (Do not routinely administer amiodarone and procainamide together) or
  - **Lidocaine**, 1 mg/kg IV bolus
**Pediatric Tachycardia Algorithm**
(For infants and children with rapid rhythm **AND** evidence of poor perfusion)

- **BLS Algorithm:** Assess and support ABCs

**Pulse Present?**

- *Yes*
  - **12 lead EKG if practical**
  - **Evaluate QRS Duration?**

**QRS duration normal for age** (approximately less than or = 0.08 seconds)

**Evaluate the tachycardia**

- **Probable Sinus Tachycardia**
  - **History Compatible**
  - **P Waves present & normal?**
  - **HR often varies with activity**
  - **Variable RR with constant PR**
  - **Infants:** Rate usually <220 bpm
  - **Children:** Rate usually <180 bpm

  - **Consider Vagal Maneuvers**

- **Probable Supraventricular Tachycardia**
  - **History Incompatible**
  - **P Waves absent and/or abnormal?**
  - **HR not variable with activity**
  - **Abrupt rate changes**
  - **Infants:** Rate usually >220 bpm
  - **Children:** Rate usually >180 bpm

  - **Immediate cardioversion** with 0.5 to 1.0 J/kg (may increase to 2 J/kg if initial dose ineffective)
  - **Use sedation if possible**
  - **Sedation must not delay cardioversion**

  - **Immediate IV/IO adenosine**
    - **Adenosine:** use if IV access is immediately available
    - **Dose:** adenosine Consider adenosine 0.1 mg/kg IV/IO (maximum first dose: 6 mg)
    - **May double and repeat dose once** (maximum second dose: 12 mg)
    - **Use rapid bolus technique**

- **Probable VT**
  - **Cardioversion,** 0.5 to 1.0 J/kg (consider sedation, but do not delay cardioversion)

  - **Amiodarone,** 5mg/kg IV over 20 to 60 minutes (Do not routinely administer amiodarone and procainamide together) **or**
  - **Procainamide,** 15 mg/kg IV over 30 to 60 minutes (Do not routinely administer amiodarone and procainamide together) **or**
  - **Lidocaine,** 1 mg/kg IV bolus

**QRS duration wide for age** (approximately > 0.08 seconds)

- **Evaluate the tachycardia**

- **Probable VT**
  - **Cardioversion,** 0.5 to 1.0 J/kg (consider sedation, but do not delay cardioversion)

  - **Amiodarone,** 5mg/kg IV over 20 to 60 minutes (Do not routinely administer amiodarone and procainamide together) **or**
  - **Procainamide,** 15 mg/kg IV over 30 to 60 minutes (Do not routinely administer amiodarone and procainamide together) **or**
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**Immediate cardioversion** with 0.5 to 1.0 J/kg (may increase to 2 J/kg if initial dose ineffective)

- **Use sedation if possible**
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**Consider alternative medications**

- **Amiodarone,** 5mg/kg IV over 20 to 60 minutes (Do not routinely administer amiodarone and procainamide together) **or**
- **Procainamide,** 15 mg/kg IV over 30 to 60 minutes (Do not routinely administer amiodarone and procainamide together) **or**
- **Lidocaine,** 1 mg/kg IV bolus
ADDITIONAL NOTES (EMERGENCY CARDIAC CARE):
PHARMACOLOGY

GUIDELINES AND CONSIDERATIONS: The key to drug use is using caution. Familiarity with adverse drug effects and preparedness to deal with those effects are also paramount to safe use. The following factors can influence the therapeutic effects of medications:

- Age
- Body Weight
- Sex
- Route of administration
- Time of administration
- Rate of inactivation and excretion
- Tolerance
- Pathological state
- Genetic factors
- Drug interaction

Allergy and Hypersensitivity: Hypersensitivity reactions can vary in their presentation. Antibiotics are the most common cause, however, any medication may be at fault. Allergic reaction to any antigen, e.g. snake envenomation, insect stings, pollens, etc., can cause similar symptoms. Reactions may include, but are not limited to:

- Allergic rhinitis, urticaria (hives), reactive airway/asthma or profound hypotension.
- Local reactions may include GI distress and/or dermal presentation, e.g. nausea, vomiting, cramps, diarrhea, pruritic skin, hives, local rash.
- Life threatening reactions (such as anaphylaxis) can occur in seconds to minutes and may include:
  - Tightness in the chest and wheezing
  - Skin changes: diffuse redness, hives and flushing
  - Angioedema or swelling of the periorbital and perioral area
  - Rapidly progressive respiratory distress due to laryngeal edema, bronchospasm and fluid accumulation in the lungs.
  - Hypotension/overt signs of shock

OBSERVE THE FOLLOWING:

1. Medications are not always indicated. You must weigh the benefits against the potential adverse patient and mission effects.
2. All medications have potential adverse effects and many patients have a history of adverse reactions to various medications. In a conscious patient obtain a drug history. In an unconscious patient search for identification/warning tags denoting medication sensitivities.
3. Recommended doses will be followed.
4. When using IV medication, have a reliable IV fluid line running and inject the medication into the rubber fitting in the IV line.
5. When injecting through a saline lock, flush the lock with 10 cc of normal saline after administering the medication.
6. In addition to medication, your patient will require maintenance fluids, electrolytes, and nutritional balance.
7. CAUTION: Be prepared for anaphylactic reactions at all times.
GENERAL RULES:

- **Sterile technique**: Alcohol cleaning of injection port or skin.
- Always aspirate before injecting medication to make sure you are not in a vessel or to insure proper placement in a vein for IV medication.
- **For IVs**: Mark on tape the date, time, and needle size.  
- **CAUTION**: Be prepared for immediate hypersensitivity reactions and anaphylactic shock reactions at all times.

ROUTES OF ADMINISTRATION:

- **Oral**: Give adequate fluids
- **Subcutaneous (SQ or SubQ) injection**: Gently grasp skin over injection site and pull skin away from underlying muscle, forming a mound. Insert the needle at a 45° angle. Aspirate before injection.
- **Intramuscular (IM) injection**: Hold needle at 90 degrees to the skin, insert deep into the muscle, aspirate to make sure you are not in the vein or artery, and inject.
- **Intravenous (IV) injection**: Inject slowly into the tubing of an actively running, reliable IV. You may "piggy back" (run one IV into the tubing of another) a medication. IV injection through the port of a saline lock should be followed by at saline flush of 5-10 cc’s.

MEASUREMENT OF DOSAGES:

- **Grain (gr)**: Measure of weight (apothecary system).
- **Gram (gm)**: Measure of weight (metric system) equals to 1,000 milligrams (mg).
- **Liter (l) and Cubic Centimeter (cc)**: Measures of volume.
- **Milligrams per milliliter (mg/ml) and milligrams per cubic centimeter (mg/cc)**: Units of concentration.
- **Milligrams per Kilogram (mg/Kg)**: Most commonly used with pediatric medications
- **Units (u)**: An arbitrary measure of an active ingredient, e.g., penicillin, established to determine the effective dosage of medication.

**ANAPHYLAXIS PROTOCOL**

<table>
<thead>
<tr>
<th>Signs/Symptoms of Anaphylaxis Present?</th>
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<tbody>
<tr>
<td>• 100% Oxygen by mask</td>
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<tr>
<td>• Support Ventilation as needed</td>
</tr>
<tr>
<td>• Start IV NS</td>
</tr>
<tr>
<td>• Evaluate severity of symptoms</td>
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</table>
**NOTE 1:** *If unable to obtain IV access consider sublingual injection (injection into the plexus of veins under the tongue) of epinephrine as a temporary measure while establishing an IV. May also be given by ET Tube (dilute to 1:10,000 and follow with 5-10cc of saline to flush).*

**NOTE 2:** **May give IM if no IV access.**

**CAUTION:** SxS of anaphylaxis may reoccur 12-24 hours after the initial reaction. Keep the patient under close observation at all times for the first 24 hours following initial reaction. If symptoms reoccur, treat via the above protocol. Patients with moderate or severe reactions should be evacuated as soon as possible, with close observation while awaiting evacuation.

**Caution:** In the treatment of anaphylactic shock, IV epinephrine must be given very slowly, preferably at least 5 minutes per dose. Rapid bolus IV injection can cause myocardial ischemia and potentially fatal cardiac arrhythmias.

**Caution:** IV epinephrine must be injected SLOWLY: Give dose over at least 5 minutes.
Lidocaine HCL 2% (Xylocaine): Local anesthetic

- See ACLS drugs for cardiac therapy.
- **CAUTION:** Some lidocaine solutions contain 1:10,000 epinephrine. This causes intense vasoconstriction, and prolongs the duration of the anesthesia. These solutions are identified by a red label or red lettering on the label. **DO NOT** use solutions containing epinephrine on or near the fingers, toes, nose, ears or penis.

**Rx:** (As a local anesthetic): Suturing, debridement, nerve blocks, thoracostomy or other similar procedures. Duration of anesthesia is 30-60 minutes.

**Dose:** To desired effect.
- Maximum single adult dose is 4.5 mg/Kg or 300 mg (15 cc’s of the 2% solution contains 300 mg lidocaine).

- **Note 1:** This is different max dose than with IV lidocaine for ACLS use.
- **Note 2:** 2% lidocaine contains 20 mg of lidocaine per cc. Diluting 2% lidocaine 1:1 with normal saline gives a 1% solution (10 mg per cc) that is just as effective as the 2% solution.

**Contra:** 2nd degree, 3rd degree, hypotension, Stokes-Adams Syndrome

**SE:** slurred speech, altered mental status, tinnitus, edema

**AR:** Skin: dermatologic reactions, status asthmaticus, anaphylaxis, and seizures

Morphine Sulfate: Narcotic analgesic (opioid). Alters perception of pain and emotional response to pain. **Have Narcan available when using Morphine.**

**Rx:** Severe Pain, pain from cardiac ischemia, CHF
- Alters perception & emotional response to pain

**Contra:** Respiratory depression, hypotension, head injury

**Dose:** 4-15 mg IV slow push (Dilute in 5 cc saline & inject slowly over 4-5 min)
- **Peds:** 0.1-0.2 mg/Kg SC. Do not exceed 15 mg.

**SE:** ↓ RR, hypotension, bradycardia, N & V, dizziness, pruritus and skin flushing

**AR:** Seizures with large doses, constipation, ileus, urinary retention

Narcan (Naloxone HCL): Narcotic antagonist.

**Rx:** Known or suspected narcotic-induced respiratory depression.
- **Note:** Have available when using morphine.
- **Warning:** The duration of action of Narcan is 20-40 minutes, much less than the duration of action of morphine. After use of Narcan, observe patient closely, repeat doses of Narcan may be necessary after 20-30 minutes.

**Dose:** 0.4-2 mg IV. Repeat q. 2-3 min/prn.
- Duration is 20-40 minutes (< duration of action of morphine). Repeat doses of may be necessary after 20-30 minutes.
- **Peds:** 0.01 mg/Kg dose IM, IV or SC q. 2-3 min.
If initial dose does not result in clinical response, increase dose up to 0.1 mg/Kg
If no response after 10mg has been administered, diagnosis of narcotic-induced toxicity should be questioned.

SE: In narcotic dependent patient, withdrawal symptoms may be precipitated.
AR: With higher than recommended doses: nausea, vomiting, tachycardia hypertension, and tremors.

ANTIBIOTICS

Cefotetan (cefotan): Broad-spectrum bactericidal antibiotic for IV/IM use (cephalosporin)
Rx: For serious infections of: Lower respiratory tract (i.e. pneumonia); urinary tract; skin infections; intra-abdominal infections (especially penetrating abdominal trauma); & penetrating trauma to the extremities.
   • NOTE: NOT effective in CNS infections (see Rocephin)
Contra: Use caution in pts w/ hx of penicillin allergy, hepatic and/or liver dysfunction
   • Not recommended for children
Dose: 1-2 Gm IV/IM q. 12 hours
SE: headaches, dizziness, nausea, vomiting, diarrhea, abdominal cramps, urticaria, elevated temperature
AR: eosinophilia, thrombocytosis, leukopenia; pain at injection site; induration, sterile abscess, tissue sloughing, phlebitis; thrombophlebitis with IV use.

Cipro (Ciprofloxacin): Broad-spectrum oral antibiotic (quinolone).
Rx: Infectious diarrhea, Typhoid, acute sinusitis, wounds contaminated by seawater or freshwater, some biological warfare bacteria
Contra: Not be used by pregnant women. Not recommended for children < 18 y.o.
Dose: 500 mg q. 12hrs (take w/ meals). Continue for two days after symptoms resolve.
SE: syncope, irritability, lethargy, drowsiness, urticaria, edema, dyspnea,
AR: GI bleed, insomnia, nightmares, manic reaction, ataxia, seizures, depression, paresthesias, blurred vision, diplopia, tinnitus, joint or back pain, gout, acidosis, HTN, angina, AML, bronchospasm

Garamycin (Gentamycin) Ophthalmic Ointment: Ophthalmic antibiotic ointment.
   • Erythromycin Ophthalmic Ointment can be substituted. Use/dose are the same.
   • No corneal toxicity noted w/ erythromycin.
Rx: conjunctivitis, prophylaxis for ocular infection.
Dose: Instill 1/2 to 1 inch of ointment into conjunctival sac q.i.d. and at bedtime.
Contra: Known allergy
SE: Hypersensentivity, photophobia, slowed corneal wound healing
AR: corneal toxicity w/ prolonged use (> 5 days), overgrowth of nonsusceptible organisms.

Keflex (Cephlexin): Broad-spectrum bactericidal oral antibiotic (cephalosporin)
Rx: Respiratory, genito-urinary tract infections, skin and soft tissue infection, bone and joint infection.
Contra: Use caution in pts w/ hx of penicillin allergy, hepatic and/or liver dysfunction
Dose: 250 mg to 1 gm PO q. 6hrs.  Ped: 6 - 12 mg/Kg PO q6h.
SE: dizziness, headache, malaise, N & V, diarrhea, urticaria
AR: neutropenia, eosinophilia, anemia, paresthesias, abdominal cramps, skin disorders
Mefoxin (Cefoxitin sodium): Broad-spectrum antibiotic for IV/IM use. (cephalosporin)
  • Similar to Rocephin, but covers GI organisms better. Does not cover CNS infections or
  penetrating trauma to CNS. Similar in coverage to Cefotan.
Rx: As an alternative to Rocephin. Infections of GI, lower respiratory, and urinary tracts.
Contra: Use caution in pts w/ hx of penicillin allergy, hepatic and/or liver dysfunction
Dose: 1-2 grams IV/IM q. 6–8/hrs.
  Peds: 80-160 mg/Kg per 24 hours, divided into 3-4 doses 6-8 hours apart.
SE: headaches, dizziness, nausea, vomiting, diarrhea, abdominal cramps, urticaria,
↑↑ ↑↑ temperature
AR: eosinophilia, thrombocytosis, leukopenia; pain at injection site; induration, sterile
abscess, tissue sloughing, phlebitis; thrombophlebitis with IV use.

Rocephin (ceftriaxone sodium): Broad-spectrum bactericidal antibiotic for IV/IM use.
(cephalosporin)
Rx (Serious infections of): Lower respiratory tract (i.e. pneumonia); urinary tract; skin
infections; intra-abdominal infections (especially penetrating abdominal trauma); penetrating
trauma to the extremities; & CNS infections
Contra: Use caution in pts w/ hx of penicillin allergy, hepatic and/or liver dysfunction
Dosage: 1-2 gm IM/IV daily or in divided doses bid; Max dose 4 gm/day
  Peds: 50-75 mg/Kg given in divided doses q12 hours, max dose 2 gm/day.
Preparation procedure:
  1. W/draw 10cc NaCl from a 100cc bag. Inject 10cc NaCl into 1 gm Rocephin vial. Mix.
  2. W/draw entire contents of vial and inject into original 100cc NaCl IV bag. Mix.
  3. Piggyback with running IV.
NOTE: If giving IM, reconstitute with 1% lidocaine WITHOUT epinephrine.
SE: headaches, dizziness, N & V, diarrhea, abdominal cramps, urticaria, ↑ temperature
AR: eosinophilia, thrombocytosis, leukopenia; pain at injection site; induration, sterile
abscess, tissue sloughing, phlebitis; thrombophlebitis with IV use.

Silvadene Cream (Silver sulfadiazine) Topical microbial
Rx: Treatment and prevention of sepsis in 2nd and 3rd degree burns.
Dosage: Using sterile technique, apply thick layer to burn area, cover w/ saran wrap (if
available), then bulky dressing. Change dressing q. 12-24 hours.
  • It is normal for silvadine will turn gray/black color on exposure to light.
Contra: G6PD deficiency. Do not use on face. Use extreme caution in sulfa sensitivity.
SE: burning sensation, rash
AR: transient leukopenia, systemic sulfa reaction

Benadryl (Diphenhydramine HCL): Antihistamine.
  • Prevents (but does not reverse) histamine-mediated responses.
Rx: Mild to moderate allergic symptoms and/or allergic reactions, dystonic reaction
Dose: 25-50mg IM/IV or 25-50mg/PO/t.i.d.
  • Max dose 400mg/day
  • May be given PO, IM or IV
  Peds: (Children < 12 years): 5 mg/Kg/day in divided doses q.i.d.
    • May be given PO, IM or IV
Contra: asthma, pregnant or lactating females

ANTIHISTAMINES
SE: sedation, blurred vision, N & V, vomiting, diarrhea, headache
AR: insomnia, vertigo, palpitations, dry mouth, constipation, dysuria, urine retention

Phenergan (Promethazine Hydrochloride): Antihistamine
• Prevents but does not reverse histamine mediated response.
• Phenergan can induce an acute dystonic reaction (symptoms may resemble a stroke). Rx w/ 25-50 mg of Benadryl IV or IM. Symptoms normally resolve within 15-20 minutes.
Rx: Motion sickness, nausea and vomiting, sedation.
Dose: 25-50 mg IM q. 4-6h prn. (IM Injection is painful).
  Peds: 0.5-1mg/Kg IM q6-8h pm not to exceed 25 mg.
IV administration:
  • Administer over a prolonged time > 5 min and through a free flowing IV line, rather than a saline lock.
  • The 50-mg/ml formulation must be diluted to 25 mg/ml (50/50 dilution) or less before being administered IV.
  • Dosage is 12.5-25 mg every 6-8 hours.
  • Peds: 0.5-1mg/Kg IM q6-8h pm not to exceed 25 mg.
Contra: Additive effect w/ ALL other sedation medication. May cause excessive drowsiness or apnea. Monitor patient closely.
SE: hypotension, dry mouth, constipation, restlessness, N & V
AR: confusion, acute dystonic reaction, anorexia, photosensitivity, urine retention

Decadron (Dexamethasone): Parenteral steroid. (glucocorticoid)
Rx: Emergency treatment of AMS, HACE, HAPE, when tactical conditions preclude descent or acclimatization
  • Use of Decadron ↓symptoms of AMS, but does not speed acclimatization. Use of Decadron does not preclude the need for an emergency descent. (Administer Decadron every 6 hours until descent is accomplished)
Dosage: 4mg IV/IM or PO every 6 hours
Contra: Use caution in pts w/ hx of diabetes, hypertension, and ulcers
SE: delayed wound healing, acne, various skin eruptions, edema
AR: Usually dose related. Psychotic behavior, CHF, HTN, cataracts, glaucoma, hypokalemia, hyperglycemia, and carbohydrate intolerance

Motrin (Ibuprofen): Analgesic, antipyretic (NSAID)
Rx: mild to moderate pain, arthritis
Dose: 200-800 mg PO t.i.d. or q.i.d. Not to exceed 2400 mg/day (800 mg TID)
Contra: Penetrating trauma, suspected internal bleeding, or suspected intracranial bleeding, pregnancy, nursing mothers.
  • NOTE: Should not be given to pts w/ hx of aspirin sensitivity or severe asthma.
SE: N & V, headache, dizziness, drowsiness
AR: Prolonged bleeding time, tinnitus, edema, peptic ulcer
Solumedrol (Methylprednisolone): Parenteral steroid. Decreases inflammation, reduces immune response in allergic conditions. (glucocorticoid)

**Rx:** Severe inflammation, severe asthma, severe allergic reaction, anaphylaxis.
- For blunt, Non-Penetrating, spinal chord trauma w/ SxS of spinal chord injury.
- Most effective when started as soon as possible after the injury occurs.

**Dose:** 125 mg IM or IV q. 6hrs.  
*Peds:* 1-2 mg/Kg IV or IM q. 6hrs
- Anaphylaxis: 125 mg IV or IM (see protocol)
- Spinal trauma: Initial bolus = 30mg/kg IV slow push followed by IV drip of 5.4 mg/kg/hr for subsequent 23 hours (see protocol)
  - If started > 6 hrs after the original injury, continue the IV drip for 48 hours.
  - All persons started on the Solu-Medrol protocol should also receive ulcer prophylaxis of Zantac 50 Mg IV or IM every 6-8 hours, or 150 Mg orally every 12 hours.

**Contra:** Use caution in pts w/ hx of diabetes, hypertension, ulcers

**SE:** delayed wound healing, acne, various skin eruptions, edema
**AR:** Usually dose related. Psychotic behavior, CHF, HTN, cataracts, glaucoma, hypokalemia, hyperglycemia, and carbohydrate intolerance

Toradol (Ketorlac Tromethamine): Analgesic (NSAID)

**Rx:** Short term pain relief (especially musculoskeletal pain).
- May be used as single or multiple dose, for the management of moderately severe, acute pain requiring analgesia at the opiate level
- Analgesic effect starts within 30 minutes of administration, peaks at 2 hours.
- Increasing dosage does not increase analgesic effect. If additional analgesia is needed, consider using small doses of morphine.

**Dose:** 30 mg IM or IV. May be repeated every 6 hours prn; not to exceed 120 mg per day; total duration of therapy not to exceed 5 days
- Rapid IM injection is painful. Administer slowly into deep muscle
- IV bolus must be given over no less than 15 seconds

**Contra:** Penetrating trauma; Suspected internal bleeding; Suspected intracranial bleeding; Pts currently receiving aspirin, NSAIDs, or anticoagulant therapy; active peptic ulcers or recent GI bleed
- Use w/ extreme caution in pts w/ hx of: renal & liver disease, COPD, asthma, ulcers, bleeding disorders, elderly, diabetes

**SE:** Nausea, GI bleed, edema.
- Does not usually cause drowsiness or altered mental status. Check for other causes of altered mental status.

**AR:** GI bleeding and/or perforation; renal impairment and/or failure; inhibits platelet function

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**Afrin Nasal Spray (Oxymetazoline HCL): Vasoconstrictor (decongestant)**

**Rx:** Use as an adjunct to clear ears and sinuses during compression and decompression.

**Dose:** Spray into each nostril 2 times, twice daily. Not to exceed three consecutive days.
- **NOTE:** Do not tilt head backwards while spraying.

**Contra:** Severe damage to tympanic membrane/sinuses from barotrauma (see Barotrauma)

**SE:** Burning, sneezing and stinging of nasal mucosa

**AR:** Rhinitus
Atropine sulfate: Vagolytic
Rx: Organophosphate or chemical poisoning, asthma, symptomatic bradycardia (see ACLS medications)
• NOTE: Successful treatment of organophosphate or chemical exposure may require mass quantities and repeated administration of atropine.

Dosage: 0.5-1.0 mg q. 5 minutes up to max dosage is 3 mg (0.04 Mg/Kg).
  • Organophosphate poisoning: 2-5 mg IV q. 15-30 minutes
  • Pediatric: 0.015 mg/Kg up to a maximum dose of 0.04 mg/Kg.

Contra: Atrial fibrillation, atrial flutter, glaucoma
• Use extreme caution in patients w/ hx of Type II AV block and in 3rd degree block.

SE: Dilated pupils, ↑HR, VT, VF, dry mouth
AR: Delirium

Diamox (acetazolamide): Non-diuretic antihypertensive(carbonic anhydrase inhibitor)
Rx: Prevention and/or amelioration of symptoms associated with acute mountain sickness in climbers attempting rapid ascent and/or in those who are very susceptible to acute mountain sickness despite gradual ascent.
  • For maximum benefit begin regimen 7 days prior to ascent
  • Of minimal benefit in Rx of AMS, HACE, or HAPE

Dose: 125-250 mg b.i.d., 24 hours prior to ascent, continuing for 48 hours after ascent.
  • Prevention and/or amelioration benefits is nominal once ascent has commenced
  • If the 500 mg sustained release tablet is used, dose is 500 mg every 24 hours.

Contra: Sulfa allergy.

SE: Paresthesia in extremities, hearing dysfunction/tinnitus, loss of appetite, taste alterations, N & V, diarrhea, polyuria, drowsiness and confusion.
  • Use of Diamox results in a significant alteration in taste. Carbonated beverages will have seriously altered taste, and may be undrinkable.
  • Increased fluid intake is required with use of Diamox: It is a diuretic, and can result in serious dehydration unless great care is taken to maintain proper hydration.

AR: Transient myopia (usually resolves w/ DC of drug). Uticaria, melena, hematuria, flaccid paralysis, photosensitivity, convulsions.

Epinephrine (Adrenaline): Alpha and beta adrenergic sympathomimetic. First-line drug for anaphylaxis (See ACLS drugs for cardiac therapy)
• Causes bronchodilitation, vasoconstriction, increases blood pressure.
• Decreases edema/swelling due to allergic reactions.
• NOTE: 1:1,000 dilution epinephrine (1mg in 1 cc) is standard pararescue issue. 1:10,000 dilution (1mg in 10cc) is the standard ‘Cardiac’ dosage form, the only dilution that can be used IV. 1:1,000 epinephrine can be diluted to the 1:10,000 form by putting 1 cc of 1:1,000 epinephrine (1 mg epinephrine) in 9 cc’s of normal saline.

Rx: Anaphylaxis, Allergic reactions (mild/moderate/severe), & Asthma
Dose: Anaphylaxis: 0.3-0.5 mg (3-5 cc of 1:10,000 dilution) IV or 0.3-0.5 mg (0.3-0.5 cc of 1:1,000 dilution) IM
  • Allergic reaction: 0.2-0.5 mg (0.3-0.5 cc of 1:1,000 dilution) SubQ or IM
  • Asthma: 0.3-0.5 mg (0.3-0.5 cc of 1:1,000 dilution) SubQ
  • Pediatric: 0.01 mg/Kg SubQ or IM. Not to exceed 0.5 mg

Contra: 1:1,000 Epi is NOT given IV.
• Use caution in pts with a hx of heart disease, or over the age of 40.
• Do not inject Epi (or solutions containing Epi) into/near the fingers, toes, nose, ears or penis. Intense vasoconstriction may cause necrosis.

SE: Cardiac arrhythmias, VT, VF, angina, HTN, ↑BP, nausea and vomiting, vasoconstriction
AR: Uncontrolled effects on myocardium & arterial system
Imodium (Ioperamide HCL) Anti-Diarrheal (opioid)

**Rx:** Treatment of acute diarrhea.
- For use in **acute, non-invasive** diarrhea only.
- Refer to medical emergencies if blood and/or mucus are present in stool, or diarrhea is associated with fever (infectious diarrhea).
- **NOTE:** The best course of action for acute diarrhea is to allow it to “run its course”.  Ensure copious hydration.

**Dose:** 2 capsules (4 mg) first dose, then 1 capsule (2 mg) after every unformed stool, not to exceed 10 mg (5 capsules) in 24 hours.
- Use only if control of diarrhea is critical for continued operations.

**Contra:** Acute dysentery. Not for use in children < 12 y.o.

**SE:** Abdominal pain/distention, N & V, severe constipation, drowsiness, dizziness.

**AR:** Hypersensitivity

Lasix (Furosemide): Diuretic

**Rx:** CHF w/ pulmonary edema, acute pulmonary edema, hypertensive crisis
- Use in HAPE is controversial, not currently recommended without direct physician control.
- Should have a urinary catheter in place to monitor urine output.

**Dosage:** 20-40 mg slow IV push.
- **Peds:** 1mg/kg IV or IO slow push.

**Contra:** Dehydration, hypotension, hypokalemia, hepatic coma

**SE:** Hypokalemia, hypotension, dehydration

**AR:** Agranulocytosis, leukopenia, thrombocytopenia; transient deafness w/ rapid IV

Mannitol: Osmotic diuretic

**Rx:** ICP; Myoglobinuria secondary to crush syndrome and rhabdomyolysis

**Dose:** 0.25-1.0 grams/Kg IV (Takes effect w/in minutes of administration and can last 6-8 hours)
- Increases urine flow, making this an unreliable indicator of resuscitation.
- Use mannitol ONLY if there is evidence of ICP.

**Contra:** suspected/actual renal failure, suspected/actual intracranial hemorrhage

**SE:** headache, nausea/vomiting, blurred vision, dizziness, rash, dehydration

**AR:** seizures, pulmonary edema, cardiovascular collapse.

Valium (Diazepam): General CNS depressant (Anticonvulsant/sedative).

**Rx:** Acute anxiety, seizures, status epilepticus, relaxation of skeletal muscle
- Drug of choice for treatment of convulsions associated with chemical agents or organophosphates.

**NOTE:** Successful treatment of convulsions from organophosphate or chemical exposure may require mass quantities and repeated administration Valium.

- Has **NO** analgesic or anesthetic properties.
- Overdose may be reversed w/ Flumazenil

**Dose:**
- **Status Epilepticus:** 5-10 mg IV slow push
- **Acute anxiety:** 5-15 mg IV slow push
- **Relaxation of skeletal muscle:** 5-15 mg IV slow push
- **Chemical Warfare**: 10-15 mg IV slow push
  - *Auto injection Diazepam should be used for seizures induced by chemicals

**Contra:** head injury, ↓BP, acute narrow angle glaucoma
- Has additive effect with other respiratory depressants (morphine, phenergan and alcohol).  Be prepared to perform BLS.

**SE:** ↓BP, ↓Respirations, drowsiness, venous irritation, pain at injection site, N & V

**AR:** bradycardia, CV collapse, amnesia, abdominal discomfort
Zantac (ranitidine): H-2 blocker; ↓ secretion of stomach acid  
• **NOTE:** Drug Interactions: ↓ absorption of oral diazepam.  

**Rx:** Gastric and/or peptic ulcers, upper GI bleeds, prevention of stress ulcers in burn victims or patients on steroid treatment.  
• Drug of choice for treatment of gastric or peptic ulcers.  
• Adjunct in treatment of urticaria and anaphylaxis.  

**Dosage:** 50 mg IV or IM q. 6-8 hours for ulcers, burns, steroid use, upper GI bleeds, urticaria or anaphylaxis.  
• **Oral dose:** 150 mg b.i.d. for ulcer, urticaria.  
• **Peds:** 1.5 mg/Kg IV x 1, then 0.75 mg/Kg IV every 12 hours  

**Contra:** Known/suspected liver disease  
**SE:** Headache, diarrhea/constipation, muscle aches, vertigo, malaise, dry mouth, N & V  
**AR:** Thrombocytopenia, liver toxicity.  

**Additional Notes for Standard Pharmacology:**
Adenocard (Adenosine): Anti-arrhythmic
Rx: PSVT
- WILL NOT convert atrial flutter, atrial fibrillation, or VT
Dosage: 6 mg rapid bolus (1-3 sec) followed by 10cc saline flush. If no effect in 1-2 minutes, give 12 mg in 1-3 sec. May repeat 12 mg bolus one more time.
- Peds: 0.1-0.2mg/kg IV rapid push, if IO up to 6mg
- May double dose if no effect up to max 12 mg dose (1 time)
Contra: 2nd or 3rd degree AV block, Sick Sinus Syndrome
SE: Transient dysrhythmias, syncope, flushing, dyspnea, chest pressure, hypotension, headache, N & V, bronchospasm
AR: • Adenosine is blocked by methylxanthines
  • Adenosine is potentated by dipyridamole & carbamazepine

Atropine sulfate: Vagolytic
Rx: Asystole, PEA, symptomatic bradycardia
- Initial therapy for patients with symptomatic bradycardia.
- May restore normal AV nodal conduction and electrical activity in patients with 1st degree AV block or Mobitz Type 1.
Dosage: 0.5-1.0 mg q. 5 minutes until desired response is achieved or abatement of signs and symptoms up to max dosage of 3 mg (0.04 Mg/Kg).
- The administration of 3 mg should be reserved for asystole.
- Administration of less than 0.5 mg can produce a paradoxical bradycardia.
- Pediatric: 0.015 mg/Kg up to a maximum dose of 0.04 mg/Kg.
Contra: Atrial fibrillation, atrial flutter, glaucoma
- Use extreme caution in patients with Type II AV block and in 3rd degree block.
SE: Dilated pupils, ↑HR, VT, VF, dry mouth
AR: hypotension, CNS anti-cholinergic effects

Dopamine (Intropin): Adrenergic Inotropic Vasopressor
Rx: Cardiogenic shock or significant hypotension in the ABSENCE OF HEMODYNAMIC COMPROMISE.
Dosage: Mix 200 mg in 250 mg of D5W w/ initial infusion rate is 1-5 ug/kg/min, up to max dose 5-20 ug/Kg per minute.

<table>
<thead>
<tr>
<th>Dopamine Drip</th>
<th>For a 1-5 mcg/min drip rate: Mix 200 mg dopamine in 250 ml D5W. Run drip at desired rate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mg/min</td>
<td>1mcg</td>
</tr>
<tr>
<td>mcg/mtts/min</td>
<td>15gtts</td>
</tr>
</tbody>
</table>

- Increase infusion rate until BP, urine output and other indicators of organ perfusion improve.
- ↓ dose to 1/10th for patients on MAO inhibitors
Contra: Tachydysrhythmias
  • CAUTION: Dopamine will increase heart rate and may induce or exacerbate supraventricular and ventricular arrhythmias. Even at low doses, venous and arterial vasoconstriction effects can exacerbate pulmonary congestion and compromise cardiac output.
SE: Tachydysrhythmias, VT, VF, HTN & V and ischemia
AR: AMI, tissue necrosis from extravasation
Epinephrine 1:10,000 (Adrenaline): Anti-arrhythmic

Rx: Cardiac arrest from ventricular fibrillation or pulseless ventricular tachycardia unresponsive to initial countershocks; asystole, or pulseless electrical activity.

Dosage: Cardiac arrest: 1 mg (1:10,000) IV push followed by 20 cc saline flush q. 3-5/min.

   Pediatric: 0.01 mg/Kg IVP

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Epinephrine Drip

For a 1-10 mcg/min drip rate: Mix 1mg in 250ml of D5W. Run drip at desired rate.

<table>
<thead>
<tr>
<th>mcg/min</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>mcgts</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
</tr>
</tbody>
</table>

Contra: tachydysrhythmias, coronary artery disease

   • **CAUTION:** Use extreme caution in pts with Type II AV block and 3rd degree block; a hx of heart disease or over the age of 40.

   SE: Cardiac arrhythmias, VT, VF, angina, HTN, ↑BP, nausea and vomiting

   AR: Uncontrolled effects on myocardium & arterial system

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Lasix (Furosemide): Diuretic

Rx: CHF w/ pulmonary edema, acute pulmonary edema, hypertensive crisis

   • Use in HAPE is controversial, not currently recommended without direct physician control.

   • Should have a urinary catheter in place to monitor urine output.

Dosage: 20-40 mg slow IV push.

   Peds: 1mg/kg IV or IO slow push.

Contra: Dehydration, hypotension, hypokalemia, hepatic coma

   SE: Hypokalemia, hypotension, dehydration

   AR: Agranulocytosis, leukopenia, thrombocytopenia; transient deafness w/ rapid IV

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Lidocaine Hydrochloride 2% (Xylocaine): Anti-arrhythmic

Rx – Cardiac arrest, pulseless VT/VF, VT w/ pulse, PVC’s, ventricular ectopy.

   • First line antiarrhythmic agent for use in the treatment of ventricular tachycardia and ventricular fibrillation.

   • Suppression of ventricular ectopy.

Dosage: Peds: 1.5-2mg/kg up to 6 y.o.

   • Cardiac arrest / pulseless VT / VF: 1.5 mg/kg IVP; repeat q. 5 – 10 min up to 3 mg/kg
      • Drip rate = 2-4 mg/min

   • VT w/ pulse: 1.5 mg/kg IVP; repeat q. 5 – 10 min up to 3 mg/kg
      • Drip rate = 2-4 mg/min

   • PVC’s: 1.5 mg/kg IVP; repeat q. 5 – 10 min up to 3 mg/kg
      • Drip rate = 2-4 mg/min

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Lidocaine Drip

For a 1-4mg/min drip rate: Mix 1 gm in 250 ml D5W. Run drip at desired rate.

<table>
<thead>
<tr>
<th>Mg/min</th>
<th>1mg</th>
<th>2mg</th>
<th>3mg</th>
<th>4mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mcgts/min</td>
<td>15gtts</td>
<td>30gtts</td>
<td>45gtts</td>
<td>60gtts</td>
</tr>
</tbody>
</table>

Reduce maintenance infusion by 50% if pt is >70 y.o., has liver disease, CHF, or in shock

Contra: 2nd degree, 3rd degree, hypotension, Stokes-Adams Syndrome

   • **CAUTION:** Excessive doses of Lidocaine can produce neurological changes, myocardial depression, and circulatory depression. Seizures can result from overdose.

   SE: slurred speech, altered mental status

   AR: Edema, tinnitus, status asthmaticus, anaphylaxis, seizures, urticaria, hives.

125
Nitroglycerine: Coronary artery dilator (vasodilator)

**Rx:** Angina, Hypertension, CHF
- Indicated for acute relief from an MI or prophylaxis of angina pectoris due to coronary ischemia.

**Dosage:** 0.4 mg SubL (spray or tablets) q. 5 minutes for a maximum of 3 doses.
- **Note:** Once opened or prolonged exposure to sunlight may inhibit nitroglycerine’s therapeautic affects.

**Contra:** Hypotension, hypovolemia, intracranial bleeding, ICP

**SE:** Hypotension, syncope, tachycardia, flushing, dizziness

**AR:** Marked sensitivity reaction to the hypotensive effects and a severe response (nausea, vomiting, restlessness, pallor, diaphoresis and collapse).

**Procainamide HCL (Pronestyl):** Anti-arrhythmic

**Rx:** PVCs, VT, PSVT, refractory VF.
- Is acceptable and probably helpful in persistent cardiac arrest due to VF.
- May be helpful in suppressing PVCs and recurrent VT that refractory to lidocaine.
- May also be used to convert supraventricular arrhythmias or prevent their recurrence.

**Dose:** 20-30 mg/min IV until:
- 1) Arrhythmia is suppressed;
- 2) Hypotension ensues;
- 3) QRS complex is widens by 50% of its original width;
- 4) 17 mg/kg of the drug is administered. Follow by infusion rate of 1-4 mg/min

<table>
<thead>
<tr>
<th>Procainamide Drip</th>
<th>For a 2-4mg/min-drip rate: Mix 1 gm in 250 ml D5W. Run drip at desired rate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mg/min</td>
<td>1mg</td>
</tr>
<tr>
<td>mcgtts/min</td>
<td>15gtts</td>
</tr>
</tbody>
</table>

**Ped:** 2-6 mg/kg IV or IO @ < 20 mg/min

**Ped drip:** 20-8- mcg/kg/min

**Contra:** 2nd & 3rd degree AV block, Torsades de Pointes, Lupus, digitalis toxicity, myasthenia gravis. Administer with caution to patients with AMI.
- **CAUTION:** May produce hypotension and conduction disturbances including heart block leading to cardiac arrest. Must be administered cautiously to patients with acute myocardial infarction (AMI).

**SE:** PR, QRS, & QT widening, AV Block, hypotension, N & V

**AR:** Cardiac arrest, Seizures

**Additional Notes for ACLS Pharmacology:**
WATER PURIFICATION IN THE FIELD

GUIDELINES AND CONSIDERATIONS
• **All Water Sources in the Field Are Considered Contaminated Until Proven Otherwise.**
• Water may be purified by mechanical means (heat and filtration), chemical means (iodine or chlorine) or a combination.
• Make sure all canteens, drinking cups, camelbacks, etc are clean and disinfected prior to use. If a container has been used to carry contaminated water, it must be cleaned and disinfected before being used to carry drinking water.
• “Gold Standard” for potable water is to boil the water for 2 minutes and allow cooling. However most authorities feel that bringing water to a boil, then covering and cooling is sufficient.
• Chemical purification is effective against most pathogenic organisms. However, this may not be effective against some cysts, such as Cryptosporidium. Chemical purification depends on having the correct concentration of the chemical (usually a halogen such as iodine or chlorine) in contact with the water for a specific amount of time (contact time). Either contact time or concentration of the chemical must be increased if the water is cold or has a lot of organic material in it (turbid).
• Use a combination of heat and chemical purification: Heat the water to the temp of warm bath water and then add iodine or chlorine allowing 20 minutes contact time before drinking.

CHEMICAL PURIFICATION (IODINATION AND CHLORINATION)

1. Iodination
   • **Iodine Tablets**: 1 tablet per quart of water yields 8 parts per million (ppm) iodine. Contact time 20 minutes minimum, 90 minutes for cold and/or turbid water.
   • **10% Povidone-Iodine (Betadine) solution**: 16 drops per liter yields 8 ppm iodine. Contact time 20 minutes minimum. For cold or turbid water contact time is 90 minutes minimum. **Note: Do NOT** use betadine scrub solution for purification.

2. Chlorination
   • **Chlor-Floc Tablets**: 1 tablet per liter of water. Makes 8.4 ppm chlorine. Contact time, minimum 15 minutes. 60-90 minutes for cold and/or turbid water.
   • **Household Chlorine Bleach**: 4 drops per quart yields about 8 ppm chlorine. Minimum contact time 20 minutes. 90 minutes for cold and/or turbid water.
   **Note**: To decrease the bad taste of chemically purified water, you can add 250 mg of vitamin C (ascorbic acid) per quart **after the contact time has elapsed**. Doing so binds the free halogen and eliminates the chemical taste. This will impart a slightly sour, but not unpleasant taste to the water.

FILTRATION: Water filters may or may not purify all water. For most filters, best bet is to filter the water, then treat it chemically. Some water purification units combine a filter with an iodine-resin matrix, which can produce potable water with one pass through the filter unit. In such units, two passes through the unit is recommended for ‘worst case’ water, i.e. cold and/or heavily contaminated water. Units that have a filter and iodine-resin matrix include the PUR Explorer®, PUR Scout®, SweetWater Guardian® filter (with Viral Guard filter attached), and the TDS® Individual Water Purification systems. Filters will clog easily if not used according to instructions. Make sure you understand how to use a specific system before taking it out in the field.

**Note 1:** Most water filters **DO NOT** eliminate viruses, the source of over 50% of diarrheal disease.
**Note 2:** The Katadyne® and MSR® filter units stocked by several ST squadrons are **NOT** purification units and will **NOT** eliminate viruses.
**Note 3:** **No Filter Will Desalinate Salt Water** other than reverse-osmosis filters, which are currently too bulky and slow for Special Tactics use.
Guidelines and Considerations: The rapid growth of laser technology has resulted in increased use of lasers by DOD, US Allies and unfriendly forces. This increased use has also increased the risk of laser eye injuries. Military applications include target designators, range finders and secure communications. Personnel must ensure proper laser eye protection because of the high susceptibility of eye damage. Directed weapons have the capability to cause ocular hemorrhages, damage corneas through thermal deposition, retinal damage and induce glare and flash blindness.

Signs & Symptoms: Symptoms vary depending on distant from source, frequency of source, strength of source, length of exposure and whether any amplifying optics (binoculars, sighting scopes) was used. Symptoms include flash blindness, loss of vision (immediate or delayed), blurred vision, loss of visual field and eye pain.

Treatment:
1. Assess visual acuity with Snellen Chart and record (see attached Snellen Chart).
2. Assess visual fields with Amsler Grid Chart and record (see attached Amsler Grid).
3. If significant eye pain, apply ophthalmic ointment and patch.
4. Give pain medication as required.
5. If laser injury suspected, notify higher command.

CAUTION: An ocular hit from an IR laser may show no symptoms other than a visual field defect. Anyone who complains of ‘funny vision’, or ‘seeing spots’ in a laser environment should be examined, and screened with an Amsler Grid. Visual acuity and Amsler Grid should screen any person suspected of being hit by an IR laser. Any person with a new defect on Amsler Grid testing should be evacuated at once.

Visual Acuity Testing:
- Have the patient wear their glasses. Cover the affected eye, and then hold the chart 18 inches from the patient, and have them read the smallest line possible. Repeat with the other eye. Record the best visual acuity of each eye.

Amsler Grid Testing:
- Have the patient wear their glasses. Cover one eye. Hold the chart 18 inches from the patient, and have the patient look directly at the small black dot in the center of the grid. Record any areas of breaks in the lines or distortions of the lines. Repeat with the other eye. Normal is no breaks or distortions in the lines. Any new findings should be reported at once.
# NINE-LINE MEDEVAC REQUEST

<table>
<thead>
<tr>
<th><strong>LINE ITEM</strong></th>
<th><strong>EXPLANATION</strong></th>
<th><strong>EXPLANATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Location of pickup site.</td>
<td>Encrypt the grid coordinates of the pickup site. When using the DRYAD Numeral Cipher the same “set” line will be used to encrypt the grid zone letters and coordinates. To preclude misunderstanding, a statement is made that grid zone letters are included in the message unless unit SOP specifies its use at all times.</td>
<td>Required so evacuation vehicle knows where to pickup patient. Also, so that the unit coordinating the evacuation mission can plan the route for the evacuation vehicle or if vehicle must pick up from more than one location.</td>
</tr>
<tr>
<td>2. Radio frequency call-sign and suffix.</td>
<td>Encrypt the frequency of the radio at the pickup site, not a relay frequency. The call-sign(and suffix if used) of person to be contacted at the pickup site may be transmitted in the clear.</td>
<td>Required so that evacuation vehicles can contact requesting unit while en route to obtain additional information or change in situation or directions.</td>
</tr>
</tbody>
</table>
| 3. Number of patients by precedence | Report only applicable information and encrypt the brevity codes:  
A-URGENT  
B-URGENT (SURGERY)  
C-PRIORITY  
D-ROUTINE  
E-CONVENIENCE  

If 2 or more categories must be reported in the same request, insert the word “BREAK” between each category. | Required by unit controlling the evacuation vehicles to assist in prioritizing missions. |
| 4. Special Equipment Required | Encrypt the applicable brevity codes:  
A-None  
B-Hoist  
C-Extrication equipment  
D-Ventilator | Required so that the equipment can be placed on board the evacuation vehicle prior to the start of the mission. |
| 5. Number of patients by type | Report only applicable information and encrypt the brevity code If requesting MEDEVAC for both types, insert the word “BREAK” between litter entry and ambulatory entry.  
L+# of pts - Litter  
A+# of pts - Ambulatory | Required so that the appropriate number of evacuation vehicles may be dispatched to the pickup site. They should be configured to carry the patients requiring evacuation. |
| 6. Security of Pickup Site (Wartime) | **N**: No enemy troops in area  
**P**: Possible enemy troops in area (approach with caution)  
**E**: Enemy troops in the area (approach with caution)  
**X**: Enemy troops in area (armed escort required) | Required to assist the evacuation crew in assessing the situation and determining if assistance is required. More definitive guidance can be provided to the evacuation vehicle while en route (specific location of enemy to assist aircraft in planning approach. |
| 6. Number and types of wounds injury or illness (Peacetime) | Specific information regarding patient wounds by type. Report serious bleeding with patient blood type (if known) | Required to assist evacuation personnel in treatment and special equipment needed. |
| 7. Method of marking pickup site | Encrypt the brevity codes.  
**A**: Panels  
**B**: Pyrotechnic signal  
**C**: Smoke  
**D**: None  
**E**: Other | Required to assist crew in identifying the pickup site. Note that the color of the panels or smoke should not be transmitted until the evacuation vehicle contacts the unit just prior to its arrival. For security, the crew should identify the color and the unit confirm. |
| 8. Pt nationality and status | The number of pts in each category need not be transmitted. Encrypt only the applicable brevity codes:  
**A**: US military  
**B**: US civilian  
**C**: Non-US military  
**D**: Non-US civilian  
**E**: EPW | Required to assist in planning for destination facilities and need for guards. Unit requesting support should ensure that there is an English speaking representative at the pickup site. |
| 9. NBC Contamination (Wartime) | Include this line only when applicable. Encrypt the applicable brevity codes:  
**N**: Nuclear  
**B**: Biological  
**C**: Chemical | Required to assist in planning for the mission (Determines which evacuation vehicle will accomplish the mission and when it will be accomplished. |
| 9. Terrain Description (Peacetime) | Include details of terrain features in and around proposed LZ. If possible, describe relationship of site to prominent terrain features | Required to allow evacuation personnel to assess approach into area. |
**Example of Nine-Line Request:** 2 litter, 2 ambulatory casualties, all US Troops. Both litter cases urgent-surgical cases, both ambulatory cases routine. Good HLZ marked by panels and smoke, possible enemy troops in area, no NBC threat.

- Line 1-(give encrypted grid coordinates)
- Line 2- (Give call sign and encrypted frequency of pick-up site)
- Line 3- BRAVO 2, DELTA 2
- Line 4- ALPHA
- Line 5- LIMA 2, ALPHA 2
- Line 6- BREAK (no need for line 6 in combat situations, wounds are assumed to be trauma)
- Line 7- ALPHA, CHARLIE (encrypt as needed)
- Line 8- ALPHA (encrypt as needed)
- Line 9- BREAK (not needed if no NBC threat)

**Note:** If the line does not apply (as with line 6 and line 9 in the example above) it is acceptable to skip the line.
GLOSSARY

MEDICAL TERMS
@ -at
b.i.d. -twice a day
BM -Bowel Movement
BPM -Beats/Breaths per Minute
B/P -Blood Pressure
BS -Bowel Sounds
BVM -Bag-Valve-Mask
CC -Chief Complaint
cc -cubic centimeter
CVA -Cerebrovascular Accident
d/c -discontinue
Dx -diagnosis
ET -Endotracheal Tube
ETOH -ethyl alcohol
FB -Foreign Body
FROM -Full Range of Motion
Fx -Fracture
gtt -drops
GSW -Gun Shot Wound
hr -hour
HTN -Hypertension
KVO -Keep Vein Open
kg -kilogram
LMP -Last Menstrual Period
LR – Lactated Ringers
mmHg -millimeters of mercury
NaCl -sodium chloride
NG -Nasogastric
NPO -Nothing by mouth
NS -Normal Saline
N&V -Nausea and Vomiting
OCP -Oral Contraceptive Pills
PE -Physical Exam
PERLA -Pupils Equal and Reactive to Light and Accommodation
PO -by mouth
PRN -as needed
q -every
q.i.d. -four times daily
ROM -Range of Motion
SaO2 -oxygen saturation
SC/SubQ - Subcutaneous
SL -Sublingual
SOB -Short of Breath
TKO -To Keep Open
VA -Visual Acuity
y/o -year old
PN -positive
NEG -negative

ANATOMIC LOCATIONS
abd -abdomen
AD -right ear
AS -left ear
AU -both ears
CNS -Central Nervous System
C1-C7 -Cervical Spine
DIP -Distal Interphalangeal
GI -Gastrointestinal
GU -Genitourinary
GYN -Gynecological
LLL -Left Lower Lobe
LUQ -Left Upper Quadrant
LLQ -Left Lower Quadrant
L1-L5 -Lumbar Spine
OD -right eye
OS -left eye
OU -both eyes
PIP -Proximal Interphalangeal
RLL -Right Lower Lobe
RUL -Right Upper Lobe
RLQ -Right Lower Quadrant
RUQ -Right Upper Quadrant
TM -Tympanic Membrane
TMJ -Tempomandibular Joint
T1-T12 -Thoracic Spine
<table>
<thead>
<tr>
<th>APPEARANCE</th>
<th>Blue or pale</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Body pink, extremities blue</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Completely pink</td>
<td>2</td>
</tr>
<tr>
<td>PULSE RATE</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Below 100</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Above 100</td>
<td>2</td>
</tr>
<tr>
<td>GRIMACE</td>
<td>No response</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Grimaces</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cries</td>
<td>2</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>Limp</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Some flexion of extremities</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Active motion</td>
<td>2</td>
</tr>
<tr>
<td>RESPIRATORY</td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Slow, irregular</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Good, strong cry</td>
<td>2</td>
</tr>
</tbody>
</table>

APGAR < 4 = Serious condition requiring some degree of resuscitation
APGAR 4-6 = Condition is guarded
APGAR 7-10 = Normal stable infant

Mnemonics

Causes of Coma:

A - Alcohol, acidosis (hyperglycemic coma)
E - Epilepsy, Electrolyte abnormality, Endocrine problem
I - Insulin (hypoglycemic shock)
O - Overdose (or poisoning)
U - Uremia and other renal problems
T - Trauma; temperature (hypothermia, heat stroke)
I - Infection (e.g., meningitis)
P - Psychogenic ("hysterical coma")
S - Stroke or space-occupying lesions in the cranium

Coma Assessment:

D - Depth of coma (verbal or painful stimuli)
E - Eyes (PERLA)
R - Respiration (rate and rhythm)
M - Motor (loss of movement/sensation)

Level of Consciousness:

A - Alert
V - Responds to Verbal stimuli
P - Responds to Painful stimuli
U - Unresponsive
**Patient History:**

A - Allergies  
M - Medications  
P - Past medical history (illness, injury)  
P – Pain (PQRST)  
L - Last intake (food, fluid)  
E - Ever happen before?  
P – Pain (sharp or dull)  
Q – Quality (diffuse or pinpoint)  
R - Radiating  
S – Severity (scale of 1-10)  
T – Time of onset  

**Pupil Reaction**

P - Pupils  
E - Equal  
R - Reactive  
L - Light  
A - Accommodation  

**Dive Related Accidents**

V- Visual (Tunnel vision or blurred vision)  
E- Ear symptoms (Tinnitus)  
N- Nausea and/or vomiting  
T- Twitching (Generally involves facial muscles, but can involve arms/legs)  
I- Irritability (Change in diver's mental status)  
D-Disability (Sudden neurological deficit)  

**Additional Notes (Mnemonics)**
<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>POUNDS</th>
<th>KILOGRAMS</th>
<th>°F</th>
<th>°C</th>
<th>POUNDS</th>
<th>KILOGRAMS</th>
<th>Volume</th>
<th>Length</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>106</td>
<td>41.1</td>
<td>396</td>
<td>180</td>
<td>105</td>
<td>40.6</td>
<td>374</td>
<td>170</td>
<td>1 cc = 1 ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>40</td>
<td>352</td>
<td>160</td>
<td>103</td>
<td>39.4</td>
<td>330</td>
<td>150</td>
<td>1 tsp = 5 cc</td>
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<td></td>
</tr>
<tr>
<td>102</td>
<td>38.9</td>
<td>308</td>
<td>140</td>
<td>101</td>
<td>38.3</td>
<td>286</td>
<td>130</td>
<td>1 tbsp = 15 cc</td>
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<td></td>
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<tr>
<td>100</td>
<td>37.8</td>
<td>264</td>
<td>120</td>
<td></td>
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<td>1 fl. oz. = 30 cc</td>
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<tr>
<td>99</td>
<td>37.2</td>
<td>242</td>
<td>110</td>
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<td></td>
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<td>1 jigger = 45 cc</td>
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<tr>
<td>98.6</td>
<td>37</td>
<td>220</td>
<td>100</td>
<td>98</td>
<td>36.7</td>
<td>209</td>
<td>95</td>
<td>2 pt = 1 qt</td>
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</tr>
<tr>
<td>97</td>
<td>36.1</td>
<td>198</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
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<td>1 qt = 946 cc</td>
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<tr>
<td>96</td>
<td>35.6</td>
<td>187</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 qt = 1 gal</td>
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</tr>
<tr>
<td>95</td>
<td>35</td>
<td>176</td>
<td>80</td>
<td>94</td>
<td>34.4</td>
<td>165</td>
<td>75</td>
<td>1 gal = 8 lbs</td>
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<tr>
<td>93</td>
<td>33.9</td>
<td>154</td>
<td>70</td>
<td>92</td>
<td>33.3</td>
<td>143</td>
<td>65</td>
<td>1 cm = .39 in</td>
<td></td>
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</tr>
<tr>
<td>91</td>
<td>32.8</td>
<td>132</td>
<td>60</td>
<td>90</td>
<td>32.2</td>
<td>121</td>
<td>55</td>
<td>1 in = 2.54 cm</td>
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<tr>
<td>85</td>
<td>29.4</td>
<td>110</td>
<td>50</td>
<td>80</td>
<td>26.7</td>
<td>99</td>
<td>45</td>
<td>1 yard = 3 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>23.8</td>
<td>88</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 ft = .31 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>21.1</td>
<td>77</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 m = 3.3 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To convert °F to °C
• \((°F - 32) \div 1.8\)

To convert lbs to kg
• Divide lbs x 2.2

To convert °C to °F
• \((°C \times 1.8) + 32\)

To convert kg to lbs
• Multiply kg x 2.2

1 metric ton = 2,000 lbs
1 ton = 2,240 lbs