Pararescue Medication and Procedure Handbook

5th Edition

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This book is dedicated to all Pararescuemen, past and present, which use their skill, training, courage and ingenuity living by the Pararescue code.

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
- **Brady Weapons of Mass Destruction,** De Lorenzo, Porter, Prentice Hall
- **The Committee on Tactical Combat Casualty Care recommendations contained in Prehospital Trauma Life Support Manual, 6th Ed.** Tactical Combat Casualty Care Guidelines Update dated 18 Aug 2010
- **Emergency Medicine: A Comprehensive Study Guide, 6th Ed.**, Tintanalli, et al. McGraw-Hill
- **Lippincott Nursing Manual**, J. B. Lippincott Co.
- **Physicians' Desk Reference**, Medical Economics Data Production Co.
- **Physicians GenRx**, Mosby, 1998
- **Advanced Cardiac Life Support**, American Heart Association, 2010 edition
- **Wilderness Medicine: Management of Wilderness and Environmental Emergencies, 3rd Ed.**, PA Auerbach, Mosby 1995.
- **Emergency Medicine Concepts and Clinical Practice, 5th Ed.**, Rosen, et al., Mosby 1998
- **Clinical Anesthesia,** 4th Ed., Barash, et al., Lippincott Williams & Wilkins
- **Medical Management of Chemical Casualties Handbook**, US Army Medical Research Institute of Chemical Defense,. Feb 2007
- **Medical Management of Biological Casualties Handbook**, US Army Medical Research Institute of Infectious Diseases, Apr 2005
- **U.S. Special Operations Command Tactical Medical Emergency Protocols**. US SOCOM Office of the Command Surgeon,. 1 Jan 2010

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Chapter 1: 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 contact; for example via radio, telephone, or telemedicine.

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 (as defined above) 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.

Chapter 2: Principles of Combat Casualty Care

Brian

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. It must be stressed that TCCC deals specifically with military combat trauma, and its recommendations apply solely to *tactical* pre-hospital settings.

Tactical Combat Casualty Care Guidelines 18 August 2010

Basic Management Plan for Care Under Fire

1. Return fire and take cover.
2. Direct or expect casualty to remain engaged as a combatant if appropriate.
3. Direct casualty to move to cover and apply self-aid if able.
4. Try to keep the casualty from sustaining additional wounds.
5. **Casualties should be extricated from burning vehicles or buildings and moved to places of relative safety. Do what is necessary to stop the burning process.**
6. Airway management is generally best deferred until the Tactical Field Care phase.
7. Stop *life-threatening* external hemorrhage if tactically feasible:
   - Direct casualty to control hemorrhage by self-aid if able.
   - **Use a tourniquet for hemorrhage that is anatomically amenable to tourniquet application.**
   - **Apply the tourniquet proximal to the bleeding site, over the uniform, tighten, and move the casualty to cover.**

Basic Management Plan for Tactical Field Care

1. Casualties with an altered mental status should be disarmed immediately.

2. Airway Management
   a. Unconscious casualty without airway obstruction:
      - Chin lift or jaw thrust maneuver
      - Nasopharyngeal airway
      - Place casualty in the recovery position
   b. Casualty with airway obstruction or impending airway obstruction:
      - Chin lift or jaw thrust maneuver
      - Nasopharyngeal airway
      - Allow casualty to assume any position that best protects the airway, to include sitting up.
      - Place unconscious casualty in the recovery position.
      - If previous measures unsuccessful:
      - Surgical cricothyroidotomy (with lidocaine if conscious)

3. Breathing

a. In a casualty with progressive respiratory distress and known or suspected torso trauma, consider a tension pneumothorax and decompress the chest on the side of the injury with a 14-gauge, 3.25 inch needle/catheter unit inserted in the second intercostal space at the midclavicular line. Ensure that the needle entry into the chest is not medial to the nipple line and is not directed towards the heart.

b. All open and/or sucking chest wounds should be treated by immediately applying an occlusive material to cover the defect and securing it in place. Monitor the casualty for the potential development of a subsequent tension pneumothorax.

4. Bleeding

a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet application or for any traumatic amputation. Apply directly to the skin 2-3 inches above wound.

b. For compressible hemorrhage not amenable to tourniquet use or as an adjunct to tourniquet removal (if evacuation time is anticipated to be longer than two hours), use Combat Gauze as the hemostatic agent of choice. Combat Gauze should be applied with at least 3 minutes of direct pressure. Before releasing any tourniquet on a casualty who has been resuscitated for hemorrhagic shock, ensure a positive response to resuscitation efforts (i.e., a peripheral pulse normal in character and normal mentation if there is no traumatic brain injury (TBI).)

c. Reassess prior tourniquet application. Expose wound and determine if tourniquet is needed. If so, move tourniquet from over uniform and apply directly to skin 2-3 inches above wound. If a tourniquet is not needed, use other techniques to control bleeding.

d. When time and the tactical situation permit, a distal pulse check should be accomplished. If a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet, side by side and proximal to the first, to eliminate the distal pulse.

e. Expose and clearly mark all tourniquet sites with the time of tourniquet application. Use an indelible marker.

5. Intravenous (IV) access

a. Start an 18-gauge IV or saline lock if indicated.

b. If resuscitation is required and IV access is not obtainable, use the intraosseous (IO) route.

6. Fluid resuscitation: Assess for hemorrhagic shock; altered mental status (in the absence of head injury) and weak or absent peripheral pulses are the best field indicators of shock.

a. If not in shock:
- No IV fluids necessary
- PO fluids permissible if conscious and can swallow

b. If in shock:
- Hextend, 500-mL IV bolus
- Repeat once after 30 minutes if still in shock.
- No more than 1000 mL of Hextend

c. Continued efforts to resuscitate must be weighed against logistical and tactical considerations and the risk of incurring further casualties.

d. If a casualty with TBI is unconscious and has no peripheral pulse, resuscitate to restore the radial pulse.

7. Prevention of hypothermia

a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible.

b. Replace wet clothing with dry if possible. **Get the casualty onto an insulated surface as soon as possible.**

c. Apply the Ready-Heat Blanket from the Hypothermia Prevention and Management Kit (HPMK) to the casualty's torso (not directly on the skin) and cover the casualty with the Heat-Reflective Shell (HRS).

d. If an HRS is not available, the previously recommended combination of the Blizzard Survival Blanket and the Ready Heat blanket may also be used.

e. If the items mentioned above are not available, use dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.

f. Warm fluids are preferred if IV fluids are required.

8. Penetrating Eye Trauma

If a penetrating eye injury is noted or suspected:

a. Perform a rapid field test of visual acuity.

b. Cover the eye with a rigid eye shield (NOT a pressure patch.)

c. Ensure that the 400 mg moxifloxacin tablet in the combat pill pack is taken if possible and that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.

9. Monitoring

a. Pulse oximetry should be available as an adjunct to clinical monitoring.

b. Readings may be misleading in the settings of shock or marked hypothermia.

10. Inspect and dress known wounds.

11. Check for additional wounds.

12. Provide analgesia as necessary.

a. Able to fight:

These medications should be carried by the combatant and self-administered as soon as possible after the wound is sustained.

- Mobic, 15 mg PO once a day
- Tylenol, 650-mg bilayer caplet, 2 PO every 8 hours

b. Unable to fight:

Note: Have naloxone readily available whenever administering opiates.

- Does not otherwise require IV/IO access
- Oral transmucosal fentanyl citrate (OTFC), 800 ug transbuccally
- Recommend taping lozenge-on-a-stick to casualty's finger as an added safety measure
- Reassess in 15 minutes
- Add second lozenge, in other cheek, as necessary to control severe pain.5
- Monitor for respiratory depression.
- IV or IO access obtained:
- Morphine sulfate, 5 mg IV/IO
- Reassess in 10 minutes.
- Repeat dose every 10 minutes as necessary to control severe pain.
- Monitor for respiratory depression
- Promethazine, 25 mg IV/IM/IO every 6 hours as needed for nausea or for synergistic analgesic effect

13. Splint fractures and recheck pulse.

14. Antibiotics: recommended for all open combat wounds

a. If able to take PO:

- Moxifloxacin, 400 mg PO one a day

b. If unable to take PO (shock, unconsciousness):

- Cefotetan, 2 g IV (slow push over 3-5 minutes) or IM every 12 hours or
- Ertapenem, 1 g IV/IM once a day

15. **Burns**

a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.

b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines.

c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the Blizzard Survival Blanket in the Hypothermia Prevention Kit in order to both cover the burned areas and prevent hypothermia.

d. Fluid resuscitation (USAISR Rule of Ten)

- **If burns are greater than 20% of Total Body Surface Area, fluid resuscitation should be initiated as soon as IV/IO access is established. Resuscitation should be initiated with Lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by Lactated Ringer's or normal saline as needed.**
- **Initial IV/IO fluid rate is calculated as %TBSA x 10cc/hr for adults weighing 40- 80 kg.**
- **For every 10 kg ABOVE 80 kg, increase initial rate by 100 ml/hr.**
- **If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock.**

e. Provide adequate analgesia for burn pain.

f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per the TCCC guidelines in Section 14 if indicated to prevent infection in penetrating wounds.

g. All TCCC interventions can be performed on or through burned skin in a burn casualty.

16. Communicate with the casualty if possible.
    a. Encourage; reassure
    b. Explain care

17. Cardiopulmonary resuscitation (CPR)
    Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations, and no other signs of life will not be successful and should not be attempted.

18. Documentation of Care
    Document clinical assessments, treatments rendered, and changes in the casualty's status **on a TCCC Casualty Card.** Forward this information with the casualty to the next level of care.

Basic Management Plan for Tactical Evacuation Care

*** The new term "Tactical Evacuation" includes both Casualty Evacuation (CASEVAC) and Medical Evacuation (MEDEVAC) as defined in Joint Publication 4-02.**

1. Airway Management
    a. Perform Airway Management in accordance with TCCC Tactical Field Care guidelines.

    b. If initial airway interventions are unsuccessful:
    - Place an Extraglottic Airway (ie Laryngeal Mask Airway (LMA), Combitube or King LT) if available
    - Consider endotracheal intubation
    - Consider surgical cricothyroidotomy (with lidocaine if patient is conscious) if unable to ventilate or oxygenate the patient by any other means

    c. Spinal immobilization is not necessary for casualties with penetrating trauma.

2. Breathing
   a. Perform Breathing Management in accordance with TCCC Tactical Field Care guidelines.
   b. Consider chest tube insertion if no improvement and/or long transport is anticipated.
   c. Most combat casualties do not require supplemental oxygen, but administration of oxygen may be of benefit for the following types of casualties:
      - Low oxygen saturation by pulse oximetry
      - Injuries associated with impaired oxygenation
      - Unconscious casualty
      - Casualty with TBI (maintain oxygen saturation > 90%)
      - Casualty in shock
      - Casualty at altitude

3. Bleeding : Perform Bleeding Management in accordance with TCCC Tactical Field Care guidelines.

4. Intravenous (IV) access: Reassess need for IV access.
   a. If indicated, start an 18-gauge IV or saline lock
   b. If resuscitation is required and IV access is not obtainable, use intraosseous (IO) route.

5. Fluid resuscitation
   a. Reassess for hemorrhagic shock (altered mental status in the absence of brain injury and/or change in pulse character.)
   b. Perform Fluid Resuscitation in accordance with TCCC Tactical Field Care Guidelines.
   c. Continue resuscitation with packed red blood cells (PRBCs), Hextend, or Lactated Ringer's solution (LR) as indicated.
   d. If a casualty with TBI is unconscious and has a weak or absent peripheral pulse, resuscitate as necessary to maintain a systolic blood pressure of 90 mmHg or above.

6. Prevention of hypothermia
   a. Prevent Hypothermia in accordance with TCCC Tactical Field Care guidelines.
   b. **Use a portable fluid warmer capable of warming all IV fluids including blood products.**
   c. Protect the casualty from wind if doors must be kept open.

7. Penetrating Eye Trauma: Manage penetrating eye trauma in accordance with TCCC Tactical Field Care guidelines.

8. Monitoring: Institute pulse oximetry and other electronic monitoring of vital signs, if indicated.

9. Inspect and dress known wounds if not already done.

10. Check for additional wounds.

11. Provide analgesia as necessary in accordance with TCCC Tactical Field Care guidelines.

12. Reassess fractures and recheck pulses.

13. Antibiotics: recommended for all open combat wounds, administer in accordance with TCCC Tactical Field Care guidelines.

14. Burns
   a**. Manage burns in accordance with TCCC Tactical Field Care guidelines.**
   b. Burn patients are particularly susceptible to hypothermia. Extra emphasis should be placed on barrier heat loss prevention methods and IV fluid warming in this phase.

15. The Pneumatic Antishock Garment (PASG)

a. May be useful for stabilizing pelvic fractures and controlling pelvic and abdominal bleeding.

b. Application and extended use must be carefully monitored.

c. The PASG is contraindicated for casualties with thoracic or brain injuries.

16. Documentation of Care

Document clinical assessments, treatments rendered, and changes in casualty's status **on a TCCC Casualty Card**. Forward this information with the casualty to the next level of care.

Trauma Care for Hostile Combatants:

Because they are on the scene, PJs may be called upon to render initial care for enemy combatants. Medically speaking, this presents only a logistical problem because the tenets of trauma care do not change. Tactical, legal and ethical considerations, however, make this a complex issue. The recommendations presented below may help medics and their mission commanders formulate their plans for handling wounded enemy combatants during pre-mission planning.

- **Care for wounded Hostile Combatants**
  - Though wounded, enemy personnel may still act as hostile combatants.
  - They may employ any weapons or detonate any ordnance they are carrying.
- **Care Under Fire**
  - Enemy casualties are hostile combatants until they:
    - Indicate surrender
    - Drop all weapons
    - Are proven to no longer pose a threat
    - Are removed from reach of weapons
    - Are restrained with flex cuffs or other devices
  - No care rendered until:
    - TFC phase
    - Casualties and scene rendered safe
    - Tactical situation permits
- **Tactical Field Care Phase Management:** Medic should not attempt treatment until sure that the wounded hostile combatant is rendered safe by other members of unit.
  - Restrain with flex cuffs or other devices if not already done
  - Search for weapons and or ordnance
  - Silence to prevent communication with other hostile combatants
  - Segregate from other captured hostile combatants
  - Safeguard from further injury. Provide care IAW TFC guidelines for US forces after securing the enemy casualty as described above
  - Speed to the rear as medically and tactically feasible

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):**
   - Unresponsive patients with no pulse, regardless of cause, should not have resuscitation initiated.
   - Unresponsive patients with a pulse but no respirations 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:
   - **Do not initiate resuscitation if victim is obviously dead, characterized by:**
     - Obvious decomposition
     - Body partially consumed by scavengers
     - Dependent lividity
     - Rigor mortis

       (**Caution:** *In hypothermia victims, severe hypothermia may ressemble rigor mortis. Check core body temperature*)
     - Decapitated or partially decapitated with no pulse present
     - Dismembered or body is fragmented
     - Open head injury with brain matter exposed and no pulse present
     - Injury to the trunk with chest contents exposed and no pulse present
     - "Frozen" hypothermia victim, e.g., ice formation in the airway, incompressible chest
     - Total body burns or body carbonization and no pulse present
     - Suffered massive blunt trauma, e.g., fall of over 100 feet, and has no pulse
   - **Decisions to not initiate resuscitation will be completely documented to include:**
     - Time/Date of decision
     - Reason for decision
     - Name, title/rank, and unit/organization of medical control (if able to contact)
     - Location of victim (GPS coordinates if possible)

   - **The decision to not initiate resuscitation <u>IS NOT</u> a legal declaration of death, unless a qualified physician declares the patient dead.**

   Note: 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: 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.

- 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.

- 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.

- 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, PERMANENT 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.

Chapter 3: Trauma Assessment

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 of 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.

Scene Size-Up: before entering any scene evaluate the situation first

- **Body Substance Isolation** – Ensure PPE is available and worn
- **Scene Safety** – carefully evaluate for and attempt to control any hazards before attempting to reach the patient(s)
- **Location of all patients** – search the area quickly for all patients; call for additional resources if necessary; implement MCI plan if required
- **Mechanism of Injury** – evaluate the strength, direction and nature of forces to help anticipate locations of patients and severity and types of injuries

Initial Assessment (Primary Survey):

Goal is immediate identification and correction of life threats

- **General Impression -** 15-30 second assessment of the patient's overall condition; determine if additional resources are necessary, determine need for rapid transport
- **C-Spine -** Possible injury? MOI? Initial LOC? Stabilize prn.
- **Baseline Mental Status -** AVPU
- **Airway -** Clear? Patent? Compromised?
    1. Treat as needed: OPA/NPA/ETT/Cricothyroidotomy/BVM/O2
    2. Do not move on to breathing until airway is controlled.
- **Breathing**
    1. Rise and Fall of Chest**:** Equal & Bilateral? Asymmetrical?
    2. Rate: Rapid? Slow?
    3. Quality Equal & Bilateral? Asymmetrical? Shallow
    4. Is the Integrity of the Chest Wall Compromised by: Contusions? Fractures? Crepitus? Penetrating Injuries?
    5. Are Breath Sounds: Equal & Bilateral? Asymmetrical?
    6. Are the Lung Fields: Clear? Distant or Muffled?
    7. Are there other Signs & Symptoms: Hyperresonance? Hyporesonance? JVD? Tracheal Shift? Muffled Heart Sounds? SubQ Emphysema? Pulsus Paradoxus?
    8. Treat as needed: O2/BVM/Stabilize chest wall/Thoracentesis/Thoracostomy
- **Circulation**
    1. Stop major bleeding.
    2. Assess radial and carotid pulse rate and quality
    3. Assess skin temp, moisture and color
    4. Is patient in shock? If so, determine cause.
    5. Treat as needed: O2/NS or LR/Direct pressure/Pressure dressings/Elevation/
    6. Tourniquets/MAST
- **Determine transport priority -** Consider rapid transport for any abnormality found in initial assessment

Rapid Trauma Assessment (Secondary Survey):

Every patient with a significant MOI, altered mental status or multi-system trauma should receive a rapid, systematic assessment for other life threats.

Head-to-Toe Examination

- Head: DCAP/BTLS, wounds, depression, lack of symmetry, pupils for PERRLA
  - Treat as needed Control Bleeding, stabilize impaled objects
- Neck: DCAP/BTLS, JVD, tracheal displacement, subQ emphysema, c-spine injury
  - Treat as needed Apply cervical collar as indicated
- Chest: wounds, crepitance, symmetry, auscultation
  - Treat as needed Cover wounds with occlusive dressings (*assume sucking chest wound*), Decompress tension pneumothorax with 10 or 14g needle as indicated
- Abdomen: DCAP/BTLS, bruising, tenderness, rigidity, evisceration
  - Treat as needed Cover wounds and eviscerations
- Pelvis: DCAP/BTLS, crepitation, stability
  - Treat as needed Pelvic Binder, MAST trousers
- Extremities: DCAP/BTLS, PMS
  - Treat as needed Splint fractures, reduce fractures with PMS impairment
- Posterior: Log Roll and inspect and palpate for DCAP/BTLS,
  - Treat as needed Secure on Spine board, dress wounds
- Neurologic: Assess for motor and sensory, calculate GCS

- **Vital Signs -** Pulse, Blood Pressure, Respirations, Temperature, O2 Sat, EKG, BGL (Blood Glucose Level)
- **Patient History – SAMPLE**
  - **S**ymptoms
  - **A**llergies
  - **M**edications
  - **P**ast medical/surgical history (significant)
  - **L**ast food/fluid intake; last tetanus immunization/booster; females -- last menstrual period (LMP)
  - **E**vents preceding and surrounding the injury (e.g., History of present illness/injuries; MOI)

Ongoing Assessment Enroute to treatment facility, conduct continuing assessments of the patient to detect trends, determine changes in condition, and re-evaluate your interventions

- Mental Status
- Airway Patency
- Breathing rate and quality
- Pulse Rate and quality
- Skin Condition
- Transport Priority
- Vital Signs
- Focused assessments
- Interventions

PMS, **AVPU**, **PERRL, Glasgow Coma Scale:**

Pulse: Does the patient have distal pulses? Capillary blanch in finger in and toes?
Motor: Patient moves fingers and toes? Arms? Legs? Equal & Bilateral muscle strength?
Sensory: Does the patient feel touch of fingers and toes? Does the unconscious patient respond when you pinch his/her fingers and toes?

Alert: Patient is Alert & Oriented to person/place/date/time
Verbal: Patient responds properly to verbal stimuli
Pain: Patient responds to painful stimuli (withdraws from stimulus)
Unresponsive: Patient is unresponsive to all stimuli

Pupils
Equal
Round
Reactive to
Light

Glasgow Coma Scale		
Eye Opening	Spontaneous To voice To pain None	4 3 2 1
Verbal Response	Oriented Confused Inappropriate sounds Incomprehensible sounds None	5 4 3 2 1
Motor Response	Obeys Command Localizes pain Withdraws (pain) Flexion (pain) Extension (pain) None	6 5 4 3 2 1
Score of 8 or less, or deteriorating score indicates severe head injury in trauma patients.		

Chapter 4: 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:

The treatment of hemorrhagic shock with large amounts of fluids in the field is controversial. Hemorrhage control takes precedence over starting IV fluid resuscitation. 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 keep the patient alert and oriented &/or a palpable radial pulse (a blood pressure of 90 mmHg systolic if BP measurement is possible). In cases where the bleeding has been controlled (for example extremity wounds), then fluid resuscitation to higher blood pressures is acceptable.

Signs & Symptoms of Shock:

- Apprehension/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 (Pulse pressure = SBP – DBP)

Rapid field estimate of BP:

- Palpable radial pulse = Minimum of 80mm Hg systolic
- Palpable femoral pulse = Minimum of 60 mm Hg systolic
- Palpable carotid pulse = Minimum of 40 mm Hg systolic

Treatment:

1. Control Life Threatening External Hemorrhage
2. Assess Airway, Breathing and Circulation.
3. Start 18-gauge IV's (larger if easy IV access)
   a. Rapidly administer 500cc of Hextend/Hespan
   b. If Hextend not available, 500cc LR bolus is acceptable
   c. Reassess in 30 minutes: If patient remains hypotensive, administer additional 500cc of Hextend/Hespan or LR)
   d. Give no more than 1000 mL of colloid (Hextend/Hespan)
4. Administer oxygen at highest flow available (preferably 10-15 LPM w/NRB).
5. Keep patient warm and covered.
6. Monitor vital signs q 5-15 minutes.
7. Adjust IV flow rate to patient alert and oriented or a blood pressure at least 80 mmHg systolic. Saline lock with 18-gauge or larger IV catheter is also acceptable if patient remains hemodynamically stable.
8. Packed Red Blood Cells (PRBC) if required

PRBC TRANFUSION REFERENCE SHEET

- **CLINICAL INDICATORS:**
  1. Traumatic Injury
  2. > 1500cc blood loss – Class III blood loss
  3. Airway secured and patent
  4. Bleeding controlled by use of pressure dressing, tourniquet, fibrin dressing
  5. IV access obtained x 2
  6. 500cc Hextend bolus given or 1L LR
  7. <90mmHg systolic unresponsive to bolus
  8. Pulse > 120bpm unresponsive to bolus
  9. Hypoxemia - <90 SPO2 with reliable waveform with oxygen therapy
  10. Altered LOC unresponsive to bolus

- **HANDLING:**
  1. Two personnel independently verify blood type O, product identification number and number of units at pick up and just prior to transfusion.
  2. Transport in insulated cooler with ice. Maintain temp 1 - 6° C (34-44°F)
  3. Must complete transfusion within 4 hrs of removal from “cooler”
  4. Empty bags stay with patient

- **TRANSFUSION:**
  1. Check blood type O and expiration date
  2. Use Y-type blood administration tubing primed with NS only
  3. Warm PRBCs with authorized device (thermal angel) or body heat
  4. Begin each unit with 5 minutes of gravity flow observing for acute reactions
  5. After 5 minutes with no reactions pressure infuse with 200-300 mmHg pressure

- **ACUTE REACTIONS:**
  1. Acute Hemolytic Transfusion Reaction
  2. Febrile Nonhemolytic Transfusion Reaction
  3. Allergic Transfusion Reaction

- **TREATMENT**
  1. Stop transfusion
  2. Hydrate to promote diuresis
  3. Consider Lasix 40 mg IV to maintain diuresis
  4. Benadryl 50 mg IV if allergic symptoms present. If reaction is only allergic reaction and Benadryl relieves symptoms may restart transfusion

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, breathing and circulation status first, treat appropriately.
2. Complete rest.
3. Administer oxygen at highest flow available (preferably 10-15 LPM w/NRB).
4. Start IV and titrate IV fluids to maintain patient alert and oriented &/or a blood pressure at least mmHg systolic
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
- Angioedema
- Tachycardia
- Wheezing
- Respiratory distress
- Hypotension
- Airway obstruction/shock

Treatment:

See Protocol Algorithm Next Page

How to Make 1:10,000 Epi Concentration:

Put 1 mL of 1:1,000 Epi into 9 mL of Normal Saline

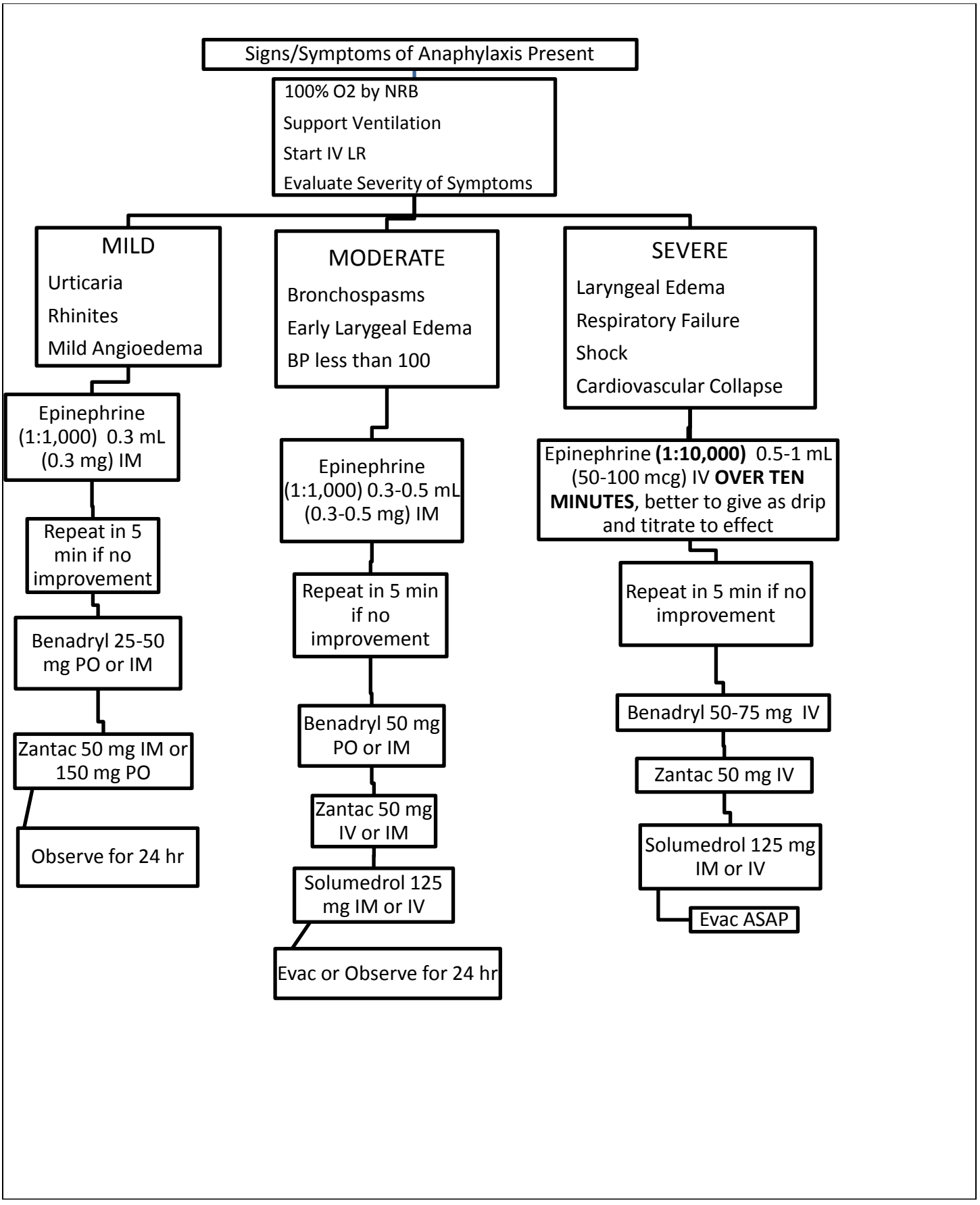
To Make an Epinephrine Drip for Treatment of Severe Anaphylaxis:

1. Put 1 mL of 1:1,000 Epi into 500 mL of LR (or 2 mL of 1:1,000 in 1 liter of NS) to make a 2 mcg/mL Epi concentration.

2. Set IV flow rate to 0.5 mL to 5 mL per minute (which will give the patient Epi at 1-10 mcg/min)

3. Titrate flow for SBP of 100 mmHg

Anaphylaxis Protocol



Septic Shock (Hyperdynamic & Hypodynamic)

Hyperdynamic Shock (Early, Warm)

Signs & Symptoms:

- Fever
- Altered mental status
- 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 rapid, weak, irregular
- Edema

Treatment: (Septic Shock)

1. Start Large Bore IV. Administer 2 liters of LR (Consider 500 mL bolus of hextend x 2 &/or as directed by on-line medical control)
2. Administer oxygen at highest flow available (preferably 10-15 LPM w/NRB).
3. Begin antibiotic therapy with Ertapenem 1 gm IV or Ceftriaxon (Rocephin) 2 gms IV
4. Drain abscesses, clean and drain wounds. Debride wounds as required.
5. Adjust IV fluid rate to patient alert and oriented &/or a blood pressure at least 90-100 mm Hg systolic

Neurogenic Shock:

Isolated head injuries do not cause shock. If shock is present in such a patient, search for other causes of shock (e.g., occult/internal hemorrhage, cardiac tamponade, tension pneumothorax).
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 probable 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 or absent reflexes
- Spasticity
- Paralysis and loss of sensation
- Point tenderness/pain, deformity of spine.

Treatment: (Neurogenic Shock)

1. Assess airway, breathing and circulation status first, treat appropriately.
2. Immobilize spine.
3. Place in Trendelenberg position (I.e., Head down)
4. Start IV with normal saline or ringers lactate, titrate to patient alert and oriented &/or minimum BP of 90-100 mm Hg systolic.
5. Administer oxygen with goal to achieve and maintain SaO2 of 100%. (Administer high flow O2 if pulse oximetry not available).

Chapter 5: Spinal Injuries

Guidelines and Considerations: If the 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.

Five Basic Types 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. Provide supplemental oxygen.
7. Titrate IV normal saline or Ringers Lactate to a palpable radial pulse or SBP of 90 mmHg, or saline lock (if BP is adequate).
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. Be prepared for vomiting, prevent aspiration.
11. Check neurological function q 15-30 min and record
12. Consider antibiotics for open wounds or delayed evacuations.

Clinical Clearing of the 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.

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

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

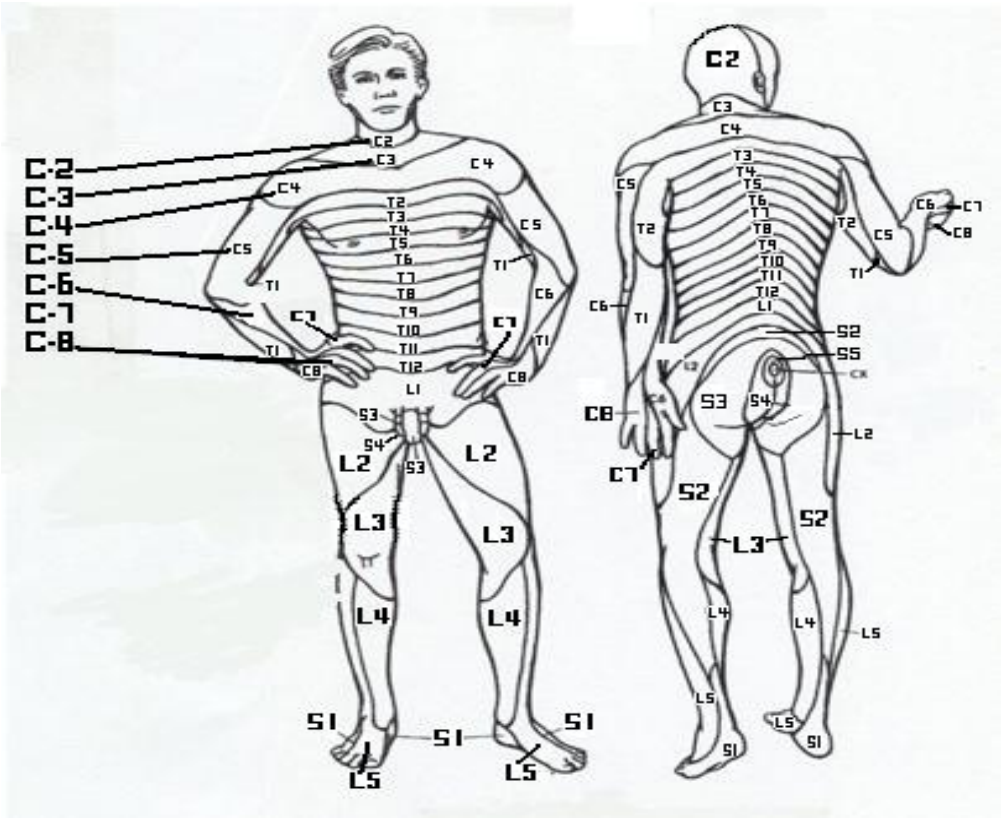
- The patient has a completely normal motor and sensory neurological examination, and does not have any significant neck pain or any midline or paraspinous muscle spasm.
- There is no pain or tenderness to palpation of the posterior cervical spine, and no palpable step-offs of the cervical spine. No muscle spasm in midline or paraspinous muscles.
- The patient has no other injury that might require long-board immobilization (thoracic or lumbar spine injury, pelvic fracture).
- The patient has no pain on unassisted range of motion of the neck.
- 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.

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).

Dermatome Chart



Motor 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.

Chapter 6: 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 without 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 the patient's initial Level of Consciousness (LOC) and any subsequent changes.**
- Perform Serial Glasgow Coma Scale measurements 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

Initial Assessment (Primary Survey):

- **ABCs**: An open and secure airway is critical. Patients with head injuries commonly vomit or patient's tongue blocks airway.
- **Level of Consciousness**: AVPU, Glasgow Coma Scale
- **Vital Signs**: Observe and record every 5 minutes.
  - Increasing Intracranial Pressure (ICP) can cause increased BP and widening pulse pressure. If possible, maintain BP between 100-140 mmHg systolic. Pain and fear can also increase BP
  - increasing ICP can cause a decreasing pulse.
  - Increased ICP can result in increased, decreased or irregular respiratory rate and pattern (Cheyne-Stokes respirations)
  - Observe for **Cushing's Reflex** (a.k.a. Cushing's Phenomenon) which is the triad of slowing pulse rate, deep erratic respirations and increasing BP often associated with life threatening increases in ICP.

Rapid Trauma Assessment (Secondary Survey):

- Obtain a history if possible to determine the MOI.
- Maintain cervical spine immobilization.
- Examine the scalp for evidence of bleeding, swelling and deformity.
- Examine the nose and ears for blood and cerebral spinal fluid.
- Gently palpate the skull (don't press on depressed areas or explore open wounds.)
- Observe pupillary size, symmetry, shape, and reactivity to light
- Record all findings and continue with remainder of rapid trauma assessment.

Treatment:

1. Secure airway, ensure adequate breathing and circulation
2. Maintain cervical spinal immobilization
3. Provide Oxygen 4-8L/min (If evidence of increased intracranial pressure, see next section)
4. Establish an IV and titrate normal saline appropriately (If shock develops give adequate fluid volume to maintain systolic blood pressure at 90). 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 (e.g., Ceftriaxone) 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 causes, such as subdural or epidural hematoma can only be managed definitively by surgical intervention. Swelling of the brain due to diffuse brain injury can be treated to some extent in the field. As the brain swells, a herniation syndrome can result, forcing the intracranial contents to 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 to odd-shaped pupil to fixed/dilated pupil. **Asymmetrical pupil size, responsiveness or size differences of 1.5 mm or more are considered pathological until proven otherwise.**

  NOTE: Approximately 3% of the populations have asymmetric pupils normally (anisocoria) and 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 90 mmHg by stopping bleeding and appropriate fluid resuscitation.

   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.

2. **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. IF GCS of 9 or below: **1.0 gram/Kg not to exceed 100 grams IV bolus**.

   NOTE: Mannitol increases urine flow (making this an unreliable indicator of resuscitation) and causes dehydration. Increase IV fluids to compensate.

3. Elevate the patient's head higher than his feet by 1-2 feet. The patient should be kept flat on the litter or stretcher. Elevate the head of the stretcher/stokes litter to accomplish this.

4. 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).

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.

Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

Purpose and Use of the MACE

A concussion is a mild traumatic brain injury (TBI). The purpose of the MACE is to evaluate a person in whom a concussion is suspected. The MACE is used to confirm the diagnosis and assess the current clinical status.

Tool Development

The MACE has been extensively reviewed by leading civilian and military experts in the field of concussion assessment and management. While the MACE is not, yet, a validated tool, the examination section is derived from the *Standardized Assessment of Concussion* (SAC) (McCrea, 2000, used with permission) which is a validated, widely used tool in sports medicine. Abnormalities on the SAC correlate with formal comprehensive neuropsychological testing during the first 48 hours following a concussion.

Who to Evaluate

Any one who was dazed, confused, "saw stars" or lost consciousness, even momentarily, as a result of an explosion/blast, fall, motor vehicle crash, or other event involving abrupt head movement, a direct blow to the head, or other head injury is an appropriate person for evaluation using the MACE.

Evaluation of Concussion

History: (I – VIII)

I. Ask for a description of the incident that resulted in the injury; how the injury occurred, type of force. Ask questions A – D.

II. Indicate the cause of injury

III. Assess for helmet use. Military: Kevlar or ACH (Advanced Combat Helmet). Sports helmet, motorcycle helmet, etc.

IV – V Determine length of time that the person wasn't registering continuous memory both **prior** to injury and **after** the injury. Approximate the amount of time in seconds, minutes or hours, whichever time increment is most appropriate. For example, if the assessment of the patient yields a possible time of 20 minutes, then 20 minutes should be documented in the "how long?" section.

VI – VII Determine length of time of **self reported** loss of consciousness (LOC) or **witnessed/observed** LOC. Again, approximate the amount of time in second, minutes or hours, whichever time increment is most appropriate.

VIII Ask the person to report the presence or absence of each specific symptom since injury.

Examination: (IX – XIII)

Standardized Assessment of Concussion (SAC):

Total possible score = 30

Orientation = 5

Immediate Memory = 15

Concentration = 5

Memory Recall= 5

IX Orientation: Assess patient's awareness of the accurate time

Ask: WHAT MONTH IS THIS?

WHAT IS THE DATE OR DAY OF THE MONTH?

WHAT DAY OF THE WEEK IS IT?

WHAT YEAR IS IT?

WHAT TIME DO YOU THINK IT IS?

One point for each correct response for a total of 5 possible points. It should be noted that a correct response on time of day must be within 1 hour of the actual time.

X Immediate memory is assessed using a brief repeated list learning test. Read the patient the list of 5 words once and then ask them to repeat it back to you, as many as they can recall in any order.

Repeat this procedure 2 more times for a total of 3 trials, even if the patient scores perfectly on the first trial.

Trial 1: I'M GOING TO TEST YOUR MEMORY, I WILL READ YOU A LIST OF WORDS AND WHEN I AM DONE, REPEAT BACK AS MANY WORDS AS YOU CAN REMEMBER, IN ANY ORDER.

Trial 2 &3: I AM GOING TO REPEAT THAT LIST AGAIN. AGAIN, REPEAT BACK AS MANY AS YOU CAN REMEMBER IN ANY ORDER, EVEN IF YOU SAID THEM BEFORE.

One point is given for each correct answer for a total of 15 possible points.

XI Neurological screening

Eyes: check pupil size and reactivity.

Verbal: notice speech fluency and word finding

Motor: pronator drift- ask patient to lift arms with palms up, ask patient to then close his/her eyes, assess for either arm to "drift" down. Assess gait and coordination if possible. Document any abnormalities.

No points are given for this section.

XII Concentration: Inform the patient:

I'M GOING TO READ YOU A STRING OF NUMBERS AND WHEN I AM FINISHED, REPEAT THEM BACK TO ME BACKWARDS, THAT IS, IN REVERSE ORDER OF HOW I READ THEM TO YOU. FOR EXAMPLE, IF I SAY 7-1-9, YOU WOULD SAY 9-1-7.

If the patient is correct on the first trial of each string length, proceed to the next string length. If incorrect, administer the 2nd trial of the same string length. Proceed to the next string length if correct on the second trial. Discontinue after failure on both trials of the same string length. Total of 4 different string lengths; 1point for each string length for a total of **4** points.

NOW TELL ME THE MONTHS IN REVERSE ORDER, THAT IS, START WITH DECEMBER AND END IN JANUARY.

1point if able to recite ALL months in reverse order.

0 points if not able to recite ALL of them in reverse order.

Total possible score for concentration portion: **5.**

XIII Delayed Recall

Assess the patient's ability to retain previously learned information by asking he/she to recall as many words as possible from the initial word list, without having the word list read again for this trial.

DO YOU REMEMBER THAT LIST OF WORDS I READ A FEW MINUTES EARLIER? I WANT YOU TO TELL ME AS MANY WORDS FROM THE LIST AS YOU CAN REMEMBER IN ANY ORDER.

One point for each word remembered for a total of 5 possible points.

Total score= Add up from the 4 assessed domains: immediate memory, orientation, concentration and memory recall.

Significance of Scoring

In studies of non-concussed patients, the mean total score was 28. Therefore, a score less than 30 does not imply that a concussion has occurred. Definitive normative data for a "cut-off" score are not available. However, scores below 25 may represent clinically relevant neurocognitive impairment and require further evaluation for the possibility of a more serious brain injury. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in cognitive functioning.

Diagnosis

Circle the ICD-9 code that corresponds to the evaluation. If loss of consciousness was present, then circle 850.1. If no LOC, then document 850.0. If another diagnosis is made, write it in.

Patient Name: _____

SS#: _____-_____-_____**Unit:** _____

Date of Injury: _____/_____/_____ **Time of Injury:** _____

Examiner: _____

Date of Evaluation: _____/_____/_____ **Time of Evaluation:** _____

History: (I – VIII)

I. **Description of Incident**: Ask:

a) What happened?
b) Tell me what you remember.
c) Were you dazed, confused, "saw stars"? □ Yes □ No
d) Did you hit your head? □ Yes □ No

II. Cause of Injury (Circle all that apply):

1) Explosion/Blast 4) Fragment
2) Blunt object 5) Fall
3) Motor Vehicle Crash 6) Gunshot wound
7) Other _____

III. Was a helmet worn?

□ Yes □ No Type _____

IV. Amnesia Before: Are there any events just BEFORE the injury that are not remembered? (Assess for continuous memory prior to injury)

□ Yes □ No If yes, how long _____

V. Amnesia After: Are there any events just AFTER the injuries that are not remembered? (Assess time until continuous memory after the injury)

□ Yes □ No If yes, how long _____

VI. Does the individual report loss of consciousness or "blacking out"?

□ Yes □ No If yes, how long _____

VII. Did anyone observe a period of loss of consciousness or unresponsiveness?

□ Yes □ No If yes, how long _____

VIII. Symptoms (circle all that apply)

1) Headache 2) Dizziness
3) Memory Problems 4) Balance problems
5) Nausea/Vomiting 6) Difficulty Concentrating
7) Irritability 8) Visual Disturbances
9) Ringing in the ears 10) Other _____

Examination: (IX – XIII)

Evaluate each domain. Total possible score is 30.

IX. Orientation: (1 point each)

Month:	0	1
Date:	0	1
Day of Week:	0	1
Year:	0	1
Time:	0	1

XII. <u>Concentration</u>

Reverse Digits: (go to next string length if correct on first trial. Stop if incorrect on both trials.) 1 pt. for each string length.

4-9-3	6-2-9	0	1
3-8-1-4	3-2-7-9	0	1
6-2-9-7-1	1-5-2-8-5	0	1
7-1-8-4-6-2	5-3-9-1-4-8	0	1

Months in reverse order: (1 pt. for entire sequence correct)
Dec-Nov-Oct-Sep-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan
0 1

Concentration Total Score ____/5

XIII. <u>Delayed Recall</u> (1pt. each)

Ask the patient to recall the 5 words from the earlier memory test
(Do NOT reread the word list.)

Elbow	0	1
Apple	0	1
Carpet	0	1
Saddle	0	1
Bubble	0	1

Delayed Recall Total Score ____/5

TOTAL SCORE _____/30

Notes: _____

_____

Diagnosis: (circle one or write in diagnoses)

No concussion
850.0 Concussion without Loss of Consciousness (LOC)
850.1Concussion with Loss of Consciousness (LOC)

Other diagnoses _____

Defense & Veterans Brain Injury Center
1-800-870-9244 or DSN: 662-6345

Chapter 7: Facial and Eye Trauma

Airway Obstructions:

Caution: Consider need for C-Spine Control

Posterior Tongue Displacement

1. **Unconscious patient:** Jaw thrust or chin lift. Pull tongue forward or insert airway adjunct if needed.
2. **Conscious patient:** Most common cause is bilateral mandible fracture. Have patient bend forward as needed to maintain his/her airway

Oropharyngeal Bleeding:

1. Rotate supine patient to the side. Allow for drainage.
2. Suction & apply direct pressure if possible.

Edema:

1. Early intubation if possible
2. If unable to intubate, cricothyroidotomy may be needed

Blood Loss from Facial Trauma:

1. Pressure dressing can be applied to most areas of the face.
2. Severe **Tongue Laceration**: If pressure unsuccessful, a few **sutures** may be needed.
3. **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. **Oxymetazoline nasal spray:** Give 2 squirts in each nostril
3. Packing: Anterior or Posterior.
4. Anterior Pack: Layer strips of petrolatum gauze in one or both nostrils.
5. Posterior Pack: Used if bleeding persists in the nasopharynx after the anterior packing.
6. Antibiotics all patients who have had nasal packing should be given (**Moxifloxacin**, 400 mg PO q 24 h, or **Ertapenem** 1 gram IV/IM q 24 h.)

CAUTION: DO NOT attempt to pack a nose if a cerebral spinal fluid (CSF) leak is suspected.

NOTE: Observe patient closely. If the posterior pack becomes loose it can easily obstruct the airway. Remove packing. Insert **Foley** catheter through the nose until it is **visualized** in the pharynx. **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**. If there are no contraindications, patients who require a posterior pack should receive **sedatio**n. Observe closely for decreased respirations if a posterior pack is in place in a sedated patient.

Disposition:

- Evacuation is not required if bleeding has been controlled and resolves with treatment
- Priority evacuation for severe epistaxis not responding to therapy or if Foley catheter is used

Ocular Trauma:

Guidelines and Considerations:

- Obtain history of injury, pre-existing conditions, i.e. contact lens use.
- If chemically induced, note type of chemical, treatment, visual disturbance, pain, any other associated injuries.
- Time of injury.

- Obtain gross visual acuity and record. Visual acuity can be as simple as light perception, counting 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:

Blepharospasm (blinking &/or forceful holding eyes shut) secondary to eye pain/discomfort often hinders an adequate ocular exam. This may often be overcome by a **one-time only instillation** of 1-2 drops of a topical ophthalmic anesthetic eye drop solution (e.g., **Tetracaine or Proparacaine).** In addition to providing immediate pain relief and facilitating adequate patient evaluation, this also has some diagnostic value. If acute eye pain fails to improve after use of a topical ophthalmic anesthetic agent, this may be an indication of serious intraocular pathology and requires prompt evacuation.

NOTE: Never give topical anesthetic eye drops to patients to use on their own. Repeated use can cause corneal toxicity and predispose to ocular infection!

Eyelids: Assess for edema, bruising, burns, movement and strength, ptosis (ie. drooping eyelids), foreign bodies penetrating 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/assess for: Forward or retro displacement of the globe; normal movement and double vision at the extremes of gaze; integrity of the globe; 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 pus if delayed presentation of an ocular injury), clarity; dislocation of lens. (May require use of a magnification device, such as ophthalmoscope or "Bluminator" lens, to detect/appreciate)

Lens: Examine for clarity and position.

Specific Injuries and Treatment:

Any acute and persistent decrease in Visual Acuity (VA) requires prompt on-line medical consultation. If on-line communication is not available evacuate the patient urgently.

Lid: Examine for foreign bodies. Evert the lid and examine the globe for laceration, penetrating injury, and impaled object.

Treatment: Apply dressing and transport. **DO NOT** suture lid lacerations.

Corneal Abrasion: Examine for pain, foreign body sensation, and photophobia.

Treatment: Instill ophthalmic antibiotic ointment or drops; provide adequate pain meds

Disposition: Priority evacuation

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.

Disposition: Priority evacuation

CAUTION: If you suspect a foreign body has penetrated the anterior or posterior chamber do not patch and do not use ointment. Shield eye and give **Moxifloxacin** 400 mg PO every 24 hours.

Blood in Anterior Chamber (Hyphema): A sign of possibly severe eye injury.

Treatment: Keep patient as still as possible, maintain sitting position

Disposition: Priority evacuation

Iritis: May present as constricted, dilated or irregular pupil; hyphema or severe photophobia.

Treatment: Rest

Disposition: Priority evacuation

Lens: The only lens injury you may be able to assess in the field is an anterior lens dislocation.

Treatment: Rest and transport.

Disposition: Priority evacuation

Vitreous: Blood in the posterior chamber can interfere with light transfer through the vitreous fluid and produce a black rather than a red fundoscopic reflex.

Treatment: Rest

Disposition: Immediate transport/Urgent Evacuation (combat)

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. Bloody chemosis = penetrating ocular globe injury until proven otherwise.

Treatment: Eye shield (no pressure applied to globe) and moist dressing. Moxifloxacin 400 mg po Q 24 hrs.

Disposition: Immediate transport/Urgent Evacuation (combat)

CAUTION: Palpation of globe may cause increased loss of vitreous fluid.

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.

Disposition: Immediate transport/Urgent Evacuation (combat)

NOTE: Any water will do in a pinch.

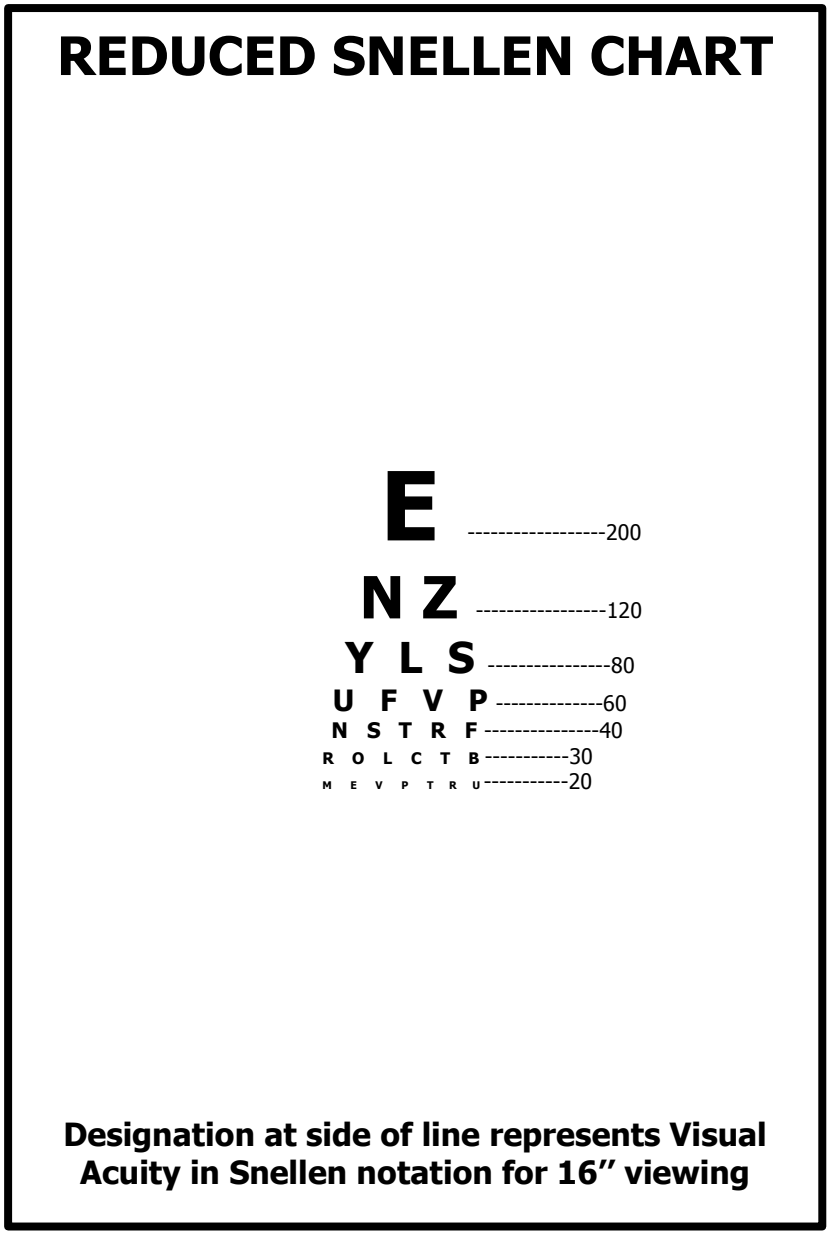
CAUTION: If the victim has had any chemicals splashed into the eye, irrigation must begin AT ONCE. This is the only time you do not take the time to evaluate the visual acuity (VA) prior to starting treatment. If the chemical was an alkali compound (e.g., lye or ammonia) continue irrigation for a minimum of 60 minutes or until directed to stop by medical control. Obtain VA's immediately following adequate and copious irrigation.

Traumatic Enucleation: Globe displaced from orbit.

Treatment: Protect globe with moist sterile gauze, shield globe and immediate transport.

Disposition: Immediate transport/Urgent Evacuation (combat)

Snellen Visual Acuity Chart



Chapter 8: Chest Trauma

General Evaluation of Chest:

- Get history of breathing difficulties
- Expose chest and abdomen.
- Observe respiratory rate, depth and symmetry.
- Examine anterior and posterior chest for flail chest and penetrating 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 immediate transport/Urgent Evacuation (combat) with special consideration for aeromedical concerns due to cabin altitude.

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 IV fluids to patient alert and oriented &/or a blood pressure at least 90 mmHg systolic (whichever occurs first).

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.
- There may be ecchymosis, localized tenderness to palpation or crepitus.
- Normal symmetrical breath sounds bilaterally.

Treatment:

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

Disposition: Immediate Transport/Urgent Evacuation (combat)

CAUTION: Do not tape or strap fractured ribs in absence of paradoxical motion (flail chest). This contributes to pooling of secretions, atelectasis and pneumonia. Fractures of lower three ribs may accompany splenic or hepatic injury with subsequent internal bleeding. Numerous complications can accompany chest injury. Continuous patient re-evaluation & monitoring 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:

1. 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 your hand or roll patient onto affected side.
2. Semi-Fowler's position if there are no contraindications (Semi-reclining position, with head and torso inclined to 45-60 degrees, legs/knees extended).
3. Oxygen
4. Pain medication as required.

Disposition: Immediate Transport/Urgent Evacuation (combat)

NOTE: Definitive treatment is usually intubation with mechanical ventilation.

CAUTION: Monitor respirations closely and look for evidence of underlying problems such as pulmonary contusion, cardiac. contusion, abdominal injuries or hemopneumothorax. May need to assist ventilations with BVM. Intubation may be required. Limit hydration because 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.

Treatment:

1. Positive pressure oxygen.
2. May require intubation.
3. Suction secretions.
4. Prevent fluid overload: IV TKO.
5. Pain control.

Disposition: Immediate Transport/Urgent Evacuation (combat)

CAUTION: BEWARE OF CNS DEPRESSANTS (E.G., NARCOTICS, BENZODIAZAPINES) WHICH MAY LEAD TO HYPOVENTILATION AND HYPOXIA. CLOSELY MONITOR AND CARE FOR YOUR PATIENT.

Pneumothorax (Spontaneous or Traumatic)

Signs and Symptoms:

- Chest pain.
- Diminished breath sounds on affected side.
- Hyperresonant to percussion.
- Decreased movement on the affected side.

Treatment:

1. If no severe symptoms, observe
2. Provide supplemental O2.

Disposition: Immediate Transport/Urgent Evacuation (combat)

NOTE: In the presence of severe symptoms perform a needle thoracentesis or insert a chest tube insertion to relieve respiratory distress.

Open Pneumothorax (PTX)/Sucking Chest Wound

Signs and Symptoms:

- History of penetrating injury.
- Rapid and/or gasping respirations.
- May hear sucking sound or see bloody froth escaping from wound.

Treatment:

1. Immediately seal wound with hand or available material.
2. Replace temporary seal with a saline gauze dressing or Ascherman Chest Seal or sterile saran wrap.

NOTE: Place patient in Semi-Fowler's position and provide supplemental oxygen. Monitor closely for development of a tension PTX. If patient develops increasing respiratory distress suggestive of tension PTX, IMMEDIATELY perform a needle decompression (thoracentesis). Continue to monitor and decompress as clinically indicated.

Disposition: Immediate Transport/Urgent Evacuation (combat)

Beware that a simple or small PTX may rapidly become a **life-threatening** tension PTX if patient is taken to **higher elevations** (e.g., CASEVAC via aircraft or ground transportation up and over high mountain passes)

Tension Pneumothorax

May or may not be from penetrating trauma.

Signs and Symptoms:

- Chest pain,
- difficulty breathing with extreme dyspnea (SOB = shortness of breath),
- tachypnea,
- hypoxia (decreased Pulse-Ox/SaO2).
- Altered LOC.
- 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:

1. Needle thoracentesis (2nd ICS, MCL) with 10 or 14g catheter.
2. High flow oxygen.
3. Closely monitor patient's respiratory effort (to include SaO2), HR, & BP.
4. Watch for hemodynamic decompensation and needle catheter occlusion/kinking.
5. The patient may require multiple repeat needle decompressions depending upon clinical condition and re-evaluations.

Disposition: Immediate Transport/Urgent Evacuation (combat)

Massive Hemothorax

May or may not be due to penetrating trauma.

Signs and Symptoms:

- Patient may be anxious and confused.
- S/S of hypovolemic shock.
- Respiratory distress.
- Decreased breath sounds and dullness to percussion on the affected side.

Treatment:

1. Secure airway.
2. High concentration oxygen.
3. Establish IV access and give Hextend/Hespan or NS if patient is in hypovolemic shock.
4. Observe patient closely for signs/symptoms of developing tension hemo-pneumothorax.
5. Decompress only if tension hemo-pneumothorax is suspected or respirations are significantly compromised.

Disposition: Immediate Transport/Urgent Evacuation (combat)

Chapter 9: 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 and also listen for bowel sounds in the chest (which indicates possible diaphragm rupture). 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** then **titrate IV fluids to patient alert and oriented &/or a blood pressure of at least 90 mmHg systolic (whichever occurs first).**

NOTE: MAST trousers are contraindicated in the presence of suspected or known on-going intra-thoracic, intra-abdominal or intracranial hemorrhage.

Specific Injuries

Penetrating Abdominal Injury

Signs and Symptoms:

- Patient may have multiple complaints or no complaints.
- There may be a very small or a very large penetrating wound.
- Remember to look on the patient's back and sides for additional wounds.

Treatment:

1. Control external bleeding.
2. Obtain IV access x 2 with NS or LR or Hextend/Hespan.

Disposition: Immediate Transport/Urgent Evacuation (combat)

NOTE: Large bore saline lock is an excellent alternative to an IV. Keep patient N.P.O. and insert an NG tube. Perform 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.) Initiate antibiotic therapy (e.g., Ertapenem 1 gram IV q 24 hours).

Blunt Trauma & Blast Injury

Signs and Symptoms:

- Patient may have any number of physical complaints and you may or may not see external 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:

1. Monitor patient closely and treat symptoms.
2. If hypovolemia occurs, resuscitate with Hextend or NS to normal mental status or BP of 90 mm HG systolic (whichever occurs first).

Disposition: Immediate Transport/Urgent Evacuation (combat)

Evisceration/Intestinal Herniation

Signs and Symptoms: Any protrusion of abdominal contents through a wound.

Treatment:

1. Control hemorrhage.
2. Obtain IV access x 2 with NS or LR or Hextend/Hespan. Saline lock is acceptable.
3. Apply a sterile wet (saline) dressing and cover it with saran wrap (or inside portion of used IVF bag that has been cut along 3 or more sides to fit size/shape of wound).
4. Keep patient NPO and place NG tube.
5. Urinary catheterization if rectal/penile/scrotal exam is negative.
6. Initiate antibiotic therapy (e.g., Ertapenem 1 gram IV q 24 hours).

Disposition: Immediate Transport/Urgent Evacuation (combat)

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 the urine.

Treatment:

1. Normal wound care.
2. IV NS or LR and titrate appropriately.
3. Urinary catheterization if rectal, prostate, scrotal and perineal exam is normal.

Disposition: Immediate Transport/Urgent Evacuation (combat)

Urethral Injury

Signs and Symptoms:

- Blunt or penetrating trauma to the suprapubic area &/or direct genital trauma (i.e., penile, vaginal/peri-vaginal).
- May or may not have blood at the urethral meatus.
- Signs of perineal injury.
- Assessment is based on whole patient.

NOTE: Urethral injury is usually secondary to other types of trauma. (This is especially true in males secondary to the length and redundancy of the urethra and associated structures such as prostate. Remember to think anatomically and correlate with MOI in anticipating -- and treating -- occult injuries).

Treatment:

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

Disposition: Immediate Transport/Urgent Evacuation (combat)

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

Chapter 10: 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.
3. Unless fracture is significantly angulated, do not manipulate if good circulation and nerve function are intact.
4. If there is **neurovascular compromise** of the limb or **significant angulation** of the **fracture:**
   a. 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).
   b. Perform circulation, motor, sensory 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. (i.e. Moxifloxacin).

NOTE: Femur fractures require a traction splint.

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 Ertapenem 1 gram q 24 hours should be considered when tactically feasible/practical. Oral moxifloxacin is acceptable alternative if no contraindications exist (i.e., penetrating abdominal trauma, shock, unconsciousness) and the tactical situation makes the preparation and safe administration of IV antibiotics impractical.

IN CASES WHERE EVACUATION TO HIGHER LEVEL CARE WILL TAKE 4 HOURS OR LONGER, TREAT AS ABOVE, PLUS:

1. Administer antibiotics.Moxifloxacin, Ceftriaxone, Cefotetan, Ertapenem are acceptable options.
2. If the skin over a fracture is abraded, clean the abrasion with diluted betadine solution, irrigate with saline and dress the wound.
3. 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 realignment. Do not delay realignment 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:

1. 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).
2. If **bone is visible** in the wound: Irrigate as above and cover with a moist sterile dressing.
3. If dirt or other debris is impacted into the bone, clean out as well as possible before irrigation.

Specific Injuries

Clavicle

Signs and Symptoms:

- Pain and tenderness over clavicle.
- Difficulty moving adjacent arm without discomfort.

Treatment:

1. Sling and Swath.
2. Pain medication as needed.
3. A "Figure 8" splint was previously used as the treatment of choice for this injury but it has currently fallen out of practice in favor of definitive care. In the field, however, use of a Figure 8 splint may provide better functionality and may be used if needed.

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:

1. Loose sling and swath (with no pressure under the elbow).
2. 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 injured the radial nerve, which spirals around the bone. Damage to the radial nerve is indicated by inability to lift the hand (wrist drop) and loss of sensation on the back of the hand.

Treatment:

1. Loose sling and swath (with no pressure under the elbow).
2. 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.

Treatment: Splint, sling and swath the arm with the elbow in 90 degrees of flexion.

Shoulder Dislocations

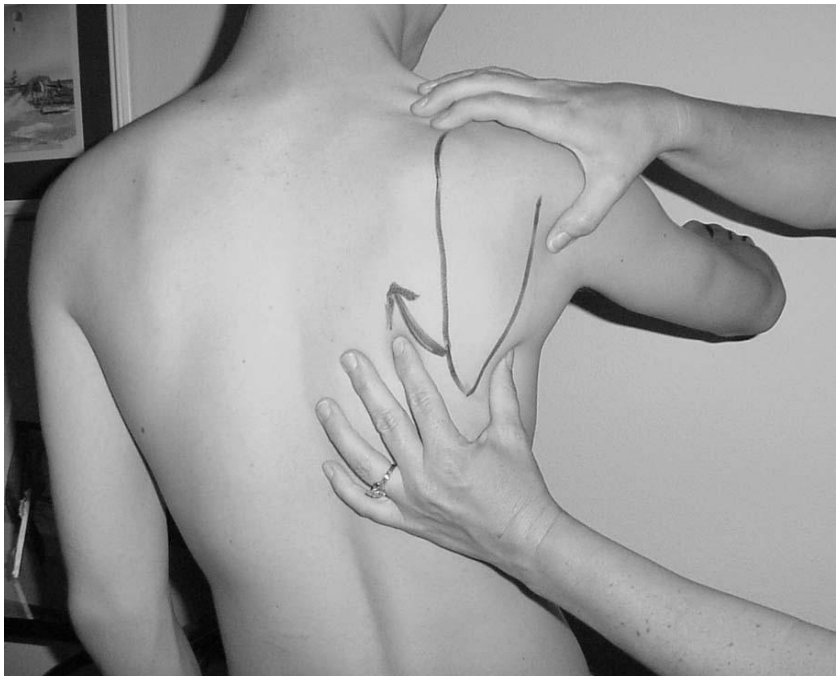
Signs and Symptoms:

- 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/"Regimental Patch" 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/"Regimental Patch" area, checking for injury to the axillary nerve.
   c. Check circulation and neurological function of the affected arm and hand.
   d. Document if any neurovascular deficits are present prior to reduction.
   e. There are multiple methods of reducing shoulder dislocations. The key to a successful 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.
   f. The patient may have to be sedated prior to reduction. Valium, 5-10 mg slow IV is usually effective and is also a good muscle relaxant.
   g. Successful reduction is usually obvious with a sudden return of the shoulder's external anatomy to normal and significant reduction of pain.
   h. Reassess the neurovascular status of the arm and hand after the reduction and then put the arm in a sling and swath.

Scapular Manipulation Reduction Method: Have the patient sit upright or lay face down. If sitting, support the affected arm straight out from the body. If lying prone on a table allow the arm to dangle straight down. Apply 5-10 pounds of long-axis traction to the arm. Stand behind the patient, grasp the tip (inferior portion) of the scapula and rotate it inward (towards the spine) and superior (towards the head) with a slow, gentle and continuous motion.



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 realignment unless neurovascular compromise or significant angulation is noted.

Treatment:

1. Splint in position of function (beer can or duckbill splint).
2. 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:

1. 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.
2. After reduction buddy-tape or splint the affected finger.
3. 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

Pelvic Fracture/Dislocation

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:

1. Place patient on a long board.
2. Apply pelvic binder. Alternatively, MAST will help in stabilizing pelvic fractures and may help tamponade bleeding from pelvic structures. Furthermore, a tightly wrapped swath around the hips/pelvis using a bed-sheet or similar material can be used.
3. Initiate IVs of LR or NS or Hextend/Hespan or start large-bore saline lock.
4. Pain medication as needed
5. Priority evacuation if uncomplicated, urgent if associated with circulatory compromise

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 Fracture

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:

1. Apply traction splint. A properly applied traction splint will significantly decrease the patient's pain and help control bleeding.
2. IVs of LR, NS, Hextend/Hespan, or saline lock,
3. pain control

Disposition: Priority evacuation

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.

1. **Assume vascular damage in all knee dislocations** even if pulses are present.
2. Knee dislocations will frequently reduce themselves. If it has not, reduce by steady, gentle long axis traction.
3. Splint carefully and monitor distal pulses frequently.

Disposition: Immediate Transport/Urgent Evacuation (combat)

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:

1. 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.
2. Splint the ankle with a well-padded posterior and U-splint.
3. Do not allow the patient to put any weight on the ankle or leg.

Disposition: If dislocation cannot be reduced, Immediate Transport/Urgent Evacuation (combat). If reduced, priority evacuation

Other Lower Extremity Fractures/Dislocations

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

Treatment:

1. Unless grossly angulated or neurovascular compromise is noted, splint fracture/dislocation as it lies.
2. If realignment is necessary, prepare to splint, then apply long axis traction to realign extremity. Check neurovascular status before and after realignment.

Disposition: Priority evacuation, Urgent Evacuation if neurovascular compromise exists

Compartment Syndrome:

Occurs when bleeding and/or swelling in a closed space exerts pressure on 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.

Treatment:

1. Treat causative factor.
2. Immobilize extremity.

Disposition: Immediate Transportation/Urgent Surgical Evacuation

CAUTION: Some of the 'classic signs' of compartment syndrome (delayed capillary refill, lack of sensation distal to the injury site, paralysis, pallor and pulselessness) occur late in the course of the syndrome and are not reliable for early diagnosis. If compartment syndrome is suspected immediate evacuation is required. Elevation of 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 actually exacerbate the situation by diminishing an already compromised blood flow/supply.

Crush Syndrome Injuries:

Results from prolonged (usually 4 hours or more) pressure being applied over a large muscle area such as the legs or pelvis which cuts off blood circulation or crushes the affected body part. This usually occurs when the patient is trapped under heavy debris secondary to a structural collapse or a motor vehicle accident with entrapment. Crush injuries of the head, neck and chest are usually rapidly fatal. Crush syndrome does not occur when only a small body part, such as a hand or foot, in involved.

Signs and Symptoms:

- Patient trapped with a large section of his/her body caught under a heavy object or within a tightly confined space causing immobility for 4 or more hours.
- The patient can be awake, alert and in remarkably little pain, even though the damage to the trapped body part may be serious.
- The trapped body part may be blue, cold and pulseless.
- Hyperkalemia and rhabdomyolysis can result from this syndrome resulting in cardiovascular collapse &/or renal failure minutes to hours after extrication/extraction.

Treatment:

1. This syndrome has a high mortality. Even though the patient may appear stable while trapped, once the entrapment has been released he/she may go into complete cardiovascular collapse from the sudden flow of blood into the formerly entrapped body part and/or from accumulated metabolic waste products going into the patient's central circulation. For this reason, maintain a **high index of suspicion** for impending cardiovascular collapse when confronted with a prolonged casualty entrapment scenario. **BEGIN treatment BEFORE EXTRICATING THE PATIENT.**
2. Obtain vascular access (IV or IO) and give the patient an initial **1L fluid bolus of NS**.
3. Follow the initial 1L bolus with a continuous infusion at a rate of ~1L/hr.
4. If cardiovascular collapse occurs, initiate standard resuscitation/ACLS protocols.
5. If cardiovascular collapse occurs shortly after extrication, consider hyperkalemia and/or metabolic acidosis as probable causes and treat accordingly.
6. Irrigate crushed extremities with normal saline,
7. apply dressings and splint
8. Minimal or no debridement should be done at this stage.
9. Provide adequate IV/IO fluid rehydration (UOP > 150 mL/hr in adults) to protect kidneys from damage related to rhabdomyolysis.
10. Insert Foley catheter to monitor urine output.
11. If AMPUTATION required for extraction perform an Emergent Field Amputation

Disposition: Immediate transport/Urgent Evacuation (combat)

CAUTION: **Do not use Lactated Ringers (LR) for IV fluid** resuscitation in crush injury because it **contains potassium** and can worsen hyperkalemia!

Chapter 11: 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.
3. Establish baseline vital signs and document accordingly.
4. Establish IV's of LR/NS. In general, IVF resuscitation will be needed for 2nd & 3rd degree burns involving ~20% BSA or more.
5. **Calculate the amount of fluid resuscitation required for 2nd and 3rd degree burns only.**

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.

Burn Fluid Resuscitation: USAISR Rule of Tens

NOTE: This protocol for fluid resuscitation of the burn patient replaces the Parkland Formula.

1. **Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines**

2. **Fluid resuscitation**
   a. **If burns are greater than 20% of Total Body Surface Area, fluid resuscitation should be initiated as soon as IV/IO access is established**
   b. **Resuscitation should be initiated with Lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by Lactated Ringer's or normal saline as needed**
   c. **Initial IV/IO fluid rate is calculated as %TBSA x 10 ml/hr for adults weighing 40 - 80 kg**
   d. **For every 10 kg ABOVE 80 kg, increase initial rate by 100 ml/hr**

3. **If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock**

4. **NEVER bolus IV fluids. Bolused IV fluids will rapidly move into the third space. Continuous infusion is the best approach**

5. **EXAMPLE:**
   A 70 kg airman sustains 2nd/3rd deg burns on both arms and his entire back.

   TBSA burned (Rule of Nines): 9% + 9% + 18% = 36%
   Round up to nearest 10% = 40%

   IV Fluid Rate = 40 x 10 ml/hr = 400 ml/hr

   NOTE: If the airman weighs 100 kg (20 kg over 80kg) then

   IV Fluid Rate = 400 ml/hr + (2 x 100 ml/hr) = 600 ml/hr

6. Place a foley catheter if possible and establish an accurate hourly intake and output record (barring renal dysfunction, urinary output is a useful measure of fluid resuscitation). Adjust IV fluid rate to maintain a urinary output of 1-2 cc/kg per hour.

   NOTE: The use of any fluid replacement formula merely provides an estimate of fluid requirements. The actual amount of fluid given should be adjusted according to the individual patient's response. Mental alertness, urinary output and vital signs reflect the adequacy of fluid resuscitation. Remember: **Treat the patient, not the formula**.

7. Monitor lung fields for indications of fluid overload (pulmonary edema).
8. Monitor patient's vital signs q. 15min-1hour.
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 (due to increased risk of GI "stress" or "Curling's" ulcers).

10. Protect patient from the environment (i.e., especially hypothermia). Cover patient appropriately while performing physical examination.
11. Apply sterile dressings to burns to protect patient from infection.
12. If unable to evacuate within 24 hours, contact medical 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.

General Burn Care:

1. Insert Foley and record urine output.
2. Depending on patient's condition and urine output, adjust fluid resuscitation prn.
3. In presence of paralytic ileus and/or if burn area is over 20% 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 gauze between the fingers.
5. Keep neck slightly hyperextended if 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 (i.e., q 5-10 minutes). This may help decrease the IV fluid requirement.
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 **Ranitidine,** 50 mg IV or IM q 6-8 hours to prevent ulcer formation. If the GI tract is functioning, **Ranitidine,** 150 mg orally q 12 hours can be used instead of the IM/IV preparation.

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.

Burn Treatment:

1st Degree: Submerge body part in cool water/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 minutes for pain relief.

NOTE: Do not submerge in ice water. Cover burn with loose, dry, sterile dressing.

If evacuation is delayed:

1. Leave blisters intact unless they are larger than 2" in diameter. Large blisters should be drained with a sterile needle/syringe and then unroofed.
2. Clean burn area and apply Silvadene. NOTE: Use bacitracin, NOT Silvadene on facial burns.
3. Silvadene 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.
4. When removing dressings, avoid removing dressings that have adhered to the skin. This can increase the damage to the underlying tissue.
5. To ease removal of adhered skin, it may be necessary to soak dressings using sterile saline prior to removal. **It is vital to remove all of the old silvadine before applying a new layer!**
6. Consider giving analgesia before changing dressings.

2nd and 3rd Degree (DEEP):

- **If Evacuation is Immediate with Rapid Transport Time:** Cover burn area with sterile dressing (if possible). If a large area is involved cover with a 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 Silvadene dressing as noted above. Gently clean and reapply Silvadene and fresh dressing every 12-24 hours. **It is vital to remove all of the old silvadine before applying a new layer!** If the saran wrap dressing is used, change as the dressing becomes saturated with exudate. NOTE: Use bacitracin, NOT Silvadene on facial burns.

NOTE: **Morphine** or **fentanyl lozenge** should be considered prior to performing initial burn wound debridement. Administer analgesics one half hour before treating patient. However, use of narcotics (e.g., morphine) may be contraindicated in head, chest or spinal trauma; check with your medical control before using in patient with head, chest or spinal trauma

Circumferential Burns:

If circulatory compromise or respiratory difficulty develops, be prepared to perform an escharotomy.

NOTE: An **escharotomy** (see wound care and procedures section) should be performed under physician control.

Chemical Burns (acids, Alkalis ect):

1. Immediately remove agent (brush off if powder, wash off if liquid).
2. **FLOOD** area with water.
3. Remove contaminated clothing, jewelry, etc.
4. Continue water irrigation of burn area as long as possible.
5. If chemicals splash into the eye, irrigate the eye with a **MINIMUM** of 1 liter of fluid, but preferably several liters.

NOTE: Do not attempt to "neutralize" with other chemicals.

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 Phosphorus (WP) Burns:

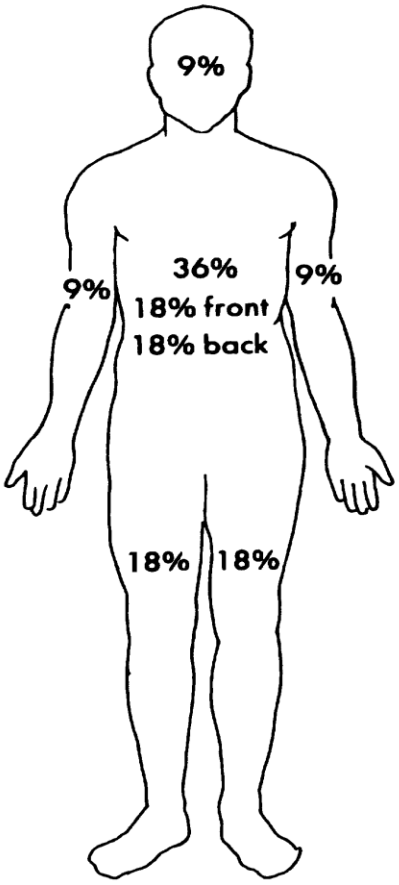
WP will continue to burn as long as it is exposed to oxygen. The key to treating WP burns is to cut off oxygen to any WP fragments in the body and then remove them as soon as possible.

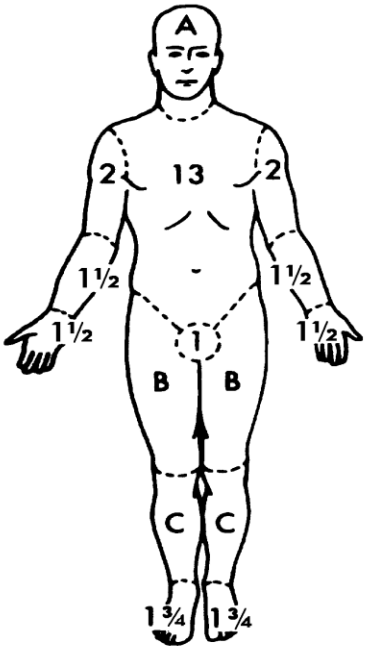
1. Completely submerge body part in water. Otherwise cover with wet dressing.
2. If possible, move patient to dark area and remove remaining particles (WP fragments glow faintly in the dark, and glow well under ultraviolet light and should show up very well using NVG's).
3. If unable to debride particles out of tissue, keep wounds covered with wet dressings during transport.
4. 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.
5. WP fragments glow under ultraviolet light allowing easy debridement.

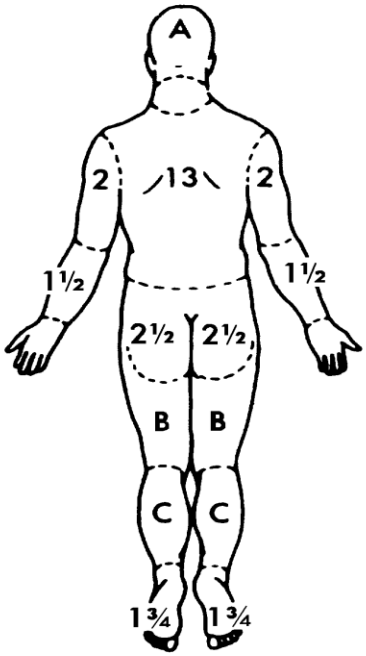
Burn Nomogram (Rule of Nines)

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 (excluding fingers and thumb) is approximately 1% of their body surface area.







Rule of Nines (Adults only)

Relative Percentage of Area Affected by Growth

Age in Years	0	1	5	10	15
A: ½ of head	9.5	8.5	6.5	5.5	4.5
B: ½ of thigh	2.75	3.25	4.0	4.25	4.5
C: ½ of leg	2.5	2.5	2.75	3.0	3.5

% 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%

Chapter 12 Surgical and Medical Procedures

Airway (Management and Control)

Guidelines and Considerations:

- Indicated when airway is (or a significant potential exists to become) partially or completely obstructed or compromised.
- Cervical spine injury is assumed with deceleration trauma, blast injury and unconscious patients. Spinal immobilization is not required for penetrating trauma alone in the absence of other spinal precaution indications.
- Always evaluate the mechanism of injury (MOI) in unconscious patients when assessing for other possible injuries.
- Airway management options are often driven by the tactical situation and phase of patient care. In general, airway options during each phase of patient care/evacuation will be limited to the following:

1. **Care Under Fire phase**
   a. If intervention is needed, limit to NPA (nasopharyngeal airway)
2. **Tactical Field Care phase**
   a. Chin-lift or jaw-thrust
   b. Nasopharygeal airway (NPA)
   c. Place casualty in recovery position
   d. Extraglottic Airway Device (e.g. Laryngeal Mask Airway, Combitube or King LT) *or* Surgical cricothyroidotomy (with lidocaine if conscious) if above measure are inadequate
3. **Combat CASEVAC phase**
   a. Chin-lift or jaw-thrust
   b. NPA
   c. Recovery position
   d. If above measures are inadequate, insert an Extraglottic Airway Device (e.g. Laryngeal Mask Airway, Combitube or King LT) *or* Endotracheal intubation, *or* Surgical Cricothyroidotomy (with lidocaine if conscious)

Jaw Thrust: Method of Choice for Trauma Patient

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.

Chin Lift: Two Rescuers Required: One To Stabilize Neck And One To Open Airway

1. Stabilize patient'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.

Nasopharyngeal Airway (NPA): For Use on Conscious, Unconscious, & Semi-Conscious Patients. NPA is the preferred initial airway adjunct. Never force the airway.

1. Lubricate with water soluble lubricant or the patient's saliva.
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.

Oropharyngeal 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.

- Push tongue out of the way with a tongue blade and insert airway under direct visualization.
- 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. The OPA has little to no role in the pre-hospital/tactical environment. It is included here merely for completeness.

Endotracheal Tube (ETT) Intubation:

For Protection Of The Airway And/Or As A Means Of Ventilation In The Apneic Patient

Equipment:

1. Endotracheal tube with stylet, cuff checked for leaks (size 7.0-7.5-8.0 for adult)
2. Laryngoscope (check operation of blade, bulb and batteries)
3. Suction
4. Esophageal intubation detection (EID) device -- (e.g., squeeze-bulb aspirator; EID syringe; end-tidal CO2 detector)
5. Syringe to inflate cuff and tape or other means of securing the ETT once placed.

Procedure:

1. Hyperoxygenate patient with 100% oxygen for several minutes prior to intubation.
2. Assemble and test equipment while patient is being pre-oxygenated:
   a. Inflate cuff of 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 pre-oxygenation.
   a. Have an assistant stabilize the patient's head and apply cricoid pressure (Sellick's maneuver).
   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.

   Note: A modified Sellick maneuver, known as the **BURP** maneuver **(B**ackward, **U**pward, **R**ightward **P**ressure), better facilitates visualization of the cords and successful intubation.

5. When cords are visualized, advance the ETT cuffed balloon beyond cords. Inflate cuff and ventilate.
6. Confirm proper tube placement:
   a. Auscultate over stomach and both lung fields
   b. Attach esophageal detection squeeze-bulb aspirator to end of ETT, squeeze firmly and quickly release. If **in *trachea***, bulb **will *immediately refill*;** if ETT is in ***esophagus, delayed refill*** will occur. (Most reliable adjunct for determining tube placement. Squeeze-bulb may be slow to refill in cold environments. Alternatively, use esophageal intubation detector syringe. If ETT is in the trachea, there will be no resistance when plunger is withdrawn; if ETT is in esophagus, resistance will be felt when plunger is withdrawn).

c. Attach colorimetric end-tidal CO 2 detector (ETCO2) in-line with end of ETT and ambu bag and observe for color change following several (>6) ventilations. **Color change** (purple to yellow) indicates exhalation of CO 2 and proper **endotracheal placement.** (The ETCO2 detector is limited to use in dry, well-lighted working environments. It is also less reliable with patients in "low-flow" cardiac states. Best suited for use in CASEVAC phase of patient evacuation).

d. If proper tube placement can't be confirmed, reposition or remove tube as necessary.

e. Do not release Sellick's maneuver until ***proper* position** of tube in trachea is confirmed *and* **cuff is inflated**.

7. Secure tube once proper placement confirmed
8. Reconfirm position of tube by auscultation and esophageal detection device every time the patient is moved. Also monitor pulse oximetry if available. If patient begins to desaturate, check tube for placement and patency/obstruction (e.g., blood, mucous). Due to some of the limitations of continuous ETCO2 detectors in various operational environments, they are best used during CASEVAC phase for continuous visual feedback confirming proper ETT placement (or detecting dislodgement).

Elastic Gum Bougie:

When the vocal cords cannot be adequately visualized using conventional direct laryngoscopy, the use of a gum elastic bougie introducer may facilitate intubation.

Equipment:

1. Endotracheal Tube
2. Gum elastic bougie
3. Laryngoscope

Procedure:

1. Place endotracheal tube over bougie
2. While performing direct laryngoscopy, place the bougie in the area of the trachea
3. Advance bougie into area of trachea
4. Feel for the characteristic "bumps" of the tracheal rings as the bougie is advanced
5. If tracheal rings are not felt, withdraw and reposition bougie
6. Once rings are felt through the bougie, advance endotracheal tube along bougie
7. If resistance is met when advancing the ET tube, gently rotate the tube 90 degrees counterclockwise and continue to advance the tube until the cuffed balloon has passed through the vocal cords
8. Once endotracheal tube is in place, remove bougie and proceed with the remaining intubation steps

NOTE: This procedure should not be attempted until it has been practiced under direct medical supervision.

RSI- RAPID SEQUENCE INTUBATION

For experienced intubators only

The 7 Ps of RSI

1. **Preparation:**
   a. Check all equipment (BVM, O2, ETT, suction, Extraglottic Airway Devices, Cric supplies)
   b. Draw up induction and paralytic meds

2. **Pre-oxygenation**: 3 minutes with tight fitting non-rebreather mask if the patient is spontaneously breathing or 8 vital capacity breaths if assisted with BVM with 100% O2

3. **Pre-medication**: Pre-medicate with Valium 2 mg IV if using Ketamine for induction and ONLY if patient is not hypotensive.

4. **Paralyze/Induce:**
   a. Induction Agent renders the patient unconscious/unresponsive
      - Options: Etomidate 25 mg (0.4 mg/kg) IV **OR** Ketamine 150 mg (1.5 mg/kg) IV
      - Do not use ketamine in the severely hypertensive patient
   b. Paralytic eliminates muscle tone and optimizes laryngoscopy and prevents vomiting
      - Options: Rocuronium: 100 mg (1 mg/kg) IV (150 mg if > 100kg) **OR** Succinylcholine 150 mg (2 mg/kg) IV.
      - **NEVER PARALYZE WITHOUT GIVING AN APPROPRIATE DOSE OF AN INDUCTION AGENT!**

5. **Pass the tube**
   a. If successful: remove stylet, ventilate patient.
   b. If unable to pass the tube after 2 attempts or the patient's O2 sat fall below 90%, bag the patient with 100% oxygen
   c. Place an Extraglottic Airway Device (eg LMA, Combitube or King LT) or perform a cricothyrotomy if you can't intubate or oxygenate the patient

6. **Proof of placement:** End tidal CO2, auscultation, fogging of tube, bilateral chest rise

7. **Post intubation care:**
   a. Maintain IV sedation with Valium 2mg q 15 min PRN up to 10 mg.
   b. Morphine for pain and sedation 5 mg IV PRN, monitor vitals/ check tube regularly.
   c. Rocuronium 20 mg IV hourly PRN ONLY if patient continues to move despite ADEQUATE sedation and pain control.

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 without RSI (either contraindicated or not available), 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. Use an ETT ½ - 1 size smaller than what you would use for ET intubation via the oral route.

Equipment List:

1. Endotracheal tube, cuff checked for leaks (size 6.0-7.5 for adult)
2. Water-soluble lubricant (viscous lidocaine can be used)
3. Tape or other means of securing ETT
4. Syringe to inflate ETT cuff

Procedure:

1. Follow initial steps as for endotracheal intubation using a 6.0 to 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.
3. Listen and feel for the patient to inhale. When the patient inhales, advance the tube with a single smooth motion into the trachea.
4. **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.
5. Advance the tube until the balloon is past the vocal cords. Inflate cuff, confirm placement, and secure.
6. Recheck the position of the tube after every movement of the patient.

NOTE: NO stylet is used during nasotracheal intubations.

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 1: Cricothyroidotomy is the preferred initial airway technique of choice in cases of airway obstruction with penetrating wounds of the face &/or neck in which blood or disrupted anatomy preclude good visualization of the vocal cords. Do not waste valuable time trying to intubate under these conditions following rapid initial airway assessment/1-time attempted intubation.

Note 2: The PerTrach™ (percutaneous cricothyroidotomy) – or comparable device -- is approved for use, if specific instruction on its proper use by a qualified physician has been accomplished and current competence in the technique has been demonstrated and documented in OJT records.

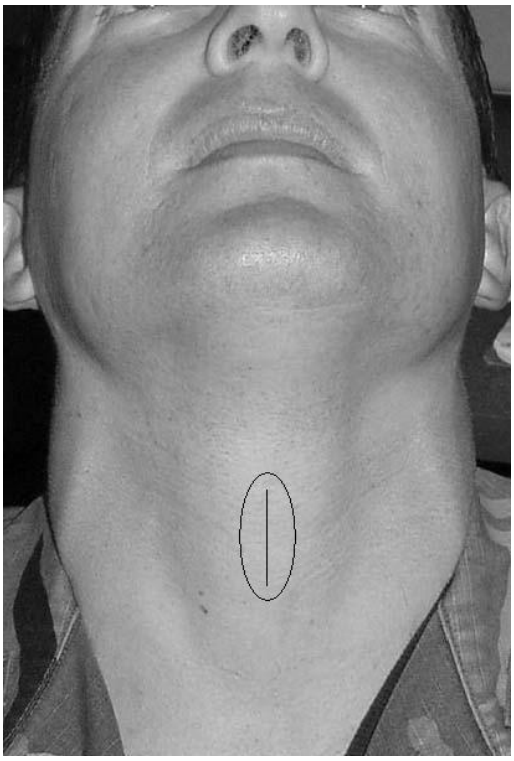
Caution: Severe bleeding is possible with this procedure. Be prepared to suction the field, and provide direct pressure to control bleeding at the incision site.

Equipment:

1. Shiley cuffed tracheostomy tube (may use 6.0-7.0 cuffed endotracheal tube if no tracheostomy tube is available)
2. Trachea hook (if available)
3. Syringe to inflate cuff
4. Scalpel or sharp surgical scissors
5. Umbilical tape or other means of securing tracheostomy or ETT
6. 4x4 gauze to control bleeding
7. 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
7. Insert tracheal hook to maintain opening before removing blade
8. Insert tube, directed caudal (towards the lungs).
9. Inflate the balloon, check breath sounds, secure tube and dress incision site.



Breathing

Oxygen Therapy

Indicated for 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 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 OR SPARKS 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:

Indication: Tension pneumothorax. Needle thoracentesis is usually sufficient for temporary treatment of tension pneumothorax (~4 hours of sustained therapeutic effect).

Signs/Symptoms:

- Severe respiratory distress
- Tracheal deviation
- Presence of distended neck veins
- Unexplained hypotension
- Unilateral absence of breath sounds
- Hypertympanic percussion over affected side.

Equipment:

1. 10 or 14 Gauge, 3-inch angiocath
2. Supplemental Oxygen (if available)

NOTE: 10 gauge catheter may allow decompression to be maintained longer than 14 gauge, which may clot more easily

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 or alcohol swabs.
4. Re-identify the 2nd intercostal space in the midclavicular line.

5. Insert 10 - 14-gauge, 3-inch catheter over the **top of the rib** into the pleural space.
6. Listen for a decompression air rush from the needle.
7. **Leave the catheter in place** and apply bandage or small dressing. A field improvised one-way valve may be attached to the catheter.
8. Observe/monitor the patient (and catheter for kinking/obstruction). Repeat procedure as necessary. Prepare for a **chest-tube** insertion **if necessary.**

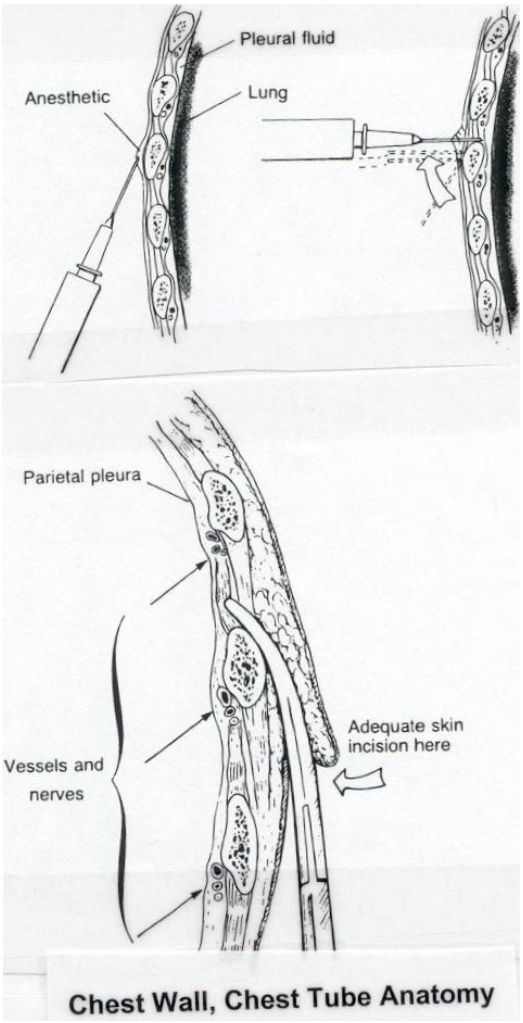
Thoracostomy (chest tube):

Indication: Treatment pneumothorax or tension pneumothorax.

NOTE: Tension pneumothorax should initially be treated with needle thoracentesis (repeated as necessary.) A stable patient with a pneumothorax should be observed closely and a chest tube should be placed **ONLY** if the patient becomes significantly short of breath or has other signs of decompensation which cannot be corrected with repeat needle thoracentesis. Formal chest tube placement is **RARELY** required in the pre-hospital environment.

Equipment:

1. Sterile gloves, chest tube (ETT may be substituted) and one-way valve (Heimlich valve)
2. Scalpel, needle, 0-Silk suture, material for occlusive dressing
3. Lidocaine
4. Syringe with needle
5. Curved or straight Kelly clamp



Chest Wall, Chest Tube Anatomy

Procedure:

1. Locate 4th or 5th intercostal space (approximately at the nipple level in males) 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 a 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 be painful for the conscious patient.

5. Sweep your finger around the incision feeling the chest wall for any adhesions.
6. 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.
7. 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.
8. Apply an occlusive dressing around the tube and incision.

Circulation

Intravenous Infusion Access

Equipment List:

1. IV Catheter, IV Tubing and IV Bag (tubing flushed and prepped)
2. Tourniquet (TQ)
3. Alcohol (or betadine) prep pad
4. Tape, sterile dressing

Procedure:

1. Clear entire IV tubing of air.
2. Apply TQ 2-6 inches above selected insertion 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 the insertion 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.
7. Pull back until needle separates from catheter and advance catheter into the vein.
8. If resistance is met: Stop, release TQ and carefully remove both needle and catheter. Attempt venipuncture with a new catheter.
9. Once successful, attach administration set to hub of catheter and adjust to proper infusion rate.
10. 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.
11. Cover with sterile gauze. Loop tubing and secure to arm.

Guidelines to Determine Effectiveness of IV Fluid Therapy:

- Palpable radial pulse or systolic blood pressure greater than 90 mmHg
- Improved level of consciousness?
- Urine output 30cc/hr or greater?

Drip Rate Calculations

To Calculate the Volume of Drug to be Administered:

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

To Calculate the Drip Rate:

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

To Calculate Drug Administration based on Patient Weight:

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

Quick Reference - Drip Rates			
	Macro Drip (10 gtts/ml)	**Macro Drip (15 gtts/ml)**	**Mini Drip (60 gtts/ml)**
ML/HR	**GTTS/MIN**	**GTTS/MIN**	**GTTS/MIN**
30cc	5	8	30
75cc	13	19	75
100cc	17	25	100
150cc	25	38	-
200cc	33	50	-
300cc	50	75	-

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 described in the Intravenous Infusion Access procedure.
2. Instead of attaching an IV fluid 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:

Indications: vascular access is required and you are unable to start standard IV.

NOTE: The sternal intraosseous device ("FAST1") and the EZ-IO tibial infusion device are approved for PJ use. Personnel using either device must have been trained on the proper technique prior to its use and have demonstrated current competency with documentation in the PJ's medical training records.

Guidelines and Considerations:

- Higher incidence of infection with intraosseous access than with IV access if left in place for greater than 24-48 hours
- Rapid fluid infusion may be painful, if so inject 1-2 cc 1% lidocaine into intraosseous catheter
- 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
- **CONTRA INDICATIONS**: Infection at the site of puncture, fracture, previous IO insertion attempt in same bone.

Equipment:

1. Gloves, PPE
2. Intraosseous needle (16 gauge or larger for adult), syringe, & IV administration set
3. Alcohol or betadine swab/wipe
4. Tape, sterile dressing
5. Lidocaine, syringe, needle

Standard IO Needle Procedure:

1. Select site.
   a. **Adult:** 2 cm above and slightly anterior to the medial malleolus, 2 cm below the tibial tubercle on the anteriomedial surface of the proximal tibia or sternum.
   b. **Children:** Proximal tibia, 2 cm below the tibial tubercle on anteriomedial surface of t tibia.
2. Clean site w/ alcohol or iodine wipe/swab. Anesthetize skin and periosteum with lidocaine.
3. With obturator (stylet) in place, angle needle slightly cephalad (towards the head) if the distal tibia is used, or slightly caudal (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 syringe & attach primed IV tubing to IO needle. Pressure infusion may be required.
7. Place sterile dressing around the IO needle.
8. Remove IO infusion needle as soon as a reliable IV access is obtained.

FAST 1 Procedure:

1. Prepare IV fluid administration set
2. BSI precautions **GLOVES MINIMUM**
3. Prepare site using aseptic technique **BETADINE ALCOHOL**
4. Place a finger at suprasternal notch
5. Align patch indentation with finger/suprasternal notch
6. Place patch on sternum
7. Verify patch is midline
8. Place introducer needle cluster in target area on patch
9. Align Introducer device must be perpendicular to the surface of the manubrium
10. Insert using increasing pressure until device releases (~20-30 pounds). If more force than that is needed, ensure the FAST 1 is perpendicular to the sternum and re-apply pressure.
11. Following device release, infusion tube separates from introducer
12. Remove introducer by pulling straight back
13. Cap introducer using post-use cap supplied
14. Connect infusion tube to tube on the target patch
15. Use syringe to administer 1 mL flush of sterile normal saline to CLEAR ANY TISSUE DEBRIS in the infusion catheter
16. Connect primed IV line to target patch tube
17. Open IV and assure good flow
18. Examine for signs of infiltration or extravasation
19. Place dome over catheter
20. Be certain that remover device is attached to patient if required for IO catheter removal later

EZ-IO Procedure:

1. Determine that no contraindications are present
   a. Tibial Fracture
   b. Previous orthopedic procedure on tibia, previous IO attempt on tibia
   c. Infection over insertion site
2. Find insertion site 1 finger breadth medial to tibial tuberosity
3. Clean insertion site with alcohol or Betadine
4. Anesthetize skin at insertion site
5. Begin insertion
   a. Hold tibia with one hand
   b. Position needle set at 90 degrees to insertion site
   c. Twist needle through skin until contacting bone
   d. Apply firm and consistent pressure to manual EZ-IO needle
   e. Continue twisting manual EZ-IO needle until "pop" is felt or needle flange touches skin
6. Remove driver from needle set
7. Remove stylet from catheter
8. Confirm catheter tip position
   a. Catheter should be firmly seated at 90 degree angle
   b. Consider aspiration of small amount of marrow to confirm placement
   c. Easy flow of flush solution
9. Attach EZ-Connect or standard luer lock to primed IV fluid administration set
10. Flush catheter with 10cc of NS and ensure free flow of fluid
11. Initiate fluid infusion and monitor for signs of extravasation or infiltration
12. Apply EZ-IO wristband and dressing
13. Secure tubing and catheter

Venous Cutdown:

Indications: Vascular access second to failure to obtain peripheral IV, Severe burns preventing peripheral IV, lack of IO Device

Relative contraindications: Less invasive procedure is available or injuries proximal to cutdown site

Equipment needed

1. Curved kelly hemostats
2. Scalpel with handle
3. Suture ties
4. Scissors
5. Gauze
6. Alcohol or betadine swabs
7. Tape
8. Constriction band/ tourniquet
9. IV catheter
10. IV admin set with fluid

Procedure

1. Identify and clean the site
   a. Lower extremity: greater saphenous vein located 1-2 cm anterior and superior to the medial malleolus
   b. Upper extremity: basilic vein located in the antecubital fossa 2cm above and 2-3 cm lateral to the medial epicondyle
2. Assemble and prepare IV fluid administration set
3. Apply tourniquet

4. Make transverse incision through the skin over the site
5. Blunt dissect down to the vein to expose it and free it from the fascia
6. Pass ligature under the vessel both distal and proximal
7. Ligate the distal end of the vessel with the ligature
8. Cannulate the vein with catheter
9. Attach the IV fluid administration set and confirm flow
10. Tie off the proximal ligature securing the catheter to the vessel
11. Dress the wound and secure the IV

Diagnostics and Patient care:

Nasogastric Tube (NG):

Indications:

Ileus, Spinal injury, Abdominal trauma Genitourinary trauma; Burns,	Electrocution, GI bleeding, Unconscious patient, Intubation, Excessive vomiting,	Acute surgical abdomen Aeromedical evacuation of severe trauma patient.

WARNING: NG tube placement is contraindicated in patients with suspected fractures of the cribiform plate, basilar skull, or open skull fractures. If a NG tube is needed it may be passed orally.

Equipment:

- NG Tube and water-soluble lubricant (viscous lidocaine preferred)
- 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 injecting air into the NG tube with the 60 cc syringe while listening over the epigastrium with a stethoscope. If bubbling is heard, aspirate stomach contents to verify placement and secure the NG tube with tape.

Urethral Catheterization (MALE & FEMALE)

Indications: Inability to void due to spinal cord damage; rupture of bladder; distal urinary tract obstruction; burns of genitalia; depressed sensorium, shock, etc. Multisystem trauma or burn 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 gauze,
- betadine solution
- 1-inch surgical tape.
- Water-soluble lubricating jelly
- 10cc syringe
- sterile fluid source
- Foley catheter w/bag for 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 gauze and retract foreskin. Clean head of penis from meatus outward with betadine. Repeat for total of 3 times.
4. Pick up catheter, lubricate tip and distal 5 inches of catheter.
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: Don't inflate balloon until urine has started to flow through the catheter.

7. Don't give antibiotics prophylactically for urinary tract infection. Give **antibiotics only** if the patient develops a **fever or other signs of infection** or if transport can't take place within 24 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 gauze moistened with betadine solution. Wipe in a downward motion from labia to 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 maintain 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. Don't give antibiotics prophylactically for urinary tract infection. Give **antibiotics only** if the patient develops a **fever or other signs of infection** or if transport can't take place within 24 hours

Suprapubic Needle Cystotomy:

Indications:

- 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:

1. 18 gauge IV cannula,
2. 25 gauge needle
3. Betadine,
4. 4 x 4 gauze,
5. sterile gloves
6. 5cc syringe
7. Tape
8. 30 inch IV extension tube
9. urine collection container
10. Lidocaine

Procedure:

1. Clean area directly over symphysis pubis with betadine (6 to 8 inches). Repeat three times.
2. Don gloves and drape area.
3. Anesthetize area where 18-ga needle will be inserted.
4. 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.
5. Continue negative pressure until syringe is filled. Remove syringe and needle leaving catheter in place. Secure catheter in place with tape.
6. Attach 30 inch IV tubing to catheter and drain urine into container.
7. After urine flow ceases, clamp off the IV tubing, and suture the catheter in place.
8. Unclamp the IV tubing and drain the bladder every 4-6 hours or as needed.

Military Anti-Shock Trousers (MAST)

Indications:

- Stabilization of pelvic fractures
- splinting of lower extremity fractures;

NOTE: The use of MAST in hypovolemic shock is highly controversial. Do not use in such patients without direct physician guidance. **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
  - Penetrating thoracic, abdominal or intracranial injuries
  - Congestive heart failure/cardiogenic shock
- Relative:
  - Pregnancy
  - Protruding viscera (abdomen)
  - Head Injury with possibility of increased ICP
  - Impaled foreign body
  - Lumbar spine instability

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
   b. Check neurovascular status of the lower extremities
   c. Obtain and record baseline Vital Signs
   d. Treat (cover) all wounds which will be covered by MAST in an expedient manner
3. Slide pants underneath patient (if a backboard is indicated, drape MAST pants over the board and slide backboard with MAST under patient)
4. Position pants appropriately, keeping MAST below xyphoid process.
5. Secure MAST using Velcro straps:
   a. Left leg, groin to ankle
   b. Right leg, groin to ankle
   c. Abdominal compartment
6. Attach tubing and confirm placement.
7. Listening for crackle of Velcro, inflate legs first and then inflate abdominal section.

   Note: Do not inflate the abdomen section if patient is in respiratory distress, neurogenic shock or cardiorespiratory arrest.

8. Recheck and record patient's Vital Signs, recheck vascular status, and LOC.
9. Listen to lungs and check for adequacy of ventilation
10. Once inflated, MAST pants remain inflated until pt is delivered to medical facility

Wound Care

Wound Irrigation

Indications: Cleaning of wounds prior to applying long term dressings or primary closure.

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 wound, 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.
3. Medium pressure irrigation can be accomplished by fitting an 18 gauge 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: The catheter tip should be held about ½-1" from the wound.
4. 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. Abrasions (such as 'road rash') may have to be scrubbed to remove 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

Wound Debridement

Indications: For removal of devitalized tissue and/or debris. In most cases, simple bandaging is all that is required for field management of wounds. Consider debridement w/delayed primary closure if:

a. Evacuation to higher level of care is delayed > 12 to 14 hours or,
b. The patient has a grossly contaminated wound with more than 8 hours until transport to higher level care

NOTE: Provide adequate local anesthesia and use good exposure with adequate lighting.

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 patient for recurring hemorrhage or signs of infection.

Wound Suturing

Indications: Suturing most of wounds sustained in combat is not indicated due to the high risk of infection. Before wound closure is contemplated, carefully consider the risk of infection and possibility of retained foreign bodies within the wound. Suturing should only be considered when there will be a delay to definitive care > 12 hours and adequate irrigation and debridement can be accomplished in the field.

Procedure:

1. Irrigate and debride the wound as described above
2. Ensure the use of sterile technique and use of PPE
3. Anesthetize the wound with 1% lidocaine with epinephrine on the torso, 1% lidocaine without epi on distal extremities. Note the maximum doses of lidocaine:
   a. 4.5 mg/kg 1% lidocaine without epi
   b. 7 mg/kg 1 % lidocaine with epi
4. Select appropriate suture material
   a. 4-0 Nylon is the best choice for closure of general skin wounds
   b. 5-0 or 6-0 Nylon should be used for closure of facial wounds
   c. 4-0 Vicryl or gut (not nylon) is appropriate for closure of deep tissue
5. Using interrupted sutures, close the wound with sufficient stitches to align the wound edge and prevent gaps
6. Dress the wound appropriately
7. Monitor for signs of infection
8. If evidence of infection occurs, remove stitches and apply appropriate dressings; consider antibiotics if signs of cellulitis are present (keflex, moxifloxacin)
9. Most sutures should be removed in 7-10 days, facial sutures should be removed in 5 days.

Delayed Primary Closure

Indications: 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 timely evacuation to 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 and irrigate wound removing all visible foreign bodies and debris.
2. Place a single layer of fine mesh gauze into the wound, and 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

Indications: Relief of circulatory and/or respiratory compromise due to circumferential burns. Rarely required in the field.

NOTE: Extensive bleeding is common during escharotomy. Be prepared to control bleeding with pressure and ligation. The most common mistake with escharotomy is not incising completey through the burned skin (“eschar”).

Equipment:

1. Lidocaine,
2. Syringe and needle
3. Scalpel
4. Sterile gloves and sterile dressing

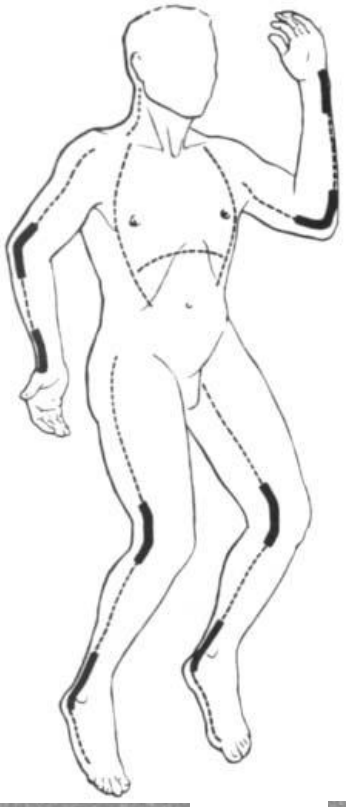
Procedure:

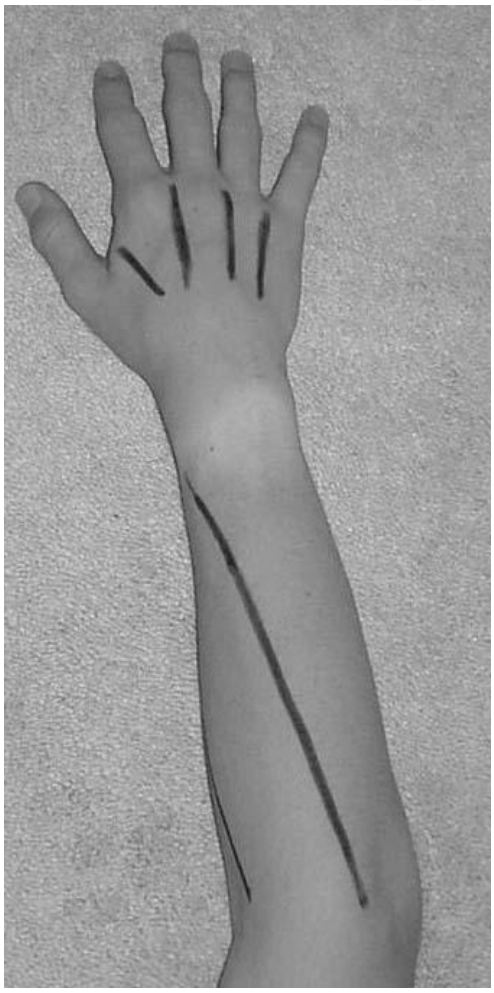
1. Irrigate & debride as needed. Outline where escharotomy is to be performed.
2. Sterile prep of incision area, anesthetize with lidocaine prn (some subcutaneous sensory nerve function may persist). Perform procedure under as sterile/aseptic conditions as possible.
3. Using scalpel, cut through eschar until subcutaneous tissue is exposed. Subcutaneous tissue will often protrude through incision when adequate depth is reached and eschar will separate
4. Continue line of incision extending entire length of eschar on opposite sides of extremity or chest (posterior/anterior or lateral/medial), being careful **NOT** to **CUT** into **UNDERLYING FASCIA** (fibrous tissue layer) or muscle tissue.
5. Control bleeding with pressure and ligation as needed.
6. After procedure completion, check for improved respiratory/circulatory status.
7. Apply bulky dressing & immobilize extremity.
8. Monitor for signs of hemorrhage, loss of circulatory/sensory/motor functions, and infection.

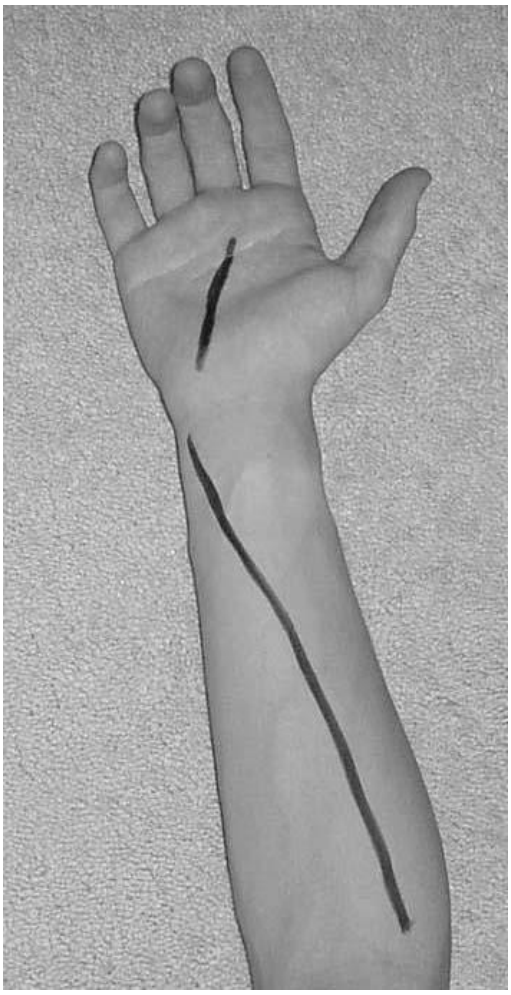
Escharotomy Precautions

- FINGERS are incised along both sides of each finger involved
- LEGS are decompressed with mid-medial and mid-lateral incisions
- TOES are done in similar manner as fingers
- CHEST is decompressed with incisions in the mid-axillary line from clavice to costal margin inferiorly and may be joined by transverse incisions connecting the mid-axillary incisions if adequate relief of constriction is not obtained

AVOID INCISING/CUTTING OVER JOINTS







Emergent Field Amputation for Extraction/Extrication

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

Caution: Should **ONLY** be accomplished with online or direct physician supervision.

Procedure

1. Position limb for circumferential access.
2. Elevate limb when practical.
3. Give IV ertapenem 1 gm prior to performing amputation if tactical situation permits.
4. Administer appropriate pain medication for conscious patients (consider morphine and valium) and provide local anesthesia if possible
5. Apply tourniquet proximal to the amputation site to prevent additional blood loss.
6. The open circular technique is most acceptable for combat conditions.
   a. Make a circumferential incision down to the bone as distally as possible.
   b. Use a bone saw (Gigli saw) or other available tool to rapidly cut through the bone.

   NOTE: It is advisable to save tissue for use in subsequent closure of the amputation stump.
7. Pack the stump recess loosely with kerlex or other suitable material.
8. Hemostatic dressing may be appropriate to control stump bleeding
9. Place bulky dressing on stump and compress with ACE bandage
10. Loosen tourniquet and monitor closely for bleeding at amputation site. Tighten tourniquet if bleeding can't be controlled with a pressure dressing.

Chapter 13: 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 providing long-term patient care in these circumstances. If the patient is unconscious, he/she 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/recorded at least every 4 hours
- Give the patient clear liquids by mouth if he/she is able to swallow and can protect his/her airway and has no contraindications to oral intake.
- 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 plus1cc/Kg/hr for the rest of the patients body weight.
- **Example:** 60 Kg adolescent. 10Kgx4cc/hr = 40 cc/Hr, plus 10 Kgx2cc/hr= 20cc/hr, plus 40 Kgx1 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 30-70 cc/hr (or 0.5-1 cc/Kg/hr for pediatric pts).

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. Start NGT hydration by giving 3-5 cc's of fluid per minute via NG tube (180-300 cc's per hour); advance as tolerated.

Note: The average adult absorbs oral rehydration salt solutions (many commercially available brands) via PO or NGT at approximately ~2 L/hr.

Aeromedical Evacuation (AE)

Aeromedical care is different from ground-based care not only because of special equipment and the space-limited environment, but because of the hostile physical setting. Patients require special planning and carebecause they are exposed to decreased atmospheric pressure, oxygen tension, humidity, increased noise, and to constant vibration. Several basic interventions can be accomplished to counter these stresses of flight. Making a patient comfortable during airlift requires knowledge of the stresses and hazards of flight.

Physiological Stresses of Flight.

- Decreased Partial Pressure of Oxygen (paO2). (hypoxia)
- Barometric Pressure Changes.
- Thermal Changes.
- Decreased Humidity.
- Noise.
- Vibration.
- Fatigue.
- Gravitational forces

Signs and Symptoms of Hypoxia	
Objective Sign (Observed)	**Subjective Symptoms (Felt)**
Confusion	Confusion
Tachycardia	Headache
Stupor	Tachypnea
Seizures	Insomnia
Dyspnea	Changing judgment or personality
Hypertension	Dizziness
Bradycardia	Blurred Vision
Arrhythmias	Tunnel Vision
Restlessness	Hot and cold flashes
Slouching	Tingling
Unconsciousness	Numbness
Hypotension (late)	Nausea
Cyanosis (late)	Euphoria
Euphoria	Anger
Belligerence	

Hypoxia Prevention: Administer O_2 based on underlying pathology, preflight vital signs and pulse oximetry. Consider an altitude restriction and placement near O_2 for high-risk patients.

Treatment of Hypoxia.

1. Maintain airway, breathing, and circulation (ABCs)
2. Administer O_2 at 4-6 liters via nasal cannula. Administer high flow O_2 for severe symptoms or respiratory/cardiac arrest. Encourage slow, deep breaths.
3. Monitor vital signs, use a pulse oximetry and maintain the O_2 saturation above 91%.
4. Annotate maximum cabin altitude (MCA).
5. Request lower cabin altitude if the patient is unresponsive to high flow O_2 and it is operationally feasible.

In-Flight Management Considerations

Airway and Respiratory Considerations

- Decreased Partial Pressure of Oxygen: Exacerbates possible oxygenation deficiency due to a compromised respiratory system.
- Barometric Pressure Changes: May cause spontaneous pneumothorax in a trauma patient with significant respiratory compromise and may convert a pneumothorax to a tension pneumothorax. GI tract gas expansion may displace the diaphragm upward and lower the patient's respiratory tidal volume.
- Thermal: Heat increases body temperature and cold produces muscle shivering increasing the patient's metabolic rate and O_2 demand. This is particularly true in ventilator dependent patients.
- Decreased Humidity: The effectiveness of the respiratory tract's cillary action is decreased and secretions are thicker.
- Fatigue: Most patients with respiratory disorders are already fatigued from the added workload of just breathing. The cumulative effects of the stresses of flight and the total time spent in the AE system may exacerbate the patient's condition.

Shock Considerations:

- Decreased Partial Pressure: Will exacerbate oxygenation deficiency due to preexisting hypoxias and compromised respiratory function.
- Thermal: Inadequate peripheral perfusion aggravated by the potential temperature extremes.
- Decreased Humidity: Exaggerates fluid loss.
- Fatigue: Can exacerbate the patient's underlying condition/diagnosis due to the cumulative effects of the stresses of flight and the total time spent in the AE system.

Burn Considerations:

- Decreased Partial Pressure: Exacerbates oxygenation deficiency due to compromised respiration and/or the decreased partial pressure of oxygen in the presence of carbon monoxide poisoning.
- Barometric Pressure Changes: Increases gastric distention and discomfort.
- Decreased Humidity: Exacerbates fluid loss.
- Vibration: May increase pain.
- Thermal: Loss of natural insulation and skin integrity leaves the patient prone to hypothermia and pain. Severity of the burn affects the autonomic temperature regulatory functions and may increase oxygen demand.
- Fatigue: Exacerbates the patient's underlying condition.

Intravenous (IV) Therapy Considerations.

- Barometric Pressure Changes: Air expansion at altitude may cause some IV rates to fluctuate. Situations potentially dangerous to a patient are a sudden surge of fluid, unregulated flow to the patient, and air bubbles in the administration tubing. Safe and accurate administration of IV therapy poses one of the greatest concerns in-flight. Drip rates must be reevaluated once cruise altitude is reached, frequently throughout the flight, after descent and after a rapid decompression.

Cardiac Considerations:

- Decreased Partial Pressure of Oxygen: Increases myocardial workload, predisposing compromised patients to arrhythmias, chest pain and may lead to myocardial infarction. Consider cabin altitude less than 6000 ft for cardiac patients.
- Barometric Pressure Changes: GI tract gas expansion may displace the diaphragm upward and lower the patient's respiratory tidal volume.
- Thermal: Excessive heat may cause patients on cardiac medication to become hypotensive. Hyperthermia and hypothermia may increase cardiac oxygen requirements.
- Fatigue: Cumulative effect of stresses may exacerbate the patient's condition.
- G-Forces: Takeoff may increase returning blood flow and cardiac workload for some cardiac patients. Use a backrest for cardiac patients on a litter.

Neurological Considerations

- Decreased Partial Pressure of Oxygen: Lower levels of O_2 causes brain cell and tissue ischemia and possibly death and produces cerebral edema and increased intracranial pressure (ICP) which leads to hypoventilation and further hypoxemia.
- Barometric Pressure Changes: Penetrating head injuries, skull fractures and severe facial fractures may produce air in the cranium, causing increased ICP. The potential for ear block exists in those patients who have a decreased level of consciousness, inability to follow directions or a physical disability. Valsalva increases ICP.
  NOTE*:* An altitude restriction minimizes the stresses of barometric pressure changes and decreased partial pressure of oxygen.

- Vibration: May cause motion sickness and vomiting, thus increasing ICP.
- Thermal Changes: A consideration for patients with hypothalamus involvement.
- Decreased Humidity: Will dry the corneas of patients with decreased corneal/blink reflex.
- G-Forces: Takeoff may increase ICP and bleeding for litter patients or decrease cerebral blood flow to ambulatory patients. Such patients are secured on a padded a litter with a backrest (if not contraindicated) with the head facing aft for flight.

Musculo-skeletal and Wound Considerations

- Decreased Partial Pressure of Oxygen: Exacerbates the effects of hemorrhage, shock and low hemoglobin and hematocrit (H & H).
- Barometric Pressure Changes: May cause compartment syndrome if patient is in a cast or has recent internal injuries.
- Vibration: May affect alignment and/or positioning of set fractures, and increase pain.
- Decreased Humidity: May lead to dehydration predisposing individuals to deep vein thrombosis (DVT) and may also cause skin dryness over time, leading to itching under cast.
- Thermal: Changes of temperature may compromise circulation and increase pain; patient can sweat under cast on the flight line and then become cold at altitude

Eyes, ears, nose and throat (EENT) Considerations

- Decreased Partial Pressure of Oxygen: May cause increased intraocular pressure and vasodilatation due to hypoxia and may aggravate retinal hemorrhage, detached retina and glaucoma.
- Barometric Pressure Changes: Causes increased pressure with pain and reduced blood flow to the eye. Post-op eye surgery patients may have trapped air in the globe; certain gases used in surgery may persist three to nine weeks. A closed penetrating eye injury may also have trapped air in the globe; air normally is reabsorbed in three days. Expanding air at altitude may lead to increased pressure, pain and/or extrusion of eye contents.
- Decreased Humidity: Excessive drying of the eyes leads to corneal irritation and abrasions of the sclera, especially in comatose patients or patients whose eyes do not completely close.
- Vibration/Thermal/Turbulence: Leads to motion sickness, vomiting, and increased intraocular pressure and pain.

Gastrointestinal (GI) Considerations.

- Barometric Pressure Changes: Gas expansion may cause abdominal discomfort, decreased lung expansion and volume, nausea and vomiting, and may require nasogastric tube decompression preflight or in-flight. If on a continuous feeding, allow for venting.
- Vibration: May exacerbate patient's underlying condition or diagnosis.
- Thermal: Underlying condition or diagnosis may make the patient more sensitive to thermal changes and more susceptible to motion sickness.
- Fatigue: May exacerbate the patient's condition due to the cumulative stresses of flight and the length of time the patient has been in the AE system.

Obstetrics and Child Birth Considerations

- Decreased Partial Pressure of Oxygen: May cause an increase in cardiac workload with a decrease in diaphragmatic excursion. Lower concentration of O_2 to the placenta may result in fetal hypoxia.
- Barometric Pressure Changes: Gas expansion may cause pain and uterine irritability and decrease capacity for lung expansion.
- Noise/Vibration: May increase seizure risk in preeclamptic and eclamptic patients, and may cause uterine irritability and excessive stimulation and movement of the fetus.

- Decreased Humidity: Dehydration may induce or complicate pre-term labor.
- Fatigue: Excess weight, physiological changes, overall affects of the cumulative stresses of flight and the length of time spent in the AE system fatigues the patient.
- G-Forces: May result in pushing fetus onto the maternal vena cava or the placenta.
- General Considerations**.** Patients who are beyond the 34th week of pregnancy are not routinely accepted for AE, but will be moved if determined necessary by a physician. ***NOTE:*** An incubator will be carried and ready to use on board the aircraft. Patients in premature labor or with prematurely ruptured membranes may be airlifted after labor is controlled on a case-by-case basis. A physician or a competent obstetrical nurse may be required to accompany a high-risk OB patient.

Pediatric and Neonatal Consideration

- Decreased Partial Pressure of Oxygen: Infants and younger children are more suspectible to hypoxia, and will become hypoxic earlier than adults.
- Barometric Pressure Changes: Encourage the use of a pacifier/bottle on descent to help the infant/child clear his/her ears. Gastric compression may restrict diaphragmatic movement, especially if supine; elevate head and consider decompression with an oral or nasogastric tube.
- Thermal: Thermal changes have the greatest impact on infants and young children who have a very sensitive thermoregulating system. Increase the cabin temperature, if necessary.
- Decreased Humidity: Infants and children are more susceptible to dehydration. If infant is in an Airborne Life Support System (ALSS), ensure that the proper amount of distilled sterile water is present in the humidification sponge. If not NPO or receiving IVs or tube feedings, give fluids at least every two hours. NOTE*:* Assess for infant dehydration: palpate for depressed anterior fontanel.
- Noise: Infants/children are sensitive to excessive noise. Earplugs should be cut in half (vertically) to fit the smaller ear canals. Infants in ALSS should also wear earplugs, even though the double paned construction muffles aircraft noise.
- Vibration: Ensure infants are padded when in car seats or the ALSS.
- Fatigue: Fatigue has the greatest impact on pediatric patients (newborn to 12 years old). The result of fatigue is an uncooperative child.

Chapter 14: 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 available medical resources (i.e., medical materials and/or 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 &/or as resource availability 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. Patient triage assessment should be completed in less than 60 seconds.

   Note: Remember: Life, Limb, Eyesight, Function, Cosmesis.

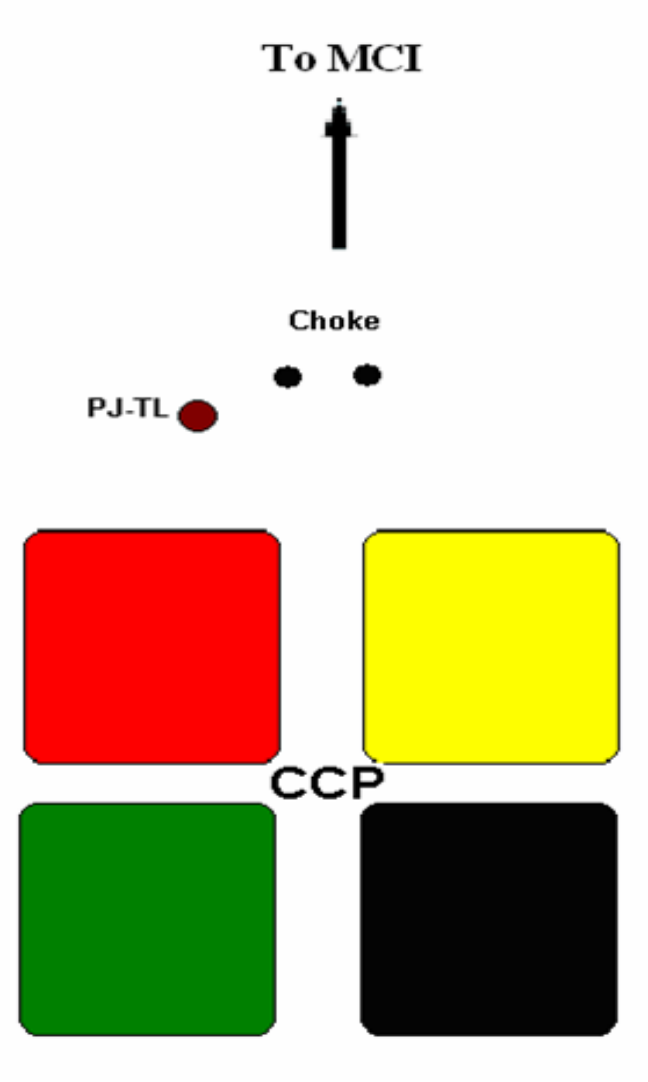
Sequence of Activity (Mass Casualty Triage)

- Verbalize: "Anyone that can walk, move over to the (designated location)."
- Triage the remaining patients appropriately. **NOTE THAT TRIAGE CATEGORIES FOR CIVILIAN SEARCH AND RESCUE ARE DIFFERENT FROM THOSE USED IN TCCC!**
- CIVILIAN: Category I (RED/Immediate), Category II (YELLOW/Delayed), Category III (GREEN/Minimal), Category IV (BLACK/Expectant)
- TCCC: RED/Immediate, GREEN/Delayed, BLUE/Expectant; use 9-Line or Modified 9-Line for reporting

Each Patient Triage Assessment Should Be Completed In Less Than 60 Seconds	
Category I: Immediate (RED) **TCCC: *red chemlite***	Examples: • Airway obstruction • Flail chest • Tension pneumothorax • Hemorrhage • 20-70% Burns
Category II: Delayed (YELLOW) **TCCC: *green chemlite***	Examples: • Fractures • Soft tissue injuries w/out active hemorrhage • Head trauma • Open abdominal wounds
Category III: Minimal (GREEN) **TCCC*: no chemlite (combat)***	Examples: • Minor abrasions, burns, lacerations • Moderate anxiety • fractures w/out complications
Category IV: Expectant∗ (BLACK) **TCCC: *blue chemlite***	Examples: • Massive head or spinal injury • Third degree burns > 70% BSA • Injuries incompatible with life
∗Expectant category is **ONLY** used in combat operations and/or when the requirements to adequately treat these patients exceed the available resources. In peacetime, it is generally assumed that all patients have a chance of survival. Chemlite colors are specified for night combat ops. In combat, it is assumed that minimal's will continue to fight	

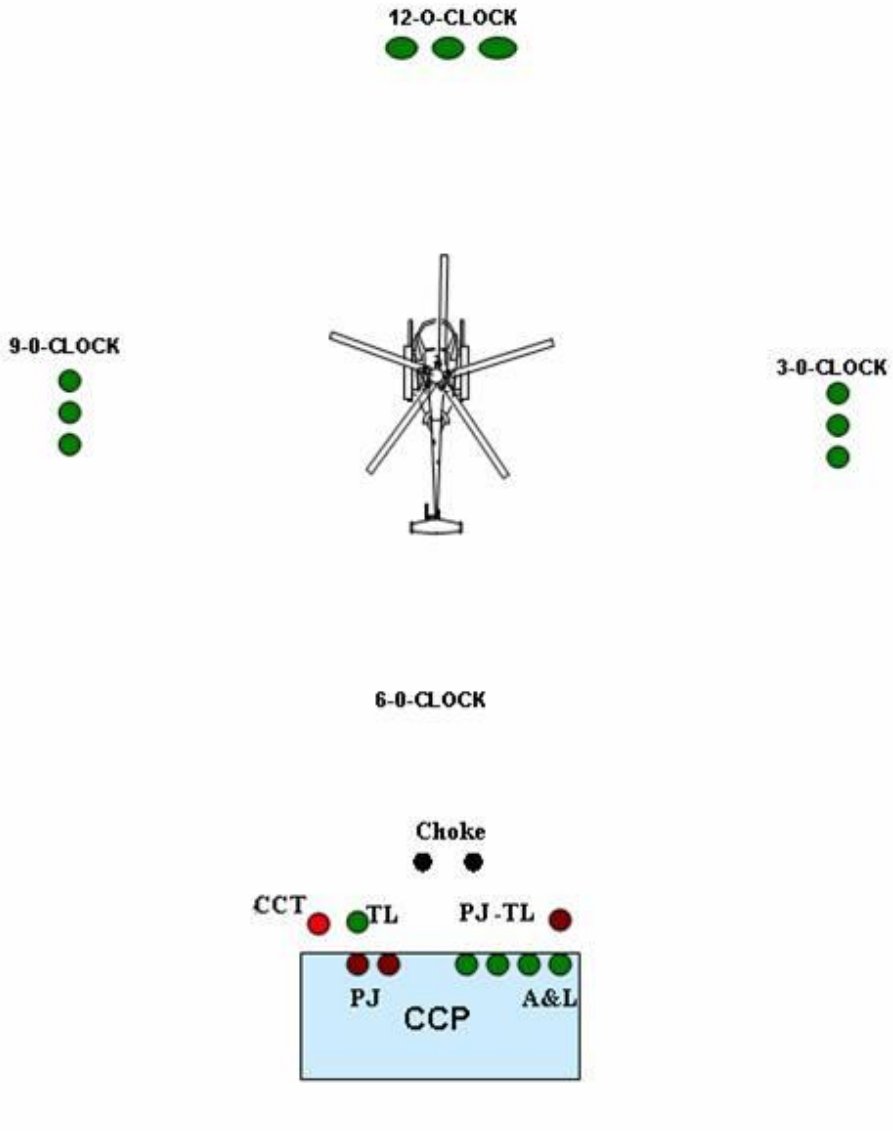
Basic MCI Casualty Collection Point (CCP) Diagram

(CIVILIAN SEARCH AND RESCUE ONLY)



CCP FOR COMBAT OPERATIONS

Basic SAR Security Team Setup Diagram



RED GREEN

BLUE

Chapter 15: 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 so they can take action prior to your arrival at the scene.
- Transport rapidly to nearest hyperbaric chamber at or below the pressure altitude of the point of departure/injury. 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**/injury may be done without major risk of worsening the patient's 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.

Non-Traumatic Dive Injuries

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 will release the medic to the 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 within an 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 personnel 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.

Traumatic Dive Injuries

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 if 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 is 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 the patient's 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 Over inflation Injuries (POI)

Characterized by a sudden onset occurring during or immediately after ascent (unconsciousness or other neurological symptoms developing within **10 minutes** of coming to the surface). Injuries include subcutaneous emphysema, mediastinal emphysema, pneumothorax, arterial gas embolism (AGE) or 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
- Chest pain.

Note: Some patients with AGE may exhibit a 'lucid 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 with a 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 musculoskeletal system (pain only),
- Cutaneous system (rashes, hives, itching)
- Lymphatic system (blotching, pain, discomfort).

Type II DCS: usually manifests 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.

1. **Intravascular** effects of bubbles include blockage, pain and obstruction of blood supply.
2. **Extravascular** effects cause pain, tissue distortion/disruption.

Signs & Symptoms:

- **Skin**: Localized or spreading prickly, itching, tingling or burning sensation; Rash/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 (DCS):

1. ABCs / High flow O2 / IV NS/LR KVO; Begin resuscitation if required.
2. 100% O2 (or highest % available) via tight fitting aviator's mask with a demand valve.
3. Perform a complete neurological exam.
4. 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
- Possible vertigo.

Treatment:

1. If in water, stop descent/ascent and return to comfortable depth. Treat 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.
3. Consider antibiotics if damage to TM is moderate to severe.

Closed Circuit Diving Emergencies

Oxygen Toxicity: Pulmonary and CNS

Pulmonary: Results from long exposures to elevated O2 partial pressures and is 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:

- Diver unable to carry on effective breathing.
- Period of unconsciousness or CNS impairment following convulsion may be similar to AGE.
- No attempt should be made to insert any object between the clenched teeth of the diver
- 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**:
- **V**isual: Tunnel vision (a decrease in peripheral vision) or blurred vision.
- **E**ar symptoms: Tinnitus.
- **N**ausea and/or vomiting
- **T**witching: Generally involves the facial muscles, but can involve arms/legs.
- **I**rritability: Change in diver's mental status.
- **D**isability: 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 victim's 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 diver's 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 his weight belt or inflate their his 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 victim is breathing. Do rescue breathing if needed.

Hypercarbia (C02 Buildup):

Generally results from inadequate ventilation or failure of absorbent canister to remove C02 from exhaled gas. May also result from flooding of the canister.

Prevention:

- Perform dip test on UBA before dive.
- Do not exceed canister duration limits for the water temperature.
- Ensure one-way valves in the supply and exhaust hoses are present and work.
- Swim at a relaxed and comfortable pace.
- Avoid skip breathing. Skip breathing does not save gas in a closed circuit unit.

Signs & Symptoms (Hypercarbia):

- Increased respiratory rate and depth of breathing. Labored breathing
- Headache
- Confusion
- Unconsciousness

Note: High partial pressures of O2 may reduce the early symptoms of CO2 buildup. Elevated CO2 levels may cause 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 CO2 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 CO2 as the diver ascends and will reappear upon return to depth.

Hypoxia:

Caused by the partial pressure O2 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:

- Frequently no warnings signs prior to loss of consciousness.
- 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 O2 toxicity is the most likely cause.

Treatment:

1. If unconscious or incoherent at depth, dive buddy should add O2 to stricken diver's UBA.
2. Bring diver to the surface. Remove mouthpiece and allow diver to breathe fresh air. If unconscious, check breathing & circulation, maintain an open airway,administer 100% 02.

Chemical Injury:

The introduction of a caustic alkaline solution into the upper airway is the result of water leaking into the canister and coming in contact with C02 absorbent (ie "caustic cocktail"). Generally occurs when diver is in a horizontal or head down position.

Signs & Symptoms:

- Rapid breathing or headache related to buildup of C02.
- 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 common. Monitor for AGE.

Rapid Field Neurological Examination:

This examination is designed to detect CNS problems and serves as a method to monitor for changes in neurological function resulting from DCS or POI. 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 or more frequently if the diver's condition is deteriorating.

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? _____

Sensory Exam: Normal light touch/pressure sensation to: Fingers, hands, forearm, upper arm, legs, toes and trunk.

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

COORDINATION (+ or --)	**STRENGTH (1-5 scale)**	**REFLEXES (1-4 Scale)**
Gait: Heel-to-toe: Romberg: Finger-to-nose: Heel-Shin-Slide: Rapid Movement:	Biceps: Triceps: Grip: Wrist: Knee: Shoulder: Ankle: Toes:	Patellar: Biceps: Triceps: Cremaster: Calcaneal: Babinski:

Additional Notes (Diving):
During Duty Hours:
USAF/SAM, Hyperbaric Medicine Division, San Antonio, TX
Commercial: (210) 292-3483 DSN: 554-3483
After Duty Hours:
Wilford Hall Medical Center Medical Control Center
Commercial: (210) 292-5990 DSN: 554-5990

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

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

Emergency consultation is available 24hours a day with:
Primary: Navy Experimental Diving Unit (NEDU)
Commercial (850) 230-3100 or (850) 235-1668,
DSN 436-4351

Secondary: Navy Diving Salvage and Training Center (NDSTC)
Commercial (850) 234-4651,
DSN 436-4651

Submersion Injury (Near-drowning)

Injuries due to immersion are mainly caused by hypoxia: The most critical action in any submersion injury is to assess and support Airway, Breathing and Oxygenation.

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.

Chapter 16 High Altitude Illness

High Altitude: 5,000-11,500 ft (1500-3500 meters)
Very High Altitude: 11,500-17,500 ft (3500-5500 meters)
Extreme Altitude: Over 17,500 ft (over 5500 meters)

Acute Mountain Sickness (AMS):

Mild, Moderate, Severe:

Guidelines and Considerations: An acute illness characterized by headache, fatigue, loss of appetite, lightheadedness and irritability. Usually occurs with rapid unacclimatized ascent from below 5,000 ft to above 8,000ft, and especially with abrupt ascent to very high or extreme altitude. • Incidence and severity of AMS 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 a sign of AMS alone: A person with AMS and ataxia is assumed to have High Altitude Cerebral Edema (HACE) and requires urgent evacuation to a lower altitude and treatment steroids.

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, pulmonary rales.

Treatment:

Mild AMS:

1. Descend minimum of 1000 ft., rest and acclimatize.
2. **Acetazolamide** (**Diamox**) 250mg b.i.d. or 500mg QD (sustained release form).
3. Mild analgesia (Tylenol) for headache or phenergan or zofran for significant nausea.

Moderate AMS:

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

Severe AMS:

1. Same as for moderate, but **IMMEDIATE** descent is mandatory.
2. 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: Acetazolamide (Diamox), a carbonic anhydrase inhibitor/diuretic, can speed acclimatization to altitude and decrease symptoms of AMS. The dose is 250 mg po BID or 500

mg (extended release) po q24 hours, preferably starting 1-2 days prior to ascent, and continuing for at least one day after ascent. This is a sulfa-based 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):

Guidelines and Considerations: 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 metal 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.

Differential Diagnosis: Hypothermia, carbon monoxide poisoning, stroke, HAPE, drug ingestion, exhaustion, infection (encephalitis).

Treatment:

1. Emergency **descent** of a minimum of 1000 ft but preferably more (the lower the better).
2. Hyperbaric bag while awaiting descent or evacuation.
3. **Oxygen** 2-4 LPM by mask. If an IV is started, run at KVO.
4. **Decadron**, 8mg IV, IM, PO loading dose, 4 mg PO, IV or IM q 6 hrs.

Warning: Do not delay descent while awaiting evacuation. If possible, have evacuation aircraft meet you at a lower elevation.

High Altitude Pulmonary Edema (HAPE):

Guidelines and Considerations: Mild, Moderate, Severe: HAPE is more common in young and healthy individuals, usually occurring 2-4 days after arriving at altitude, and most commonly on or after the second night at altitude. Rarely occurs below 8,000 ft. Any individual who does not seem to be acclimatizing to altitude, has increasing AMS symptoms after being on the mountain for 36 hrs or more, or is experiencing increasing dyspnea at rest must be suspected of having HAPE.

Signs and Symptoms:

Mild HAPE:

- Dyspnea on exertion, easy 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:

1. **Oxygen**, high flow if possible.
2. Immediate emergency **descent**.
3. Minimize physical exertion (will worsen HAPE)
4. If there is sufficient oxygen available, and the time, the victim and team might be better off to keep the patient on oxygen overnight, and then descend in the morning when he is somewhat improved.
5. **Hyperbaric bag** if not able to descend immediately.

Note: Lasix and/or Morphine are not used in HAPE.

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 orally, followed by 30 mg of the slow-release formulation every 12-24 hours, or 10 mg orally 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 like sand in the eyes), usually starting 4-6 hrs after UV exposure.
- Light sensitivity,
- Tearing,
- Headache.

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

Treatment:

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

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

Chapter 17: Cold Injuries

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/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, minimizes 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 degrees 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:

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

2nd Degree:

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

3rd Degree:

- Initially the frozen tissue is stiff with restricted mobility.
- After thawing, mobility is restored briefly, but the affected skin swells rapidly and bloody blisters develop.
- Significant skin loss follows thawing through mummification and sloughing.
- Residual cold sensitivity is common.

4th Degree:

- Frozen tissue with no mobility.
- Thawing restores passive mobility, but the intrinsic muscle function is lost.
- Skin perfusion is poor.
- Blisters and edema do not form.
- Affected area shows necrotic changes.
- 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.
   a. 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.
   b. 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.
   a. Active rewarming is best accomplished by immersing the frostbitten tissue in warm water (104-108 F). The tissue must not be exposed to temperatures in excess of 108 F.
   b. 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. Apply a dry bulky dressing to the rewarmed area. Splint as needed. With hand injuries, splint in position of function (beer-can or duckbill splint). Make sure that the fingers are separated with kerlex or 4X4 gauze.
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 (fluffed-gauze), loosely wrapped 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
- 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.

Treatment:

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.

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 body heat to the environment in excess of the rate of heat production by the body. Operationally, hypothermia often occurs as the result of either immersion in cold water or prolonged exposure in cold-wet ground environments.

Mild Hypothermia:

- **Temperature between 92-95° F.**
- Patient usually retains the ability to rewarm spontaneously, usually no 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 86-91° F.**
- Patient stops shivering,
- May be lethargic and dulled mentally, but in 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.
- Muscles may be stiff and rigid.
- Significant cardiac arrhythmias may develop.

Caution: If the patient appears cold and is not shivering, the patient has moderate to severe hypothermia until proven otherwise by measurement of body core temperature.

Treatment: Mild Hypothermia

1. Change to dry clothes if possible.
2. Protect against heat loss and wind chill, provide insulation, shelter if possible.
3. Give fluids and calories.
4. If available, share body heat in a sleeping bag.

Treatment: Moderate Hypothermia

1. Remove all wet clothes.
2. Protect against heat loss and wind chill, provide shelter.
3. Maintain horizontal position.
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. Heated, humidified air or oxygen, if available.
8. Provide warm oral fluids/sugar sources **AFTER** the patient exhibits evidence of rewarming.

Treatment: Severe Hypothermia with Vital Signs

1. Same as moderate.
2. Establish an IV of NS at 75cc/hr (warmed). (Use “Thermal Angel” or similar IVF warming device. Alternatively, place 1 L of IVF in standard microwave oven on high setting x 1-2 minutes. Check temperature and agitate to mix contents to eliminate ’hot spots’ before administering to patient).
3. Heated, humidified oxygen, if available.
4. Attempt to stabilize the core temperature:
   a. Reduce heat loss
   b. Apply heat to neck, chest, groin, be careful not to burn victim, wrap hot water bottles or hot packs in cloth
   c. Apply body heat in sleeping bag with another body or heating device.
   d. 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.

Treatment: Severe Hypothermia with No Vital Signs

1. Assess pulse and respiration for 1-2 min.
2. Observe the cardiac rhythm. If VF, defibrillate immediately. If sinus bradycardia or other organized rhythm present, do not do CPR, start rescue breathing
3. If pulse and respiration is absent and electrical monitor not available, begin CPR.
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 that 86°F:** Continue CPR, withhold IV resuscitation medications, limit shocks to a maximum of three, and evacuate.
9. Attempt to stabilize core temperature as above.

Immersion Hypothermia:

A subset of hypothermia, immersion hypothermia (hypothermia caused by immersion in cold liquid) has several unique aspects.

- Immersion hypothermia rarely causes death by itself. The usual mechanism of death involves cooling of muscles to the point where the victim is unable to keep his/her airway above water and drowns.

  Caution: Any unresponsive immersion hypothermia victim must be assumed to also have submersion injury. In such cases, airway, ventilation and circulation take priority over hypothermia treatment.

  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 is very difficult for the victim to perform any self-rescue or survival procedures. Victims who are not wearing flotation devices are likely to have significant difficulty in avoiding drowning.

Chapter 18: 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. 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 20-30 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 to attempt to 'catch up' by drinking a liter or two of fluid all at once.

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:

1. Rule out heat stroke.
2. Rest in shade,
3. drink fluids with electrolytes,
4. 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:

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

Heat Stroke

Signs & Symptoms:

- Bizarre behavior
- Confusion/Delirium
- Ataxia
- Seizure and/or coma
- Body core temperature usually above 105° F.
- Altered mental status in the setting of heat illness **is heat stroke** until proven otherwise.

Treatment:

1. Cool patient by any means available (spraying liquid on patient and fanning him; immersion in water; cool packs to neck, axilla and groin.).
2. Maintain airway and breathing control as needed.
3. IV with NS or Ringers is indicated.
4. If hypotension is present, give 10 cc/Kg bolus of NS/LR, and re-evaluate.
5. Continue IV hydration until urine is clear.
6. Monitor fluid intake and output.

Warning: Heat stroke is a true emergency and requires emergency evacuation.

Water Intoxication/Acute 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
- 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
- Prevention 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:

1. If the patient is able to drink fluids, administer small amounts of electrolyte replacement drinks (oral rehydration salts or diluted sports drinks.) frequently.
2. 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.
3. 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.

Chapter 19: Lightning Injury

Prevention:

Avoid being the tallest object in an open area. Do not take shelter under a single tall tree 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).

Signs and Symptoms:

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

Chapter 20: Venomous Injuries

Snakes

Guidelines and Considerations:

There are five venomous snake families:

1. **Crotalidae**. Uses hemotoxic venom. Includes all pit vipers (rattlesnake, copperhead, cottonmouth, etc.)
2. **Colubridae**. Uses hemotoxic venom. Back fanged snakes. Limits ability to envenomate humans.
3. **Elipidae**. Uses neurotoxic venom. Includes cobras, mambas, kraits and coral snakes.
4. **Viperdae**. Uses hemotoxic venom. True vipers. Includes puff adders, vipers and desert adders.
5. **Hydrophidae**. Uses neurotoxic venom. Sea snakes.

- 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. Irrigate aggressively, debride if needed 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,
- 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 with numbness or tingling bite site
- Numbness or tingling of bite site
- Metallic taste in mouth may occur
- Muscle weakness & Fasciculations
- Dyscoordination
- Difficulty in swallowing and speaking may occur
- Visual disturbances
- Ptosis
- Hypotension
- Convulsions may occur
- Respiratory distress and Respiratory paralysis may occur

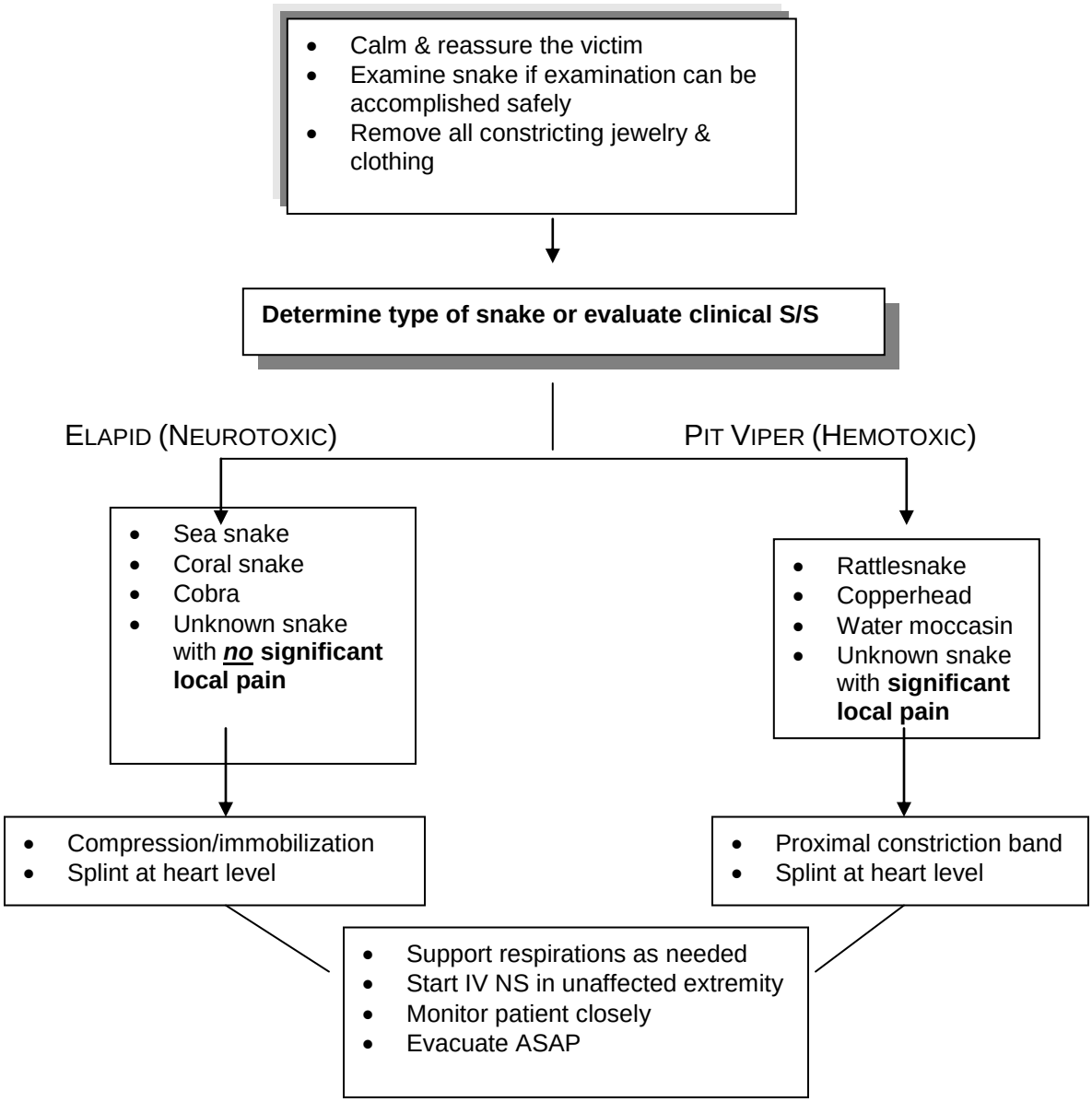
Note: Neurotoxic symptoms may take hours to appear and then progress rapidly**.**

Treatment:

1. Compression/Immobilization (Used for neurotoxic-predominant bites): Apply an ace wrap and splint to the bitten extremity. Wrap proximal to distal and slightly tight. Do not remove wrap until at a medical facility. Check distal pulses frequently.
2. Proximal Constriction Band (Used for hemotoxic-predominant bites):
   a. Use a 1" wide penrose drain or similar wide band.
   b. 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).
   c. Check distal pulses frequently.
   d. If the band becomes too tight as a result of swelling, place a second band above the first before releasing the first band.
   e. Once a constriction band has been placed, do not remove until at a medical facility.

   Note: This is not a tourniquet!

Universal Snake Bite First Aid Protocol



Bees, Wasps, Hornets and Ants

Signs & Symptoms:

- Initially will experience burning pain later followed with itching.
- If allergic, symptoms of anaphylactic reaction may develop.
- **Local reaction** includes redness and swelling at site of bite/sting.
- **Systemic reaction** occurs due to an allergic response:
  - Wheezing,
  - Urticaria,
  - Abdominal cramps,
  - Generalized edema,
  - Nausea,
  - Vomiting,
  - Dizziness,
  - Hypotension,
  - Confusion,
  - 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 Anaphylaxis protocol

Arachnid and Arthropod Bites and Stings:

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,
- respiratory distress.
- Symptoms can occur over 24 hrs,
- 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 may increase the toxic effects of some scorpion venoms. Consult with medical control before using medications of 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 an acute abdomen.
- Other symptoms include
  - dizziness,
  - restlessness,
  - nausea,
  - vomiting,
  - diaphoresis,
  - 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 by 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
  - weakness.

Treatment:

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

Venomous Marine Animals (Cnidaria and Stinging Animals)

Cnidaria

(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
  - diarrhea.

Treatment:

1. Remove the victim from the water.
2. Spray the sting area with vinegar; leave 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.

Stinging Animals (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 than with a toxic reaction.
- 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,
  - 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
  - dyspnea

Treatment:

1. Remove stinger with forceps if possible.
2. Submerge the extremity in water as hot as the patient can tolerate (not over 115 degrees) for 30-90 minutes. This will usually denature the venom and greatly reduce the pain.

Bony Fish

Signs & Symptoms:

- Severe pain quickly involving the entire extremity associated with swelling and ischemia.
- Systemic symptoms include:
  - cyanosis,
  - hypotension,
  - sweating
  - 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 Moxifloxacin 400 mg po once a day for 10 days.

Chapter 21 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 the possibility of deterioration before reaching definitive care exists, or when 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 and attempts should be made to contact medical control as soon as is feasible. If a medical treatment facility or a medic authorized to treat patients independently is available, then the patient should be seen in those settings rather than by the PJ

Pararescuemen are not "medics" and normally do not treat patients in garrison except in a supervised medical training environment with direct medical oversight and supervision by a licensed and credentialed medical provider. Appropriate documentation of diagnosis and treatment rendered in the patient's medical record will be accomplished when the unit returns to forward operating base. These protocols are not designed to allow PJs to conduct Medical/Civic Action (MEDCAP) missions independently.

NOTE: Whenever able, the PJ should contact medical control prior to initiation of treatment.

The definitions of Urgent, Priority, and Routine evacuations are based on the times found in Joint Publication 4-02.2 of 2, 4, and 24 hours respectively

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:**
  - 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.
  - 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. Point tenderness at the base of the 5th metatarsal may indicate fracture and should also be treated as per a severe sprain.

Treatment (Minor, Moderate and Severe Sprains):

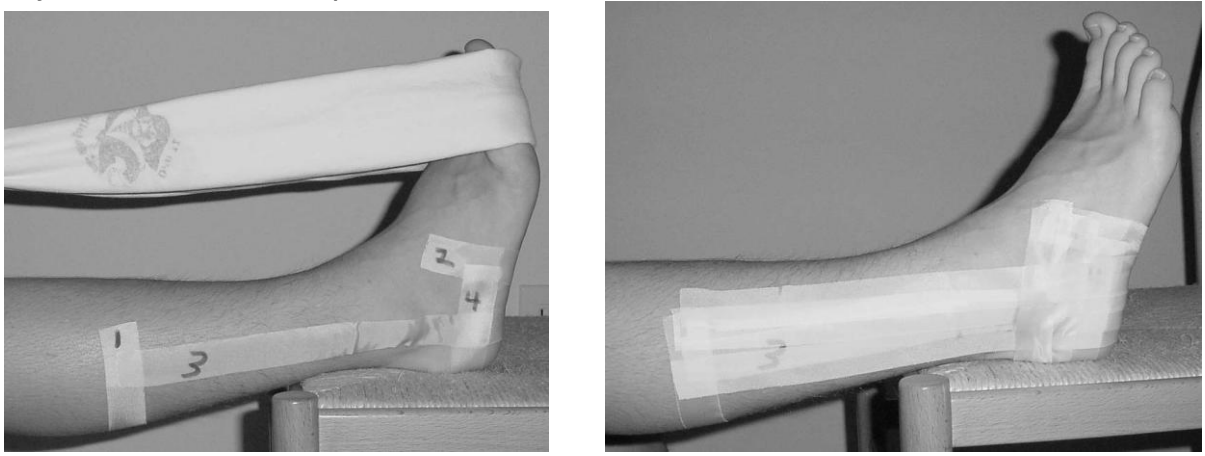
1. **Minor** Sprains (minimal swelling, no bruising/ecchymosis, able to bear weight):
2. **R.I.C.E. –Rest, Ice, Compression, Elevate.** Limit weight bearing if possible.
3. **Motrin** or **Toradol** prn.

   Note: An ace wrap around the ankle may control swelling, but doesn't stabilize the ankle.

4. A 'stirrup tape' or 'basket tape' (see below) of the ankle will help provide stability to an injured ankle.
5. If the ankle is seriously painful during ambulation, treat as a moderate/severe sprain.
6. **Moderate to Severe** Sprains (any evidence of fracture, inability to bear weight without significant pain):
7. **R.I.C.E**. – Rest, Ice, Compression, Elevate.
8. Ace wrap and splint the ankle.
9. Do not allow weight bearing.
10. Give Mobic or Tylenol prn.
11. 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 stirrup strip of tape from one side of the ankle under the heel to the other side.
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

Acute Dental Pain

Most common causes are deep decay, fractures of tooth crown/root or acute periapical (root end) abscesses

Signs and Symptoms:

- Intermittent or continuous pain,
- usually intense, heat or cold sensitivity.
- May have visibly broken/cracked tooth or severe pain on percussion of tooth.
- Occasionally intraoral swelling/abscess

Treatment:

1. Manage pain as needed.
2. If signs and symptoms of infection are present, administer Moxifloxacin 400 mg qd for 7 days OR Ertapenem 1 gm IV/IM qd x 7 days

Disposition: If no improvement with therapy, consider routine evacuation

Back Pain (Acute):

Usually occurs with a history of previous episodes of back pain. It is often associated with heavy lifting or unaccustomed physical activity.

Signs and Symptoms:

- Acute onset of back pain, often poorly localized, which worsens with movement.
- Pain is often severe and debilitating.

NOTE: Pain associated with weakness in the legs, radiation of the pain down the legs, or loss of bowel or bladder control is usually due to a herniated disc and requires urgent medical evaluation.

Treatment:

1. Tylenol ER as needed for pain,
2. apply cold compresses to affected area.
3. If therapy is not effective, consider Valium 10mg IM/IV. Valium may be repeated q6-8 hrs. as needed for muscle spasms.
4. Minimize activity and avoid vigorous physical exertion until fully recovered.

Disposition:

- Routine evacuation for pain which is not controlled or severe.
- Immediate Transportation/Urgent evacuation is required for patients with:
  - weakness in the legs,
  - loss of sensation,
  - loss of bowel or bladder control.

Blister

Foot hygiene with friction limiting prophylaxis including BursaMed®, tape, powder, quality socks & boots is first priority. Local anesthetic precipitates further trauma, don't use on 1st day of multi-day trip.

Signs and Symptoms:

- First sign: sore/"Hot Spot".
- Followed by reddened area
- Blister formation with possible rupture

Treatment:

1. Treat Hot Spot immediately with BursaMed®, moleskin or duct tape.
2. Protect to prevent blister rupture and infection.
3. If a **blister** has already **formed**:
   a. Relieve external pressure by applying a doughnut-shaped piece of molefoam,
   b. Be sure that the covering extends beyond the reddened area..
   c. A blister should not be unroofed unless absolutely necessary.
   d. If unroofing is required, wash the area with soap and water and insert a decontaminated needle ("sterilized" by a flame or with rubbing alcohol) into the edge of the blister.
   e. Gently press out the fluid.
   f. Apply a sterile dressing.
4. If the **blister** has already **broken**:
   a. Cleanse and cover the area.
   b. Topical antiseptic ointment may be beneficial.

Disposition: No transport unless patient is unable to perform his duties

Bronchitis/Pneumonia

Consider high altitude pulmonary edema (HAPE) at high altitudes and pulmonary embolism (PE) and pneumothorax (fever and productive cough are atypical for these). Patient may already be on doxycycline for malarial prophylaxis. Therefore, assume causative organism is either viral or doxycycline resistant.

Signs and Symptoms:

- fever,
- productive cough, especially with dark yellow, red tinged, or greenish sputum
- chest pain may be present.
- Rales (crackles) may be present
- breath sounds may be decreased over the affected lung.
- Dyspnea (shortness of breath) may be present in severe cases

Treatment:

1. Mild cases: **Moxifloxacin** 400 mg PO QD for 5 days.
2. Severe Cases: **Add Ertapenem** 1 gm IV/IM **OR Rocephin** (ceftriaxone) 1 gm qd IV.
3. **Albuterol** by metered dose inhaler 2 to 4 puffs q4 to 6h.
4. **Tylenol** (acetaminophen) 1000 mg PO q6h PRN pain and/or fever.
5. **Oxygen** for hypoxic patients (if available). Pulse oximetry monitoring may be helpful.
6. **Descend 1,500 – 3,000 ft.** if at high altitude

Disposition: Immediate transport/Urgent Evacuation (combat) for severe shortness of breath.

Cellulitis: Superficial bacterial infection of the skin/skin structures. Common in tropics.

Signs & Symptoms:

- Skin is red, hot and tender to the touch.
- Patient may have a mild/moderate fever.
- No abscess is palpated in the subcutaneous tissue

Treatment:

1. **Moxifloxacin**, 400 mg po every 24 hours or **Ertapenem**, 1 gram IV or IM every 24 hours.
2. Warm soaks may help decrease symptoms.
3. If cellulitis involves an extremity, treatment includes elevation and rest/immobilization of the extremity (e.g. hand/wrist splint -- or bulky dressing -- and arm sling).

Disposition:

- Typically evacuation is not needed,
- Priority evacuation if the patient develops a high fever, worsens on antibiotics or fails to improve within 24-48 hours.
- Urgent evacuation if subcutaneous emphysema develops which may indicate necrotizing fasciitis.

Constipation/Fecal Impaction:

Often seen with change of rations in field (MREs). The differential diagnosis includes more serious conditions such as appendicitis, bowel obstruction, pancreatitis, etc so care must be taken prior to treating for simple constipation. Abrupt onset of pain, point tenderness of the abdomen and fever should make the PJ suspicious for something other than constipation. If these symptoms are present, the patient needs medical evaluation.

Signs and Symptoms:

- Recent history of hard, difficult to pass stools.
- May also have mild, generalized abdominal cramps.
- Fever or vomiting SHOULD NOT be present.

Treatment:

1. Dulcolax (biscadoyl) 10 mg po TID as needed to initiate bowel movement.
2. Tylenol ER for pain relief.
3. Increase oral fluid intake.

Disposition:

- Evacuation is not required if condition responds to treatment.
- Routine evacuation if condition does not respond to conservative treatment.
- Priority evacuation for surgical evaluation is necessary.If the patient has **fever**, **point tenderness**, or **abdominal rigidity**,

Contact Dermatitis (Poison Ivy/Poison Oak)

The differential diagnoses for itchy rashes include insect bites, fungal infections and cellulitis. If there is history of exposure to an irritant plant exists and there is no evidence of infection (absence of warmth, pus, or spreading red skin rash), contact dermatitis should be assumed and treated.

Signs and Symptoms:

- Acute onset of severe itching with edema
- Clear roofed vescicles and/or bullae, occasionally with crusting

Treatment:

1. Change clothes when possible to stop further exposure.
2. Wash the affected area with mild soap and water to remove irritant.
3. Apply cold compresses to decrease itching.
4. If available, apply 1% hydrocortisone cream.
5. In severe cases Decadron 10 mg IM for 5 days may be given.
   Note: Treat as cellulitis if fever, increasing redness or pus discharge occurs.

Disposition:

- Evacuation is generally not needed for mild cases.
- Priority evacuation for severe symptoms, intra-oral or eye involvement, greater than 50% BSA involvement

Cough

Usually due to a viral upper respiratory infection, but may indicate early HAPE if in the correct high altitude environment.

Signs and Symptoms:

- Cough with no or minimal sputum production,
- No respiratory difficulty,
- Normal breath sounds
- Normal pulse oximetry.
- Often accompanied by other signs of upper respiratory infection such as:
  - Sore throat,
  - Congestion,
  - Runny nose.

Management:

1. If all of the above signs and symptoms are met, treat symptomatically with cepacol lozenges (if available),
2. Encourage adequate hydration
3. Administer albuterol MDI, 2 puffs every 4-6 hours as needed for symptom relief.

Disposition:

- Evacuation is not usually required for uncomplicated cough.
- If cough is accompanied by fever, sputum production, abnormal breath sounds, or respiratory difficulty, treat as pneumonia and evacuate accordingly.
- If at high altitude, treat as per HAPE and evacuate accordingly.

Cutaneous abscess

Cutaneous abscess is a focal collection of pus in the skin, often due to a superficial infection of a hair follicle (folliculitis) or break in skin or small retained foreign body (ie splinter).

Note: Do **NOT** attempt drainage of an abscess on the eyelid, face or neck in the tactical setting.

Signs and Symptoms:

- Include focal pain
- redness
- warmth
- tenderness
- frequently small amounts of pus discharge

Management:

1. If discomfort is severe and mission limiting, consider incision and drainage.
2. For I&D, establish a sterile field.
3. Clean the area with betadine.
4. Establish local anesthesia with lidocaine 1%.
5. Incise with a scalpel making a small incision in the area of greatest swelling and tenderness.
6. Drain pus and pack the wound with sterile dressings.
7. Cover with bandage and **DO NOT SUTURE CLOSED.**
8. Change dressings daily until definitive care is reached and keep wound clean.
9. Treat with moxifloxacin 400 mg po qD.

Disposition:

- Evacuation may be withheld if significant improvement in first 24 hours.
- If not improving, routine evacuation.
- If worsening (spreading redness, fever, pain) treat with Ertapenem 1 gm IV and evacuate priority.

Dysentery/Infectious Diarrhea:

Defined as watery stool, may be associated with bloody stool, mucus, and/or fever.

Treatment:

1. Encourage oral clear fluids, electrolyte replacement if available.

   Note: Avoid fruit juices, including apple juice, as they may increase diarrhea volume and frequency due to the high sugar content and osmotic load on the gut.

2. **Treat with Moxifloxacin 400 mg po qd x 3 day.**
3. If the patient is symptomatic (ie "tilt positive"), establish an IV with normal saline, and give 2 liter bolus of saline, then run 250cc/hr. Do not exceed 3 liters.
4. Give **Phenergan** 12.5 mg IV or **zofran** 4 mg IV if significant r nausea and vomiting.
5. After antibiotics, may give **Imodium** 2mg caps initially, then 2mg after each lose stool, not exceed 10 mg/24hrs.

Note: Do not give Imodium unless moxifloxacin is given first.

Disposition:

- Evacuation is usually not required if the condition responds to therapy.
- If dehydration occurs despite above therapy, evacuate as Priority.
- If severe, persistent diarrhea occurs after 5-10 days of antibiotics, evacuate as Priority.
- Grossly bloody stools or circulatory compromise requires Immediate Transport/Urgent evacuation

Joint Infection:

A single swollen, red joint with significant pain suggests a joint infection and is commonly the result of penetrating trauma (especially human or animal bites). Joint infection may rapidly progress and result in destruction of the affected joint.

Signs and Symptoms:

- History of adjacent penetrating trauma or infection
- Single red, swollen joint
- Very painful
- May be associated with fever.

Treatment:

1. Establish IV access, give Ertapenem 1 gm IV QD
2. Immobilize the joint
3. Treat pain with Tylenol or narcotic pain medicine (if severe)

Disposition: Priority evacuation

Kidney Stones/Flank Pain:

Obstruction of the ureters due to formation of small, usually calcium, stones in the GU tract. This disorder commonly occurs in dry climates, especially with inadequate water intake. It may progress rapidly to a life threatening infection if a UTI occurs.

Signs and Symptoms:

- Sudden onset of back or flank pain associated with nausea and vomiting.
- Patient may have costovertebral angle (CVA) tenderness,
- Fever
- Painful or frequent urination, urgency

Treatment:

1. Moxifloxacin 400 mg po if able to take po.
2. If po intolerant, Ertapenem 1 gm IV.
3. Treat nausea with phenergan 12.5 mg IV or Zofran 4 mg IV.
4. Treat pain with morphine, 4-6 mg IV or Fentanyl lozenge.

Disposition: Priority Evacuation

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 diseases. In such cases, medical control should be contacted immediately, as immediate administration of antibiotics could be necessary.

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.

Causes of tropical fever include: Typhoid fever, dengue fever, multiple forms of viral hemorrhagic fever, malaria, etc…. Treatment is generally aimed at making the patient comfortable, kept well-hydrated and evacuation ASAP.

Malaria:

Malaria **MUST** be considered in all febrile patients currently in, or recently in, a malaria endemic area. It is not uncommon for malaria to present like pneumonia or gastroenteritis (with vomiting and diarrhea) P. falciparum is often fatal if not diagnosed and treated promptly. It is appropriate to treat suspected malaria cases empirically if evacuation will be delayed

Notes:

- Persons on effective chemoprophylaxis may have atypical presentations
- Consider bacterial meningitis in evaluating the patient – treat for both disorders if meningitis is suspected
- Patients who cannot tolerate PO meds must be evacuated for antimalarial therapy via IV or NG tube with antiemetic suppository
- **IF SPECIES IS UNKNOWN, TREAT FOR P. FALCIPARIUM.**

Signs and Symptoms:

- Prodrome of malaise, fatigue, and myalgia may precede febrile paroxysm by several days.
- Paroxysms are characterized by abrupt onset of:
  - Fever,
  - Chills,
  - Rigors,
  - Profuse sweats,
  - Headache,
  - Backache,
  - Myalgia,
  - Abdominal pain,
  - Nausea,
  - Vomiting,
  - Diarrhea (may be watery and profuse) in p. Falciparum
  - Intermittent fever to >40c (105f).
- P. Falciparum malaria: classic “periodicity” is usually **absent** (ie fever may be nearly continuous).

- Profuse sweating between febrile paroxysms.
- Tachycardia,
- Orthostatic hypotension,
- Tender hepatomegaly,
- Moderate splenomegaly,
- Delirium (Cerebral malaria)

Management: P. Falciparum malaria:

1. **Administer ONE** of the following antimalarial regimens
   a. **Malarone** (atovaquone 250 mg/proguanil 100 mg) 4 tabs daily for 3 days with food **OR**
   b. **Mefloquine** 750 mg and then 500 mg 12 hours later. **OR**
   c. **Doxycycline** 100 mg PO bid x 7 days **PLUS Quinine** 650 mg PO TID for 3 days (Africa), **OR** 5 days (S. America), **OR** 7-10 days (SE Asia).
2. **Tylenol** (acetaminophen) 1000 mg PO q4h PRN fever

Management: P. vivax malaria:

1. Chloroquine 1 gm PO x 1 then 500 mg daily x 3 days starting 6 hours after 1st dose
2. **PLUS** primaquine 30 mg qd x 14 days (MUST rule out G6PD deficiency before giving primaquine)

Disposition:

- Routine evacuation for uncomplicated cases (normal vital signs, normal mental status, no nausea and vomiting, no cough/shortness of breath)
- Complicated malaria (delirium, pulmonary symptoms, unstable vital signs) is a medical emergency, requiring **URGENT** treatment and evacuation.

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 malaria 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.

Meningitis:

A life-threatening infection of the meninges (outer linings) of the central nervous system.
Meningitis may be bacterial, viral, or fungal. The bacterial type may cause death in hours, even in previously healthy young adults, if not treated aggressively with appropriate antibiotics and it is therefore appropriate to start treatment prior to evacuation.

Note: Consider malaria in differential diagnosis

Signs and Symptoms:

- Classic features:
  1. Severe Headache
  2. High Fever
  3. Neck pain with movement (active or passive)
  4. Altered mental status
- The patient may also have:
  1. photophobia,
  2. Nausea
  3. Vomiting,
  4. Malaise
  5. Seizures

Treatment:

1. If this diagnosis is suspected, IV antibiotics should be initiated **IMMEDIATELY**.

2. Prior to antibiotics, administer Decadron (dexamethasone) 10 mg IV q6h (IM route possible alternative but prefer IV route) or PO.
3. Next give Ertapenem 1gm IV/IM QD (IM route possible alternative but prefer IV route).
4. Administer Tylenol (acetaminophen) 1000 mg PO q6h for relief of pain and fever if able to take PO meds.
5. If no response, consider morphine for pain relief.
6. Control of nausea and vomiting with an antiemetic (Zofran OR Phenergan) Moxifloxacin 400 mg po x1 for prophylaxis for close contacts

Disposition: Immediate Transportation/Urgent evacuation (combat)

Otitis Externa: Infection of the outer ear canal, often called "swimmer's ear".

Signs and symptoms:

- Redness and swelling of the outer ear
- Pus drainage from ear canal.
- Decreased hearing.
- Pain with movement of the outer ear

Management:

1. Instill antibiotic ear drops in ear if available q2h while awake for 7-10 days.
2. If severe or drops not available, treat with moxifloxacin 400 mg po q24 hrs x 10 days.

Disposition:

- If prompt response to treatment, no evacuation is necessary.
- Consider priority evacuation if no response to treatment, or if severe headache or cranial nerve palsy occurs (suggest malignant otitis, a medical emergency).

Otitis Media:

Infection of the middle ear which can be viral or bacterial and results in increased pressure in the middle ear. It often occurs in the setting of air travel or mountain ascents due to changes in ambient air pressure. If ear pain occurs in the setting of blast trauma, assume the tympanic membrane has been ruptured.

Signs and Symptoms:

- Ear pain,
- Decreased hearing
- Sensation of fullness in the ear.
- Pus drainage
- No swelling of the outer ear

Management:

1. Moxifloxacin 400 mg po q24 hrs x 10 days, Tylenol for pain.

Disposition:

- If responding promptly to treatment, no evacuation is necessary.
- For worsening symptoms despite treatment, or if tympanic membrane rupture is suspected, routine evacuation.

Skin Fungal Infections:

Superficial infection of the skin caused by fungus. Various types of infections include athlete's foot, jock itch, etc. Treat in the field only if the condition prevents the patient from performing his/her job.

Signs & Symptoms:

- Red, irritated skin in affected area
- Red rash (usually yeast infection)
- Slightly red and raised scaly patches.
- Usually **NOT** painful to the touch or warm/hot to the touch.

Treatment:

1. Apply antifungal cream (such as **Lamisil** Cream or **Mycelex** Cream) to affected area BID.
2. Keep affected area as clean and dry as possible.
3. Avoid use of close-fitting or confining underwear in tropical areas.

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

Disposition: Evacuation is generally not required for simple fungal infections

Smoke Inhalation:

Common after closed space exposures to fires in the tactical setting and is often accompanied by carbon monoxide (CO) poisoning. Always consider the possibility of airway burns and be prepared to emergently manage the airway. **Note:** Normal pulse oximetry does NOT rule out CO poisioning.

Signs and Symptoms:

History of smoke exposure; may be accompanied by cough or respiratory difficulty.

Treatment:

1. Consider the use of early intubation or cricothyroidotomy if significant facial or airway burns (singed nares, facial burns, etc.) are suspected.
2. If high flow supplemental oxygen is available, apply early.
3. Albuterol MDI 2 puffs every 4 hours if available.
4. Decadron 10 mg IM may prevent progession of airway swelling.
5. Limit patient exertion.

Disposition:

- Immediate transport/Urgent evacuation for respiratory distress,
- Priority if not in respiratory distress but significant inhalation is suspected.

Testicular Pain:

The primary concern in evaluating testicular pain is differentiating acute tescticular torsion from other causes of testicular pain. Testicular torsion is an emergency requiring urgent correction to prevent loss of the affected testicle. Other, more common causes of testicular pain, include hernias, STDs such as epididymitis and orchitis, and testicular masses.

Signs and Symptoms:

- Sudden onset of severe testicular pain is the hallmark symptom of torsion.
- It is usually associated with vigorous physical activity and is accompanied by severe nausea and often vomiting.
- The affected testicle may be swollen and lying in an abnormal position within the scrotum.
- Elevation of the affected testicle may worsen the pain.

Treatment:

1. If pain is sudden onset and the testicle is lying abnormally in the scrotum, an attempt to manual detorse the testicle is warranted.
2. Attempt ONCE to rotate the testicle outward (like opening the pages of a book)
3. If pain increases w/outward rotation, attempt ONCE to rotate the opposite direction
4. Successful detorsion will result in relief of pain

Disposition:

- If detorsion is successful, **priority** evacuation.
- If unsuccessful, or pain is severe, Immediate Transport/**urgent** surgical evacuation.
- If pain is gradual onset and mild, consider **routine** evacuation.

Urinary Tract Infection:

Infection of the urinary tract is much more common in women than men, but occurs in tactical settings in the setting of dehydration and/or kidney stones. It may occasionally progress rapidly and can cause sepsis, so if evacuation is delayed it should be treated prior to transport.

Signs and Symptoms:

- Dysuria
- Frequent and urgent urination,
- Cloudy urine,
- Bladder discomfort
- May be associated with fever and flank pain if the kidney is involved.

Treatment:

1. **Tylenol** ER for fever or pain.
2. If **Zithromax** is available, give 1 gram by mouth to treat for possible sexually transmitted diseases
3. Treat with **Ertapenem** 1 gm IV.

Disposition:

- **Routine** evacuation for uncomplicated urinary tract infection,
- **Priority** evacuation if fever or flank pain is present.

Chapter 22: Medical Emergencies

Guidelines and Considerations:

As with patrol medicine, normal Pararescue medical practice does not generally include the field treatment of medical emergencies. However, any of the following conditions may be seen 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 except in a supervised medical training environment with direct medical oversight and supervision by a licensed and credentialed medical provider.

NOTE: Whenever able, the PJ should contact medical control prior to initiation of treatment.

Acute Abdominal Pain:

Common causes in young healthy adults include appendicitis, cholecystitis, pancreatitis, perforated ulcer, and diverticulitis. Consider constipation/ fecal impaction as a potential cause of abdominal pain

Signs and Symptoms:

- Key Sign: Severe, persistent or worsening abdominal pain
- Rigid abdomen
- Rebound abdominal tenderness
- Fever
- Absence of bowel sounds
- Focal percussive tenderness may be present
- Commonly associated with nausea and/or vomiting

Treatment:

1. Start IV with normal saline (NS) at 150 cc/hr.
2. Administer Ertapenem 1 gm IV QD,
3. consider pain relief with fentanyl lozenge for severe pain.

Disposition: Immediate transport/Urgent evacuation to surgical facility.

Asthma/Reactive Airway Disease (RAD):

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
  - Lethargy,
  - Exhaustion,
  - Agitation,
  - Confusion).
- Other severe signs include:
  - Diaphoresis
  - Pallor,
  - Abdominal and intercostal retractions,
  - Inability to speak,
  - Tachycardia greater than 120,
  - Tachypnea greater than 30,
  - Pulsus paradoxus greater than 20 mm Hg
  - 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. **Albuterol** metered-dose inhaler (MDI) 2 puffs every 10-15 minutes x 3 (if available).
5. If Albuterol is not available and/or the patient does not respond adequately to 3 doses of inhaled Albuterol, consider **Epinephrine** 1:1000, 0.5cc IM. If less than 50 kg (110 lbs), use Epinephrine 1:1000, administer 0.01 cc/kg IM, not to exceed 0.5 cc per dose. May repeat every 20 minutes as needed for max of 3 doses Do not exceed maximum dosing recommendations without physician directions.

   Note: If available, albuterol is the preferred treatment for asthma versus giving epinephrine. Use epinephrine if albuterol is not available. **Solu-Medrol or Decadron** may be given for severe asthma attacks that show little or no response to the initial 1-2 treatment trials; obtain on-line medical control recommendations.

Disposition If no or poor response to therapy, Immediate transport/urgent evacuation (combat).

Chest Pain

General Guidelines:

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.

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 lasting 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.

Treatment 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 X 3. Do not give if systolic BP is 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. Check blood pressure prior to each dose and hold if systolic BP is below 100

   Note 1: Approach all critically ill or potentially unstable patients by immediately addressing the A-B-C's, obtaining a complete set of vitals, assessing LOC, and providing for vascular access, supplemental oxygen, and continuous cardiac monitoring and pulse oximetry. If resuscitative equipment is available, refer to specific cardiac algorithms for further direction.

Disposition: Immediate Transportation/Urgent Evacuation

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
2. **Toxic** metabolic states that involve the presence of circulating toxins or metabolites or the lack of metabolic substrate (i.e., glucose or oxygen).
   NOTE: Preserved papillary response suggests that the origin is toxic, whereas unresponsive or asymmetrical pupillary responses point to a structural cause.

Treatment:

1. In general, treatment is directed at support of patient's vital functions, prevention of further deterioration and treatment of reversible causes
2. If respirations are slow or shallow or if cerebral edema is suspected, hyperventilate at 24-30 breaths/minute with 100% oxygen.
3. If no gag reflex, intubate.
4. Establish IV access
5. If hypoglycemia is suspected, refer to hypoglycemia treatment
6. **Naloxone** 2mg IV, repeat X 1 in 5 minutes if no response

Disposition: Immediate Transport/Urgent Evacuation (combat)

Deep Vein Thrombosis (DVT):

DVT is a potentially life threatening condition, in which a clot is present in the large veins of a leg. This clot may dislodge and become localized in the pulmonary system (pulmonary embolism). DVT may occur in young adults secondary to trauma, long airplane rides, altitude exposures, and genetic predisposition

Signs and Symptoms:

- pain and swelling in a single lower extremity.
- palpable "cord" or clot in the lower leg with warmth over the affected area.

Treatment:

1. Monitor with pulse oximetry (sudden decrease in O2 sat suggests PE),
2. Administer 325 mg of aspirin and
3. Immobilize the affected leg.

Disposition:

- Immediate transport/Urgent Evacuation (combat) if there is associated chest pain/shortness of breath (concern for pulmonary embolism).
- Priority transport if no associated chest pain or shortness of breath.

Diabetes:

There are two life threatening diabetic conditions of which the Pararescueman needs to be aware: **Hypoglycemia** and **Hyperglycemia**. Diagnosis and treatment is extremely limited in the field environment and urgent evacuation should be strongly considered in combat settings.

Hypoglycemia (insulin Shock):

Extremely low levels of circulating blood 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 access
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 blood glucose often the result of uncontrolled diabetes, infection, 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
- 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, give **naloxone** 2mg IV (may repeat X 1 in 5 minutes if no result)
6. Insulin, if available, is only to be given under direct medical control

Pulmonary Embolus:

Pulmonary Embolus is usually the result of an untreated DVT. Most PEs and DVTs occur in the setting of prolonged immobilization (long plane flights, etc.) or significant trauma to a long bone of the lower extremity. PE is easily confused with myocardial infarction and should be treated similarly. Helpful features to differentiate PE from pneumonia include lack of fever, lack of abnormal lung sounds, and lack of sputum production. PE may be differentiated from asthma by a lack of wheezing.

Signs and Symptoms:

- Cardinal Features: Shortness of breath with localized chest pain
- Tachycardia
- Tachypnea
- Decreased oxygen saturation on pulse oximetry with normal breath sounds
- PE is often accompanied by signs of DVT such as unilateral lower extremity pain, swelling and tenderness.

Management:

1. Aspirin 325 mg by mouth,
2. Oxygen if available,
3. Morphine or Fentanyl lozenge for pain,
4. Treatment as per Chest Pain of Cardiac origin.

Disposition: Immediate transport/Urgent evacuation (combat setting)

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-LIMITED** and will stop once underlying causes are corrected. If seizure activity persists for greater than 3-5 minutes, intervention is 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 or force any objects 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 if the patient is unconscious and has 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.

Disposition: Immediate transport/Urgent evacuation (combat setting)

Sepsis:

Sepsis is a severe, life threatening bacterial infection of the bloodstream caused by an overwhelming bacterial infection. It may have extremely rapid onset and be fatal in 4-6 hours without antibiotic treatment.

Signs and Symptoms:

- **HYPOTENSION**
- Fever
- Tachycardia
- Altered mental status
- Occasionally a purpuric (bruise-like) skin rash

Management:

1. Establish IV or IO access immediately.
2. Give **Ertapenem** 1 gm IV.
3. If patient is hypotensive, give 2 liters of NS or LR. (Hextend is acceptable if NS or LR are not available).
4. If no improvement in hypotension despite 2 liters of fluid, consider 0.5mg of **epinephrine** (1:1000) IM (**NOT IV).**

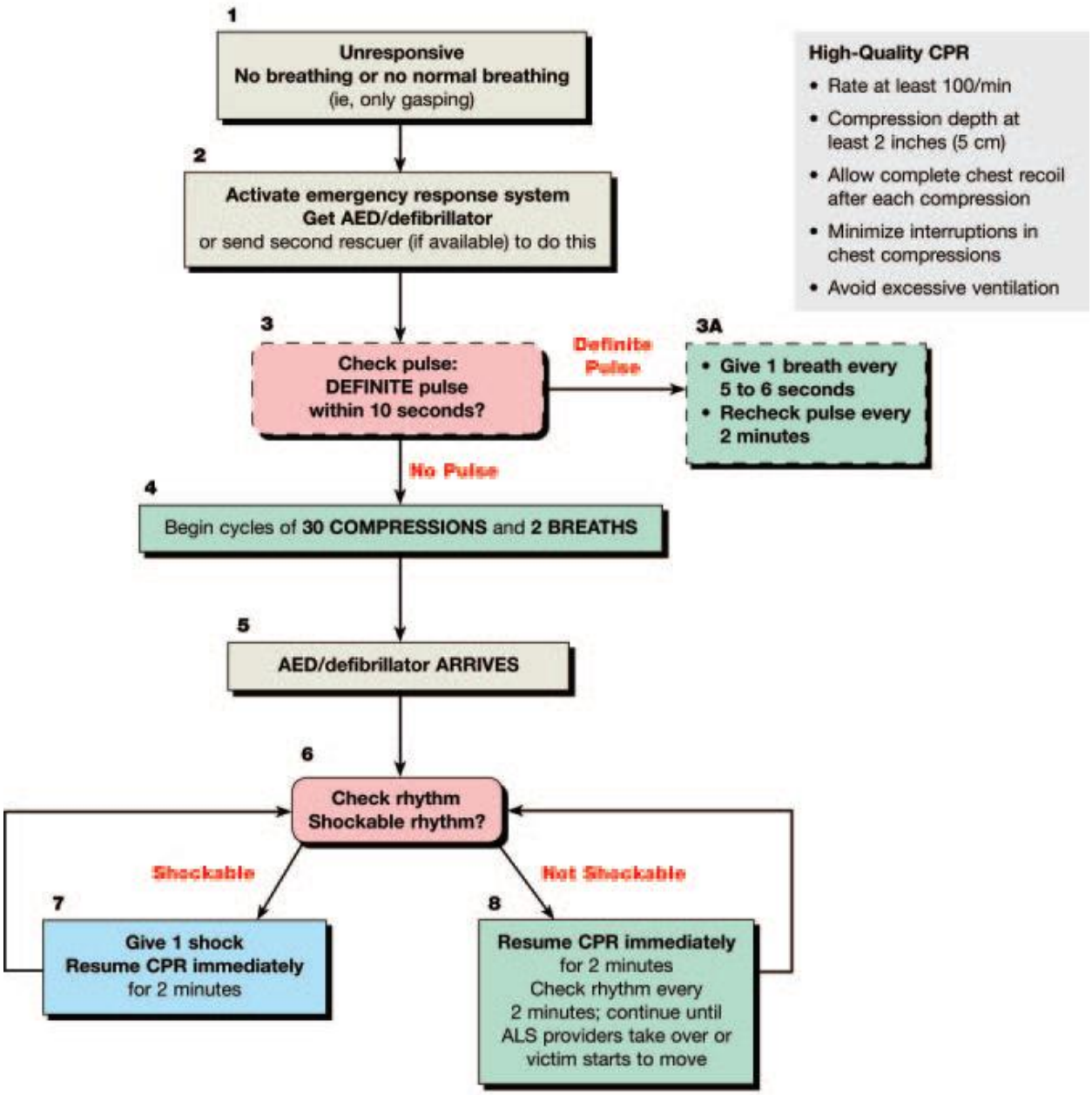
Disposition: Immediate transport/Urgent evacuation (combat setting)

Chapter 23: Cardiac Care Guidelines and Algorithms

- The following Emergency Cardiac Care protocols have been attached for reference (source: International Guidelines 2010 for Cardiopulmonary Resuscitation and Emergency Cardiac Care) Remember that these protocols are guidelines, NOT 'standards'. Modifications in treatment may be necessary depending on the tactical or rescue situation at hand.
- **BE PREPARED:** When evaluating a possible cardiac patient, begin supplemental oxygen, initiate cardiac monitoring and start an IV as early as possible. (Remember: A-B-C's, IV, O2, cardiac monitor, pulse oximeter, and vitals). 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.
- Search for treatable causes: The 2010 guidelines place great emphasis on finding and treating reversible causes of arrhythmias (the Hs and Ts), particularly in pulseless arrest/PEA, but also in other arrhythmias.

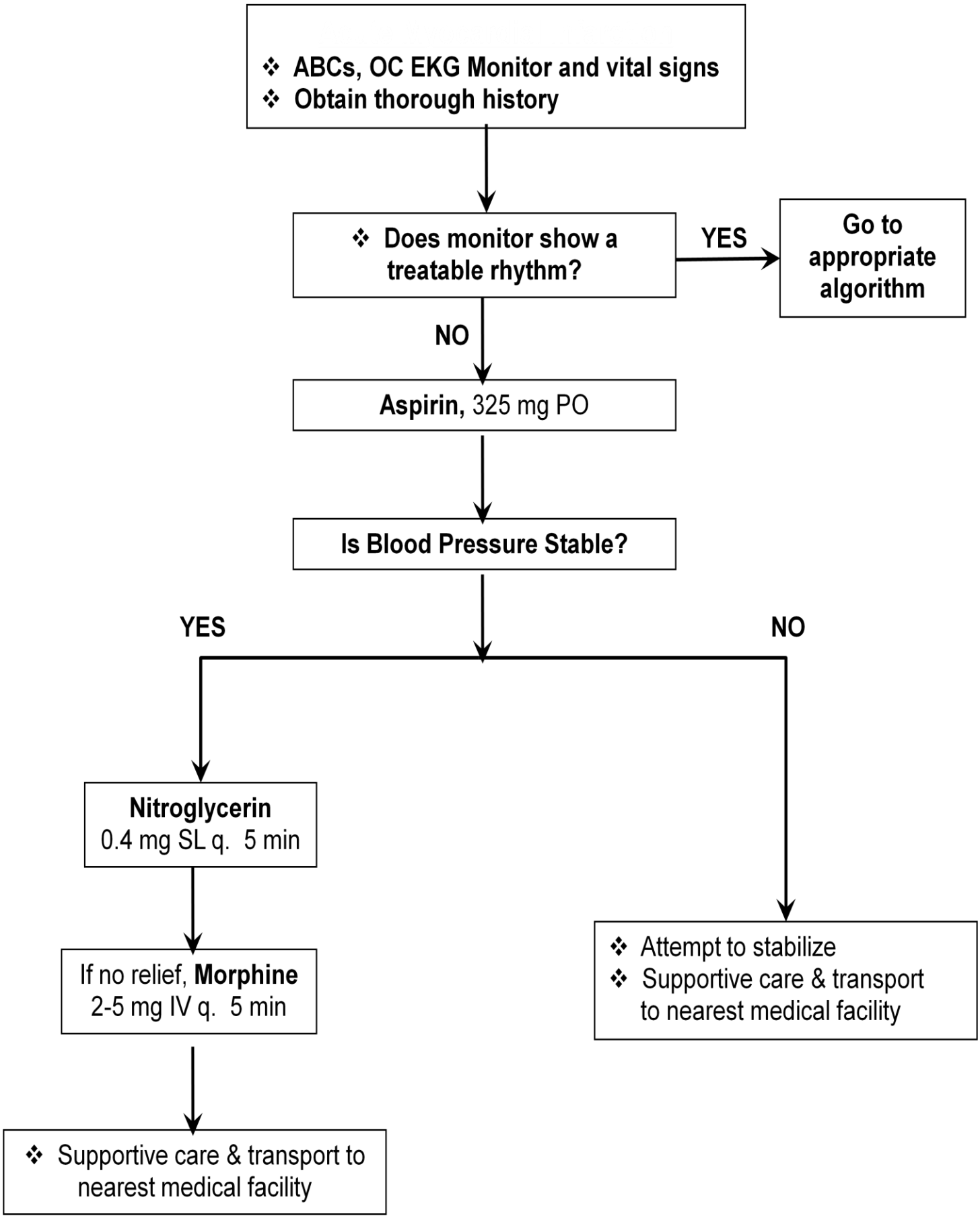
Condition	Clues from ECG/Monitor	Clues from H&P	RX
Hypovolemia	Narrow complex, rapid rate	history, flat neck veins	Volume infusion
Hypoxia	Slow rate	Cyanosis, airway probs	Oxygenation
Hydrogen ion (acidosis)	Small amplitude QRSs	History of DM, renal failure	Sodium bicarb hyperventilation
Hypokalemia	Flat T waves, Wide QRS Wide complex tachycardia	Diuretic use	Potassium IV Give magnesium
Hyperkalemia	T waves tall and peaked Wide QRS, "Sine Wave"	Renal failure, dialysis, diabetes	Sodium bicarb Glucose plus insulin
Hypothermia	J or Osborne waves	History of cold exposure	treat hypothermia
Toxins	Long QT interval +/- bradycardia	Empty pill bottles	specific antidotes based on toxin
Tamponade, Cardiac	Narrow complex Tachycardia	JVD, no pulse with CPR	Fluid bolus
Tension pneumothorax	Narrow complex Bradycardia (hypoxia)	JVD, no pulse with CPR tracheal deviation Difficult to bag	Needle decompression
Thrombosis (coronary)	Abnormal 12 lead ST elevation	History, cardiac markers	Fibrinolytics
Thrombosis (pulmonary)	Narrow complex Tachycardia	History, no pulse with CPR, h/o DVT	Fibrinolytics
Trauma (increased ICP)	Wide compex	Head trauma	Mannitol

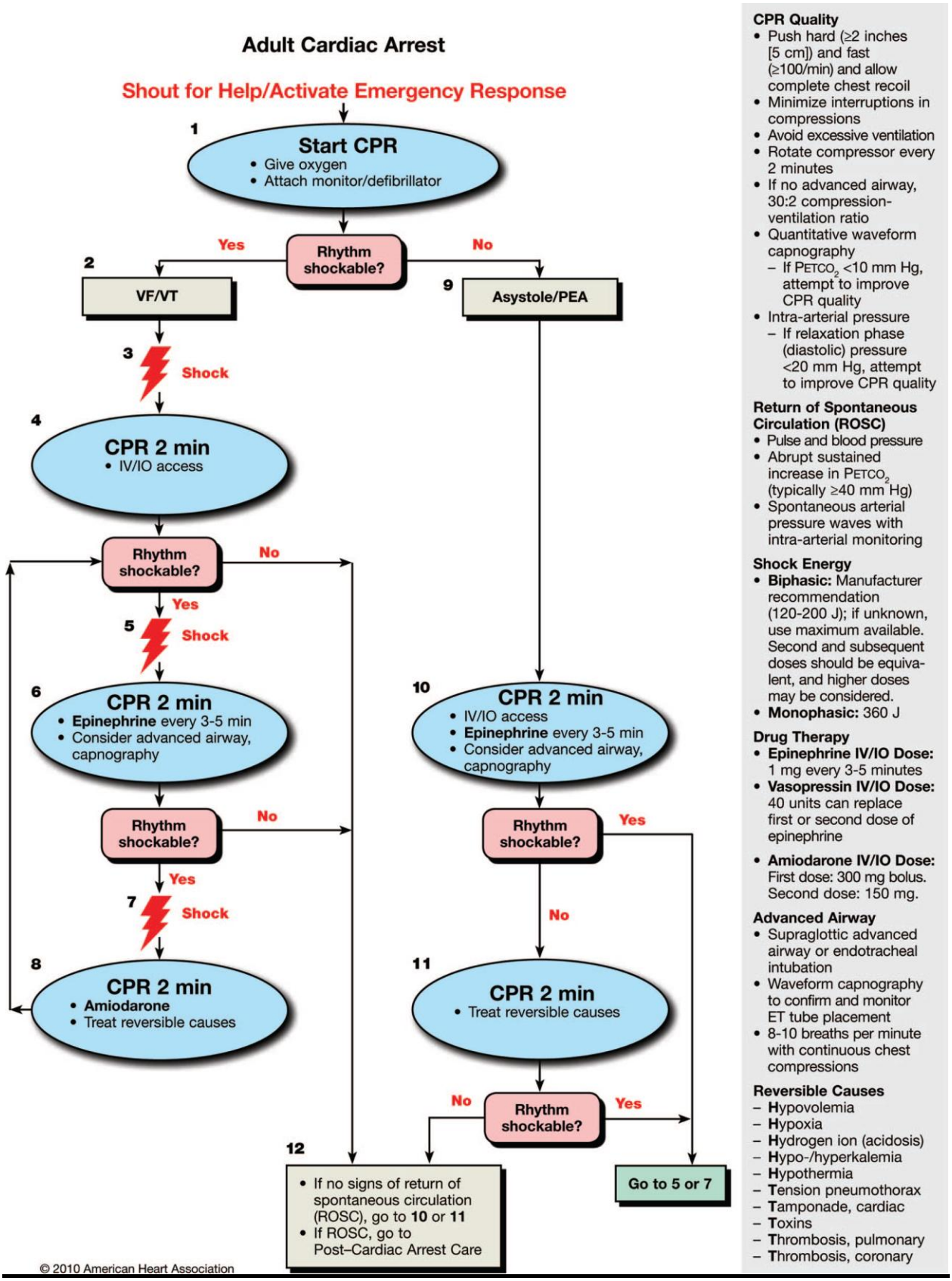
Adult BLS Healthcare Providers



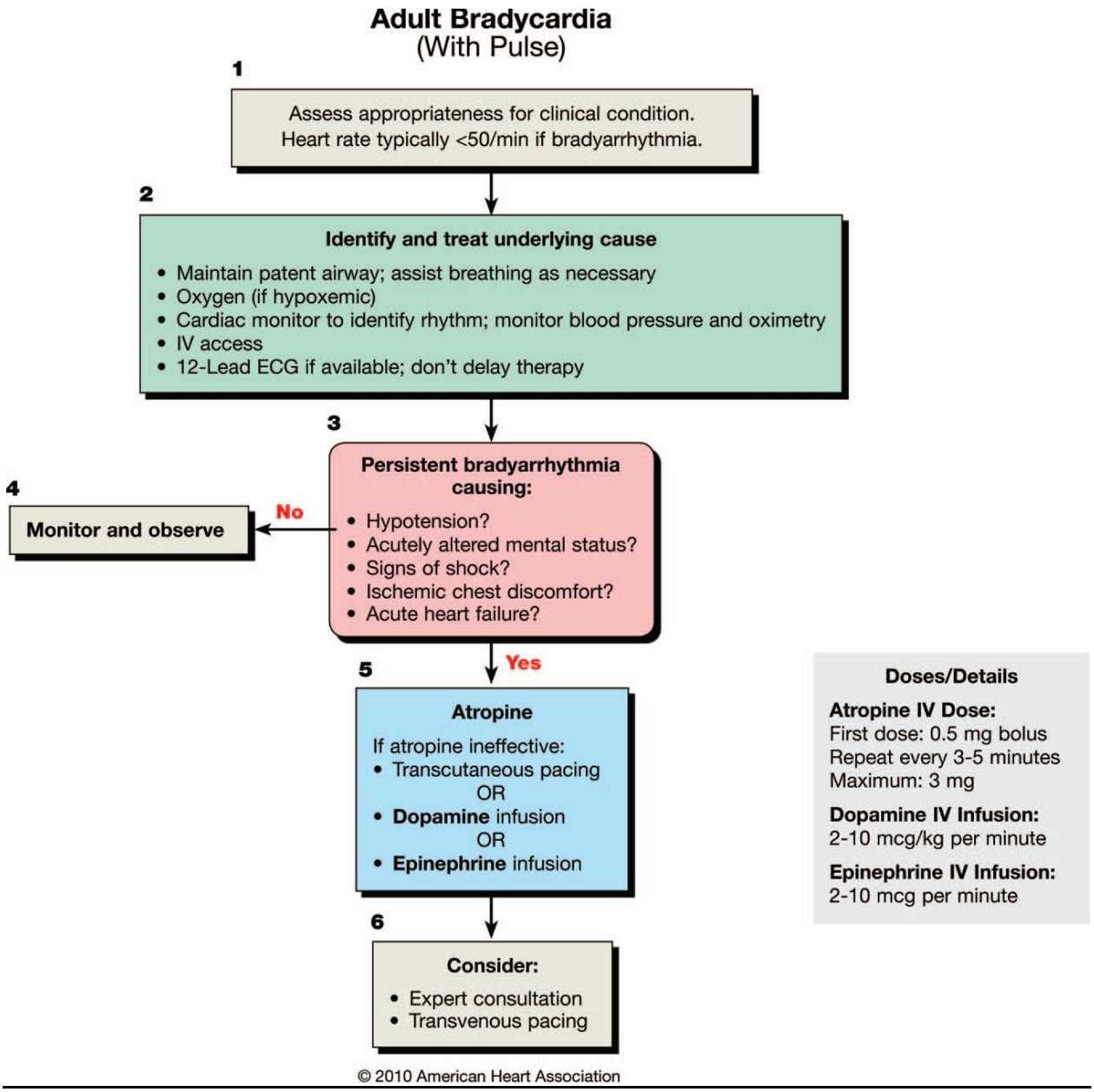
Note: The boxes bordered with dashed lines are performed by healthcare providers and not by lay rescuers

ACUTE MYOCARDIAL INFARCTION

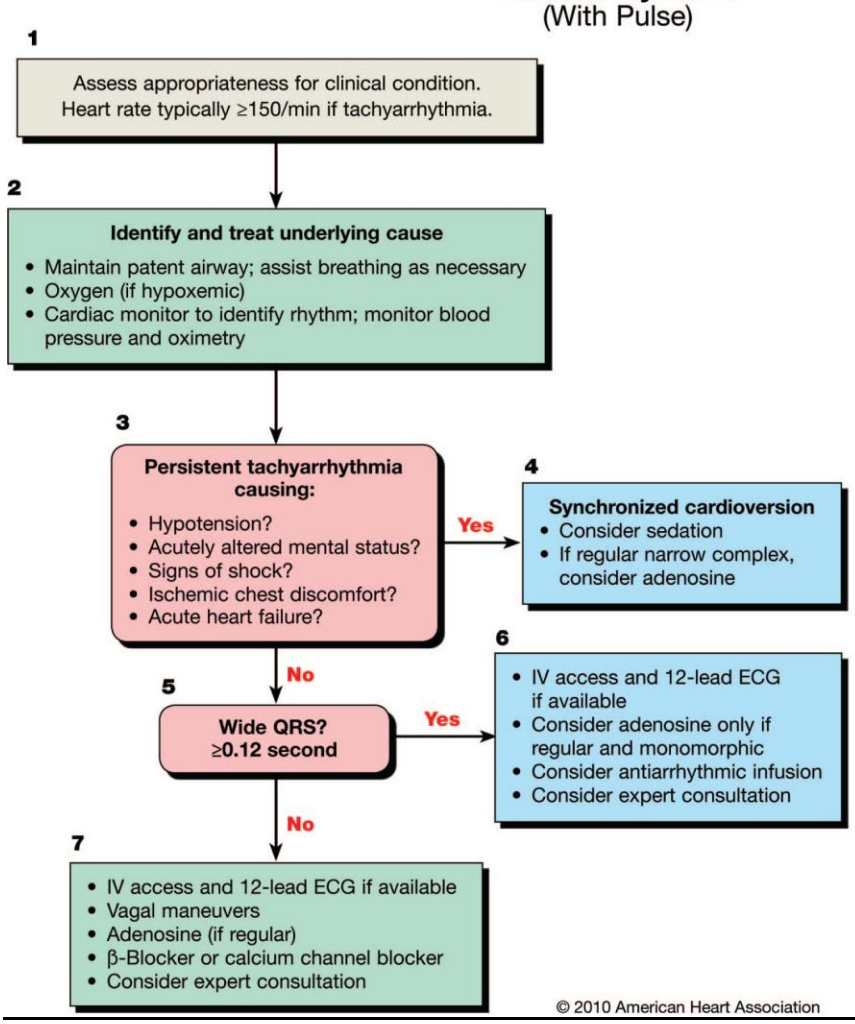




PULSELESS ARREST Algorithm


Adult Bradycardia
(With Pulse)
1
Assess appropriateness for clinical condition.
Heart rate typically <50/min if bradyarrhythmia.
2
Identify and treat underlying cause
• Maintain patent airway; assist breathing as necessary
• Oxygen (if hypoxemic)
• Cardiac monitor to identify rhythm; monitor blood pressure and oximetry
• IV access
• 12-Lead ECG if available; don't delay therapy
3
Persistent bradyarrhythmia causing:
• Hypotension?
• Acutely altered mental status?
• Signs of shock?
• Ischemic chest discomfort?
• Acute heart failure?
No
4
Monitor and observe
Yes
5
Atropine
If atropine ineffective:
• Transcutaneous pacing
OR
• Dopamine infusion
OR
• Epinephrine infusion
6
Consider:
• Expert consultation
• Transvenous pacing
Doses/Details
Atropine IV Dose:
First dose: 0.5 mg bolus
Repeat every 3-5 minutes
Maximum: 3 mg
Dopamine IV Infusion:
2-10 mcg/kg per minute
Epinephrine IV Infusion:
2-10 mcg per minute
© 2010 American Heart Association

Adult Tachycardia
(With Pulse)



Doses/Details

Synchronized Cardioversion
Initial recommended doses:
- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: defibrillation dose (NOT synchronized)

Adenosine IV Dose:
First dose: 6 mg rapid IV push; follow with NS flush.
Second dose: 12 mg if required.

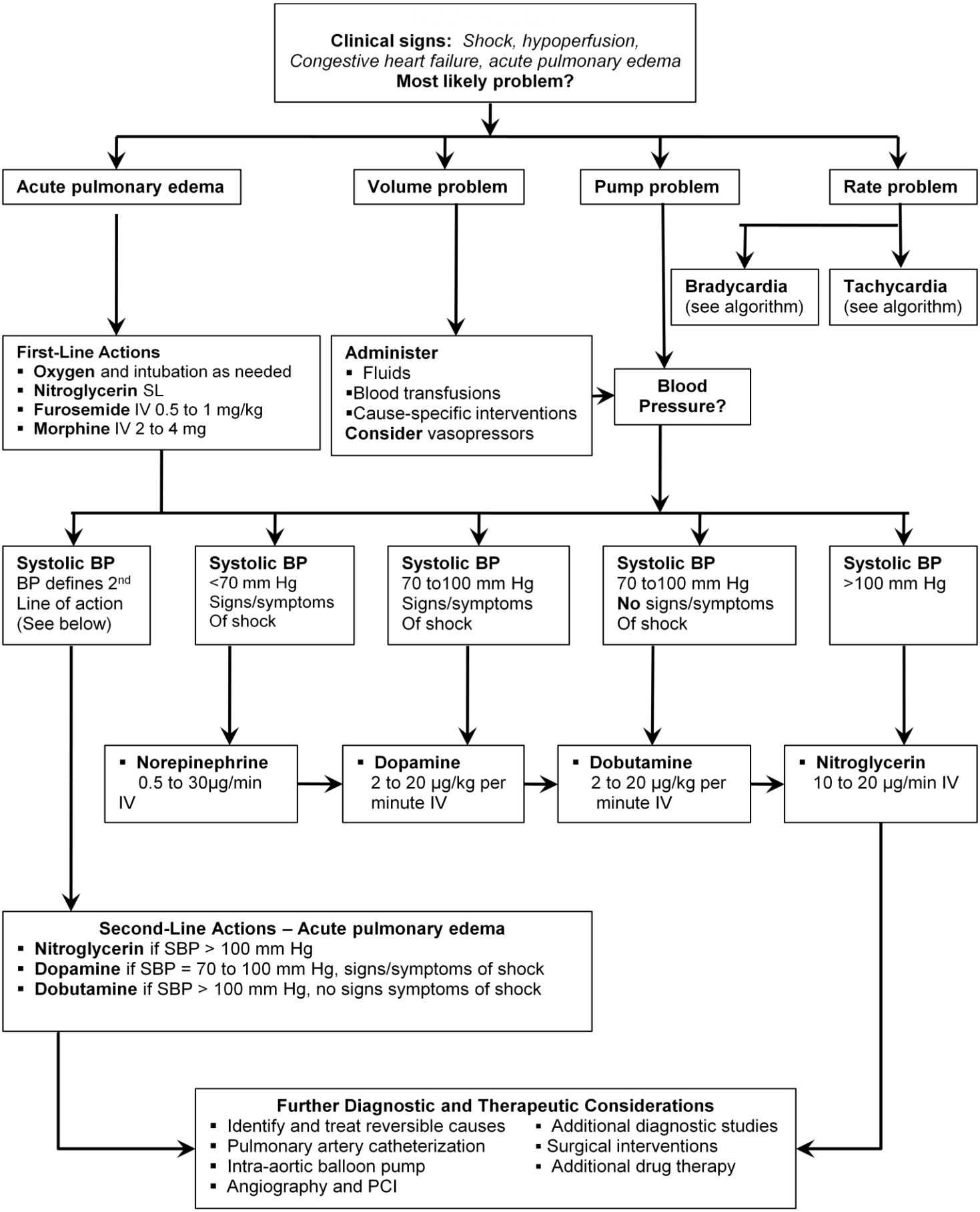
Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

Procainamide IV Dose:
20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given. Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

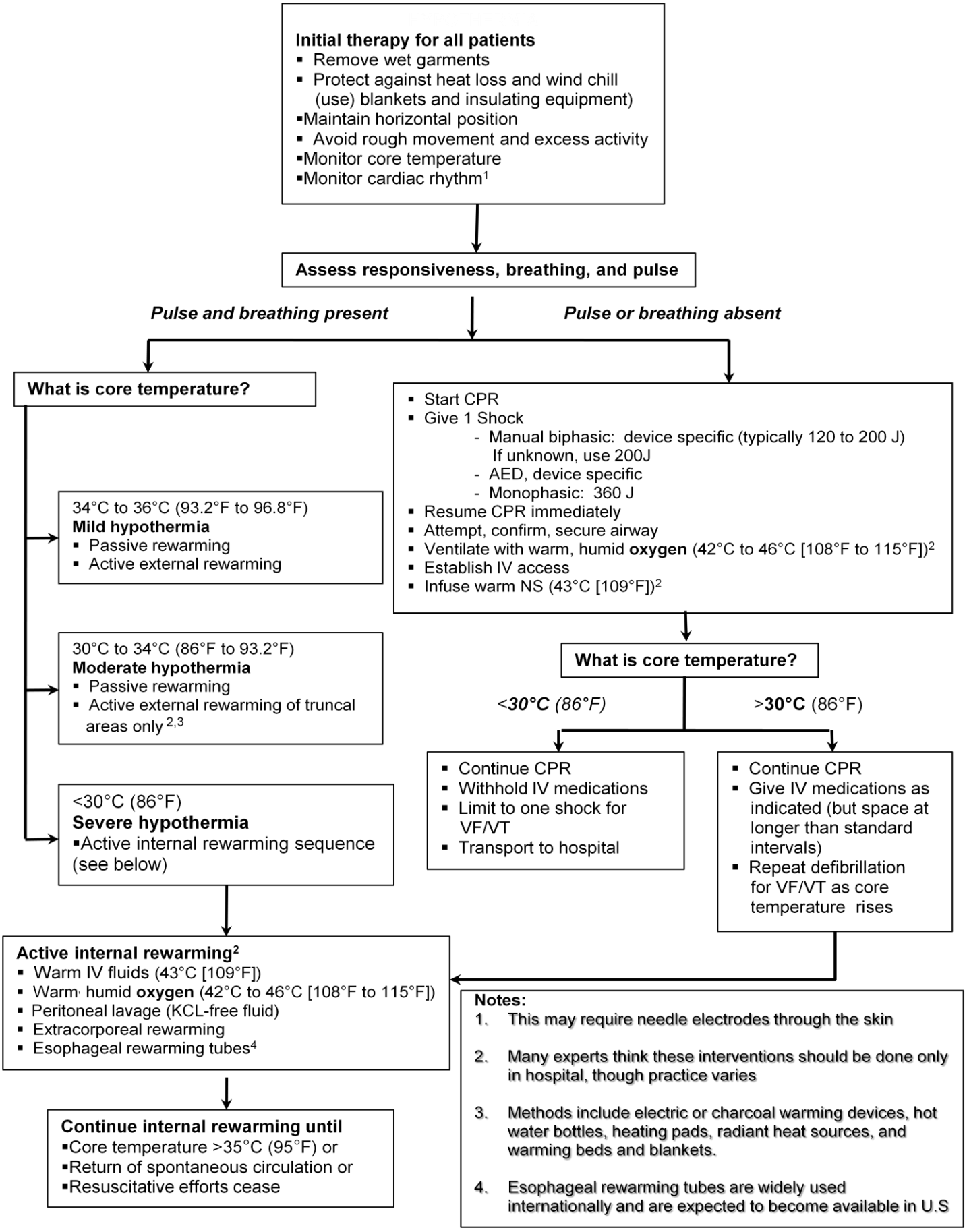
Amiodarone IV Dose:
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

Sotalol IV Dose:
100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.

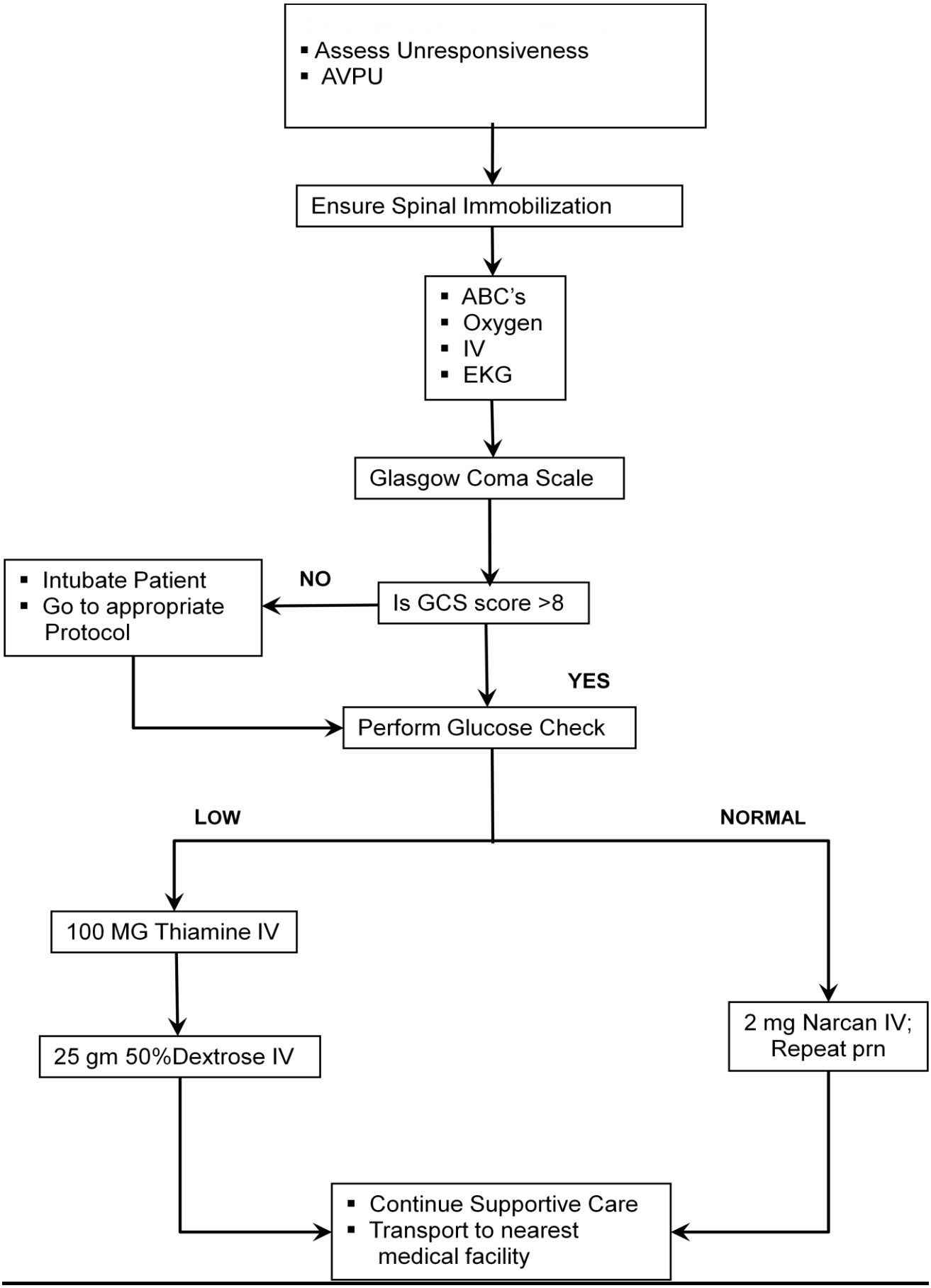
SHOCK Algorithm



HYPOTHERMIA Algorithm



UNCONSCIOUS / UNKNOWN Algorithm



CEREBRAL VASCULAR ACCIDENT

STROKE Algorithm

Identify signs of possible stroke

↓

Critical EMS assessments and actions
- Support ABCs; give **oxygen** if needed
- Perform prehospital stroke assessment
- Establish time when patient last known normal

Note: therapies may be available beyond 3 hours from onset)
- Transport; consider triage to a center with a stroke unit if appropriate; consider bringing a witness, family member, or caregiver
- Alert hospital
- Check glucose if possible

THE CINCINATTI PREHOSPITAL STROKE SCALE

FACIAL DROOP

(have the patient show teeth or smile)
- Normal – both sides of face move equally
- Abnormal – one side of the face does not move as well as the other side

ARM DRIFT

(patient closes eyes and extends both arms straight out, with palms up, for 10 seconds)
- Normal – both arms move the same or both arms do not move at all
- Abnormal – one arm does not move or one arm drifts down compared with the other

ABNORMAL SPEECH

(have the patient say "you can't teach an old dog new tricks")
- Normal – patient uses correct words with no slurring
- Abnormal – patient slurs words, uses the wrong words, or is unable to speak

INTERPRETATION

IF ANY 1 OF THESE 3 SIGNS IS ABNORMAL, THE PROBABILITY OF STROKE IS 72%

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 hear rate is < 150 bpm.

↓

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

↓

Premedicate whenever possible 1

↓

Synchronized Cardioversion: 2, 3, 4, 5, 6

- Ventricular Tachycardia
- Paroxysmal Supraventricular Tachycardia
- Atrial Fibrillation

100 J, 200J
300 J, 360 J
monophasic energy dose (or clinically equivalent biphasic energy dose

Notes:
1. Effective regimens have included a sedative (e.g., **diazepam, mida-zolam, 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 algorhythm
6. Paroxysmal supraventricular tachycardia and atrial flutter often respond to lower energy levels (start with 50 J)

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
8. Position conductor pads on patient (or apply gel to paddles).
9. Position conductor pads on patient (or apply gel to paddles).
10. Announce to team members: "Charging defibrillator - Stand Clear"
11. Press "charge" button on apex paddle (right hand).
12. When the defibillator 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.)

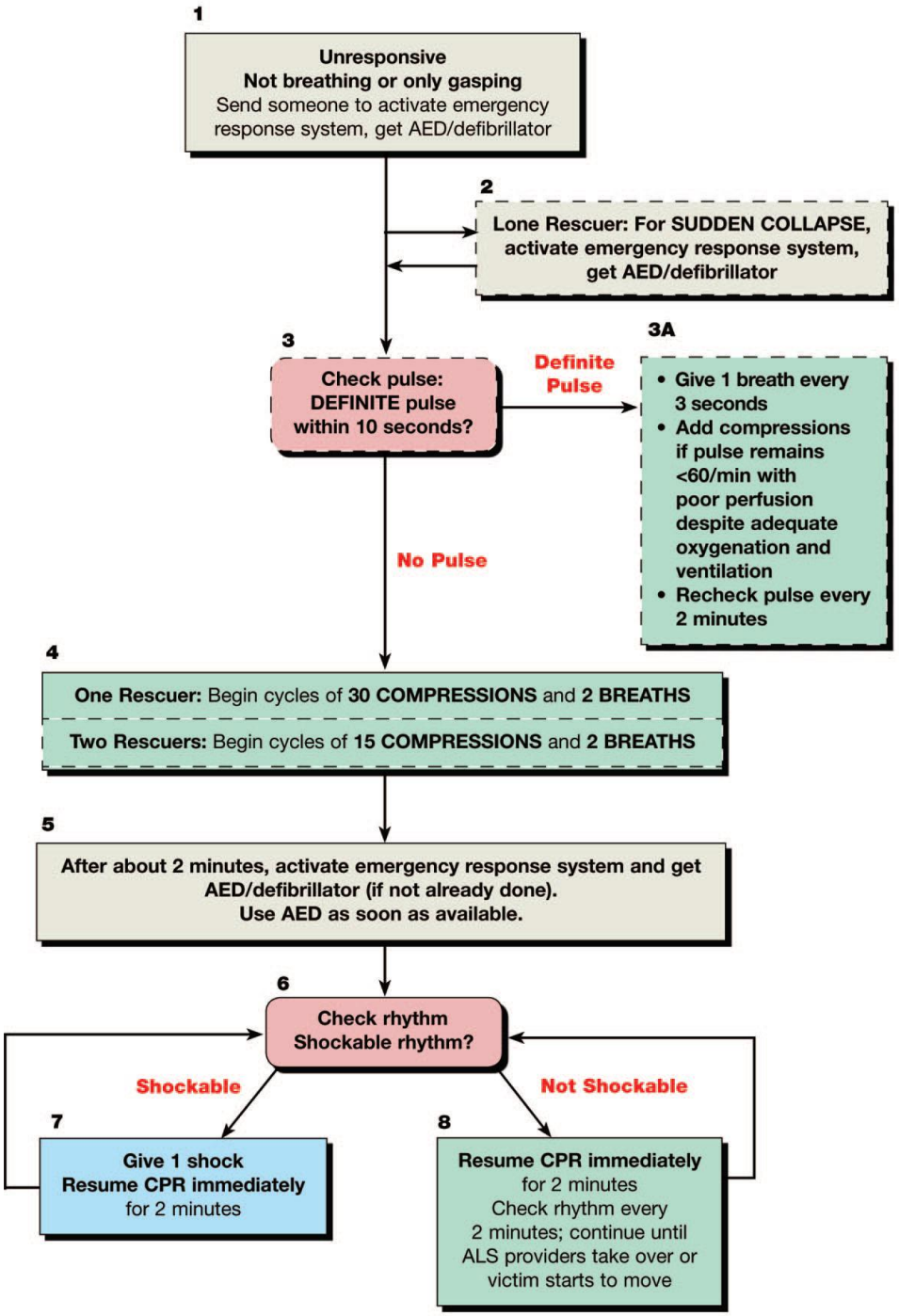
13. Apply 25 lbs pressure on both paddles.
14. Press the "discharge"buttons simultaneously.
15. Check the monitor. If tachycardia persists, increase the joules according to the electrical conversion algorithm
16. Reset the synch mode after each synchronized cardioversion because most defibrillators default back to unsynchronized mode. This default allows an immediate defibrillation if the cardioversion produces VF.

Pediatric Medications for Cardiac Arrest and Symptomatic Arrhythmias

Drug	Dosage (Pediatric)	Remarks
Adenosine	0.1 mg/kg **Repeat Dose:** 0.2 mg/kg **Maximum Single Dose:** 12 mg	Rapid IV/IO bolus Rapid flush to central circulation Monitor EKG during dose
Amiodarone for Pulseless VF/VT	5 mg/kg IV/IO **Maximum Dose**: 300 mg IV/IO	May repeat up to total dose of 15 mg/kg per 24 hours
Amiodarone for Perfusing Tachycardias	5 mg/kg IV/IO **Maximum Dose:** 300 mg IV/IO	IV over 20 to 60 minutes Routine use in combination with drugs prolonging QT interval is ***not*** recommended. Hypotension is most frequent side effect.
Atropine Sulfate* for **Symptomatic** Bradycardia	0.02 mg/kg **Minimum Dose:** 0.1 mg/kg **Maximum Single Dose:** 0.5 mg in child, 1.0 mg in adolescent. May repeat once.	May give IV, IO, or ET Tachycardia and pupil dilation may occur but ***not*** fixed dilated pupils.
Calcium Chloride 10%-100mg/ml (=27.2 mg/ml Elemental Ca)	20 mg/kg (0.2 ml/kg) IV/IO	Give IV slow push for: Hypocalcemia, hypermagnesemia, calcium channel blocker toxicity. Preferably via central vein. Monitor heart rate: Bradycardia may occur.
Calcium Gluconate 10%-100mg/ml (=9 mg/ml Elemental Ca)	60-100 mg/kg (0.6-1.0 ml/kg) IV/IO	Give IV slow push for: Hypocalcemia, hypermagnesemia, calcium channel blocker toxicity. Preferably via central vein.
Epinephrine for Symptomatic Bradycardia*	**IV/IO:** 0.01 mg/kg (1:10,000, 0.1 ml/kg) **ETT:** 0.1 mg/kg (1:1000, 0.1 ml/kg)	Tachyarrhythmias and hypertension may occur
Epinephrine for Pulseless Arrest*	• **IV/IO:** 0.01 mg/kg (1:10,000, 0.1 ml/kg) • **ETT:** 0.1 mg/kg (1:1000, 0.1 ml/kg) • Administer epinephrine every 3 to 5 minutes	Tachyarrhythmias and hypertension may occur
Glucose (10% **or** 25% **or** 50%)	**IV/IO:** 0.5-1.0 g/kg • 1-2 ml/kg 50% • 2-4 ml/kg 25% • 5-10 ml/kg 10%	For suspected Hypoglycemia; **Avoid Hyperglycemia**
Lidocaine* **Lidocaine** Infusion (start after a bolus)	**IV/IO/ETT:** 1 mg/kg **Infusion IV/IO:** 20-50 mcg/kg/min	Rapid bolus 1 to 2.5 ml/kg/hr of 120 mg/100ml solution
Magnesium Sulfate (500 mg/ml)	**IV/IO:** 25-50 mg/kg. **Maximum dose**: 2 g per dose.	Rapid IV infusion for torsades or suspected hypomagnesemia: 10-to-20 minute infusion for asthma that responds poorly to Beta-adrenergic agonists.
Naloxone*	• Initial dose: 0.1 mg/kg • Maximum dose: 2.0 mg/kg • Infusion: 0.04-0.16 mg/kg/hr	For total reversal of narcotic effect. Use small repeated doses (0.01 to 0.03 mg/kg) titrated to desired effect. (E.g., Improved respiratory function &/or improved LOC/mentation)
Procainamide for Perfusing tachycardias (100 mg/ml and 500mg/ml)	**Loading Dose:** 15 mg/kg IV/IO	Infusion over 30 to 60 minutes: Routine use in combination with drugs prolonging QT interval is ***not*** recommended.
Sodium Bicarbonate (1mEq/ml and 0.5 mEq/ml)	**IV/IO:** 1 mEq/kg per dose	Infuse slowly and only if ventilation is adequate.

* 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 BLS Healthcare Providers

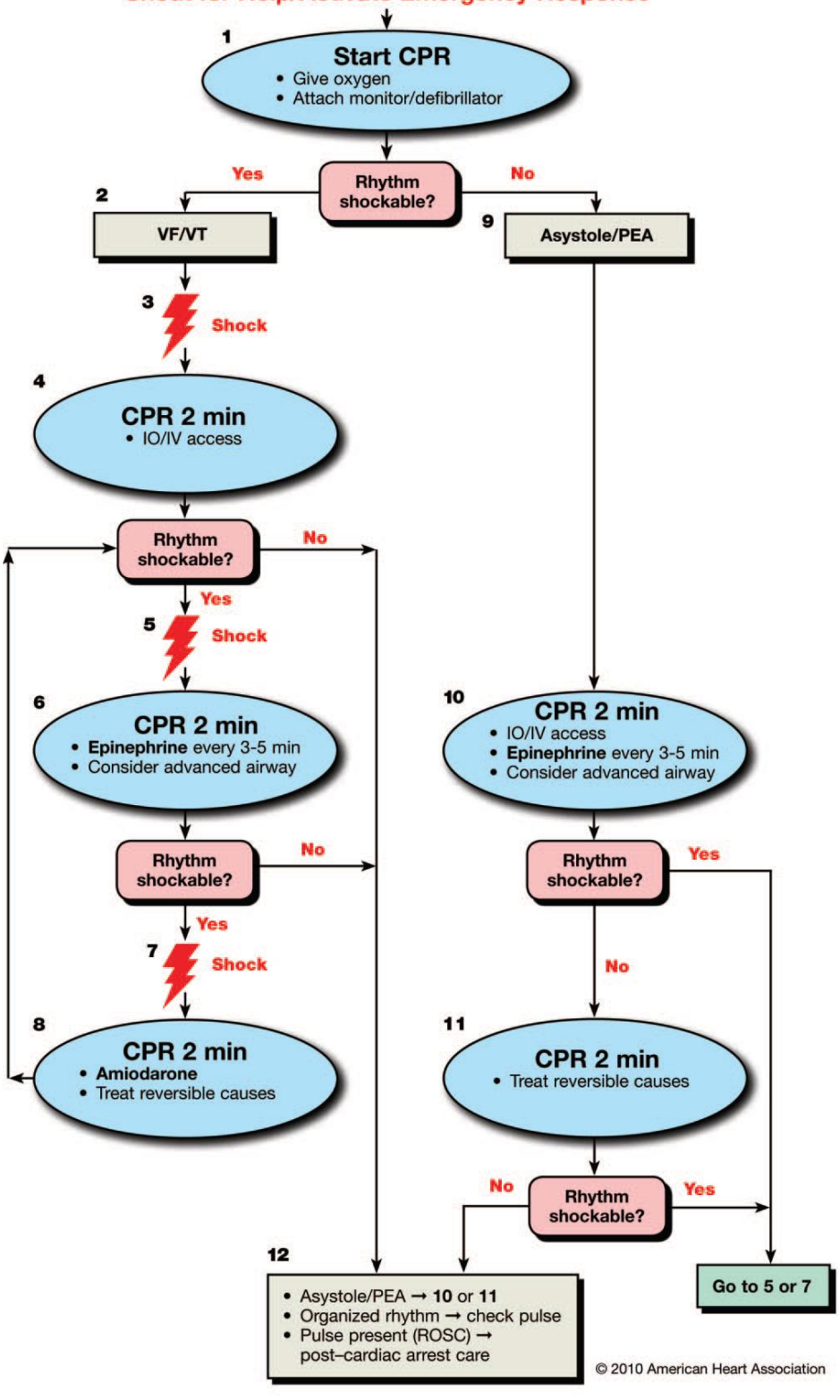


High-Quality CPR

- Rate at least 100/min
- Compression depth to at least ⅓ anterior-posterior diameter of chest, about 1½ inches (4 cm) in infants and 2 inches (5 cm) in children
- Allow complete chest recoil after each compression
- Minimize interruptions in chest compressions
- Avoid excessive ventilation

Note: The boxes bordered with dashed lines are performed by healthcare providers and not by lay rescuers

Pediatric Cardiac Arrest



Doses/Details

CPR Quality

- Push hard (≥1/3 of anterior-posterior diameter of chest) and fast (at least 100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 15:2 compression-ventilation ratio. If advanced airway, 8-10 breaths per minute with continuous chest compressions

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥4 J/kg, maximum 10 J/kg or adult dose.

Drug Therapy

- **Epinephrine IO/IV Dose:** 0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- **Amiodarone IO/IV Dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place give 1 breath every 6-8 seconds (8-10 breaths per minute)

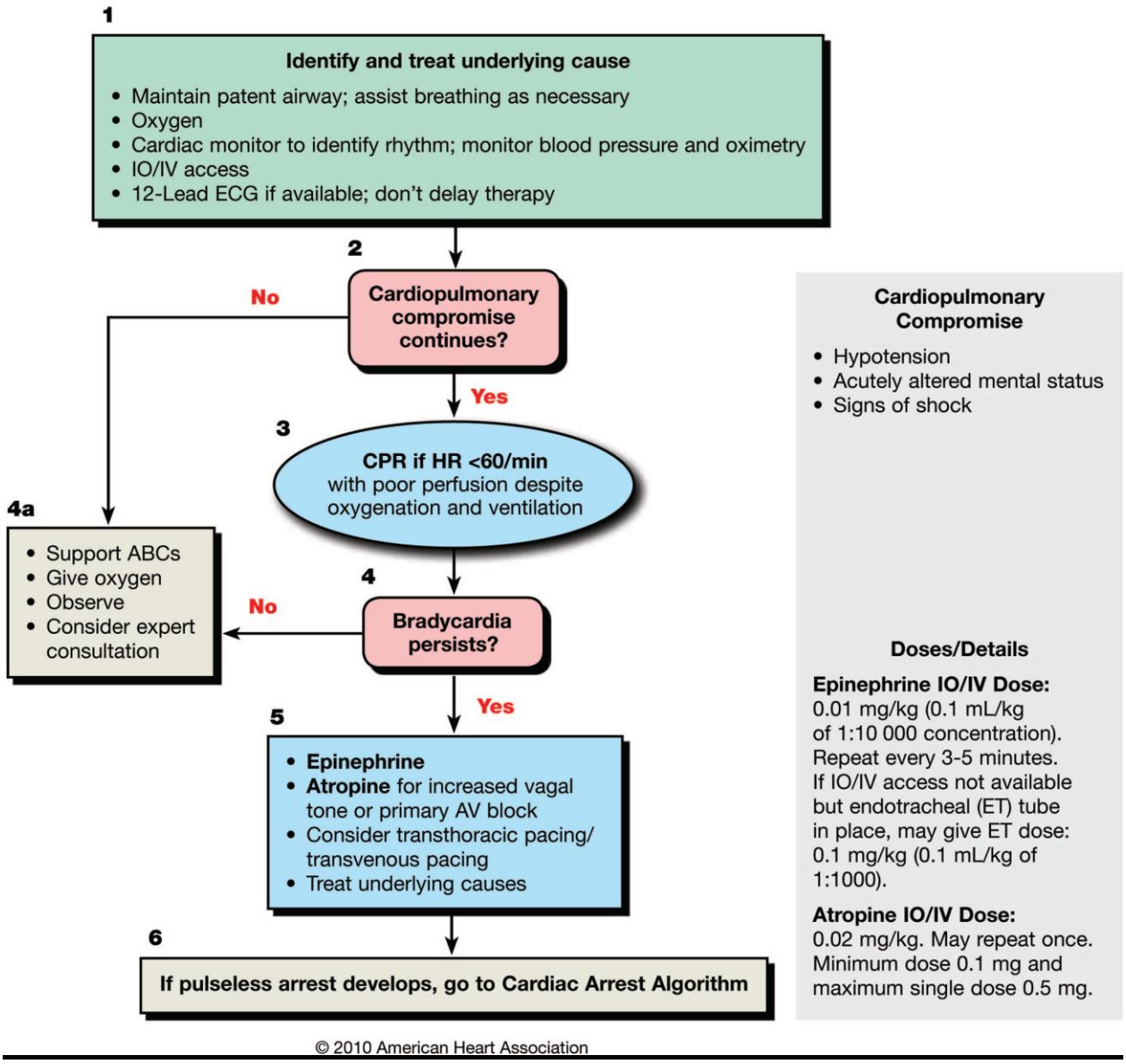
Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

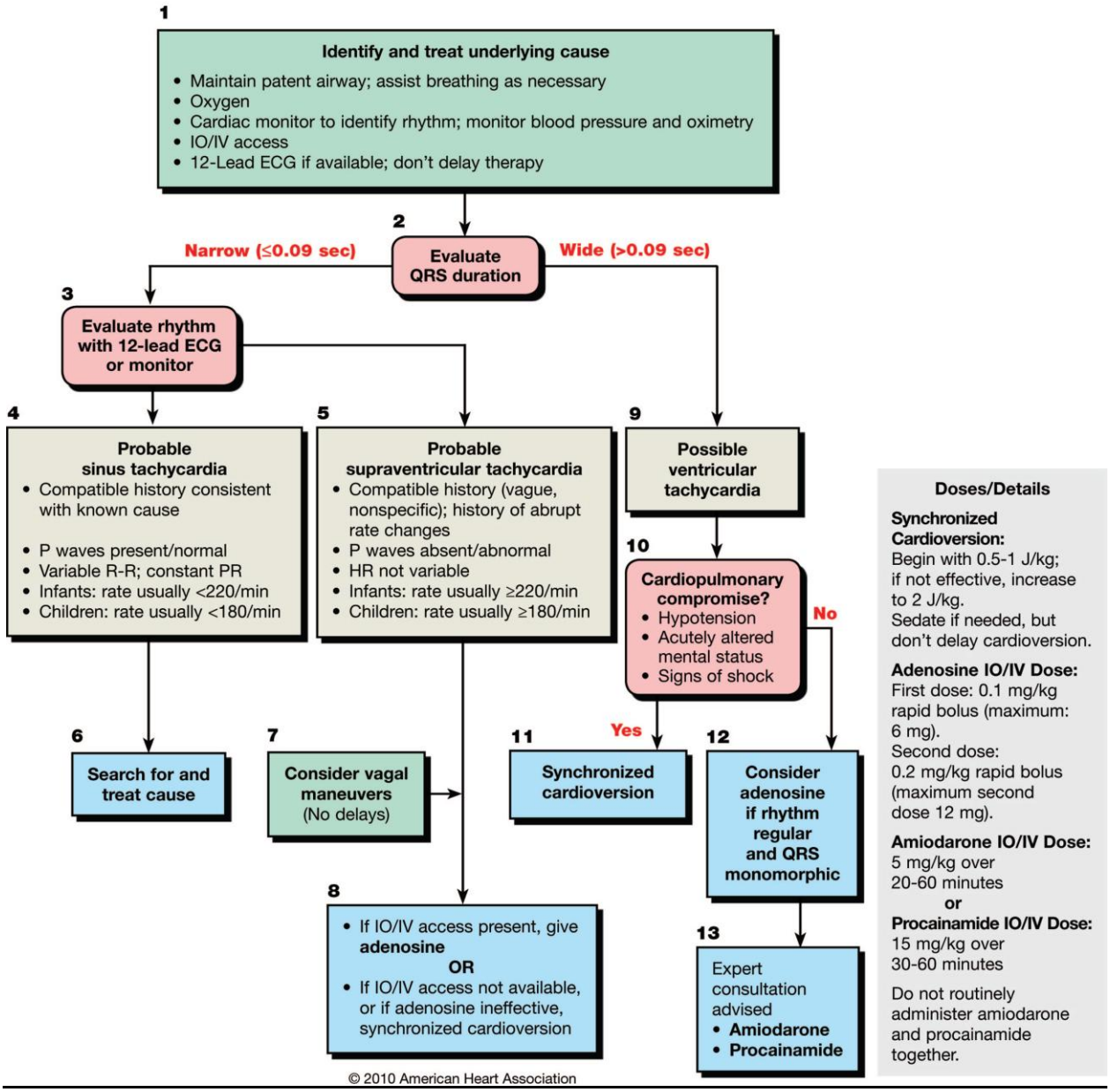
Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypoglycemia
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

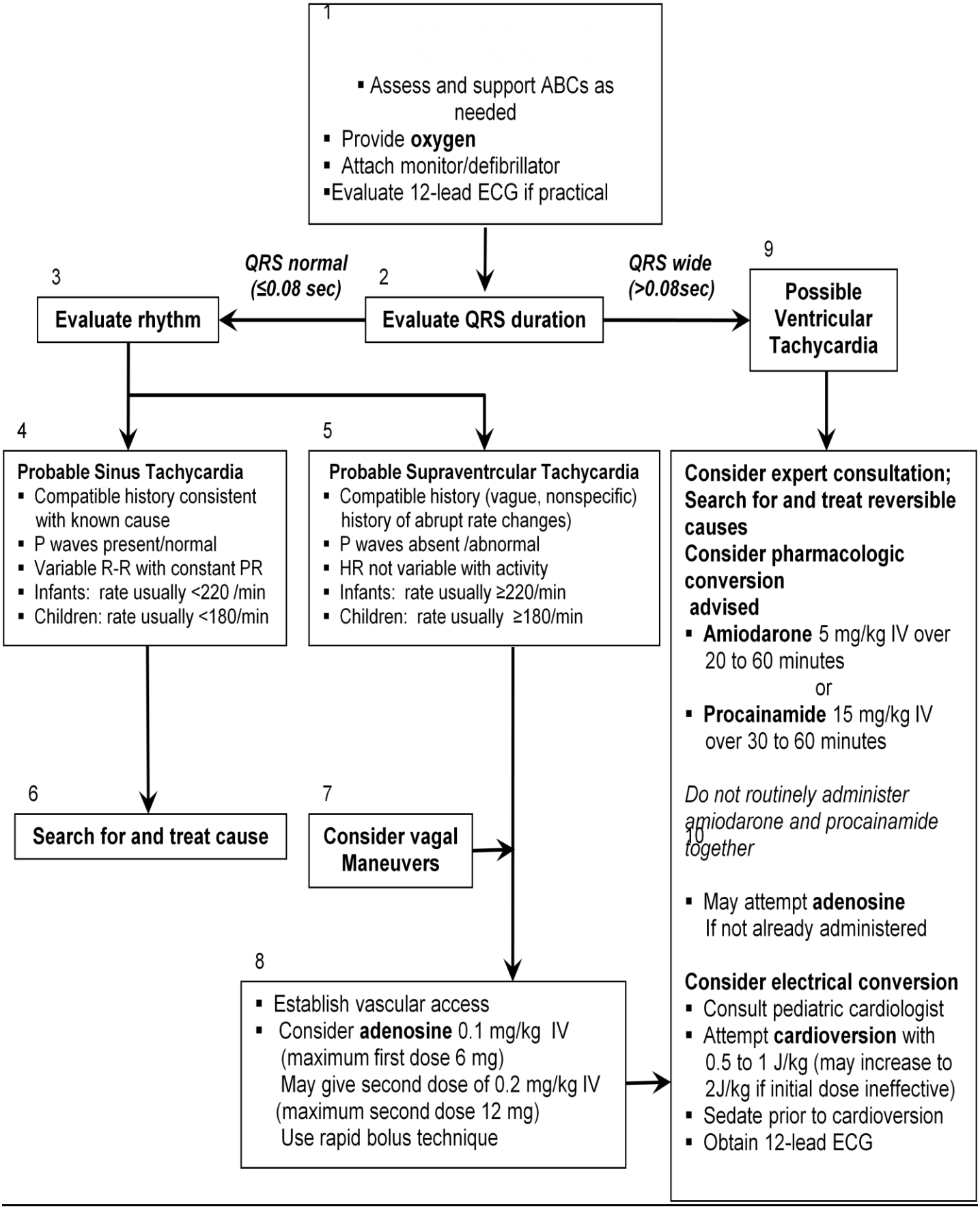
Pediatric Bradycardia
With a Pulse and Poor Perfusion



Pediatric Tachycardia
With a Pulse and Poor Perfusion



PEDIATRIC TACHYCARDIA WITH ADEQUATE PERFUSION Algorithm



Chapter 24 Pharmacology

Guidelines and Considerations:

The key to safe drug use caution and attention to detail. Familiarity with adverse drug effects and being prepared to deal with those effects are paramount to safe drug 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 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, reactive airway/asthma or profound hypotension.
- Local reactions may include GI distress (nausea, vomiting, cramps, diarrhea) and/or dermal presentation, (pruritic skin, Urticaria (hives), local rash).
- Life threatening reactions (**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 the potential for 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/medical warning tags/bracelets.
3. Follow recommended doses.
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 may require maintenance fluids, electrolytes, and nutritional balance.

Caution: Be prepared for anaphylactic reactions at all times; follow anaphylaxis protocol

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.

Routes of Administration:

1. **Oral**: Give adequate fluids
2. **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 degree angle. Aspirate before injection.
3. **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.
4. **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 as long as they are compatible. IV injection through the port of a saline lock should be followed by a saline flush of 5-10 cc's.

Other routes of administration may include:

- Endotracheal (e.g., via ETT – NAVEL meds)
- Intranasal
- Transdermal
- Transmucosal (e.g., OTFC – oral transmucosal fentanyl citrate)
- Ocular instillation (e.g., drops or ointment)
- Rectal (e.g., suppositories)
- Intravaginal (e.g., Monistat-7 for vaginal candidiasis)

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.
- One milliliter is equal to one cubic centimenter: 30 ml=30cc
- 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., heparin, established to determine the effective dosage of medication.

Standard Medications

- **Generic Name (Common Trade name) & Classification**
- **Primary Indications (Rx:)**
- **Primary Contraindications (Contra:) Includes cautions**
- **Dosages (Dose:) Pediatric doses are in italics**
- **Common Side Effects (SE:)**
- **Adverse Reactions (AR):**

ANALGESICS & ANESTHETICS

Acetaminophen (Tylenol): Nonnarcotic analgesic and antipyretic. Blocks generation of pain impulses in the CNS by preventing sensitization of pain receptors.

- **RX**: Mild Pain or fever

- **Contra**: Individuals with hypersensitivity to drug. Cautious use in patients with a history of excessive/chronic alcohol use
- **Dose**: 325-650 mgms PO q 4-6 hours; or 1 gram PO every 6-8 hours
- **SE**: Rash, urticaria,
- **AR**: Hemolytic anemia, liver damage

Aspirin (ASA): Antiplatlet, Anti-inflammatory

- **RX**: Acute myocardial infarction (AMI), Unstable angina
- **Dosage**: 160-325mg po (chewed) one time dose
- **Contra**: Known allergy, use with caution in asthma, ulcers GI bleeding or bleeding disorders
- **SE**: GI bleeding

Transmucosal fentanyl citrate (Actiq): Narcotic analgesic: Alters perception of pain and emotional response to pain. As with all narcotics, have Naloxone (Narcan) readily available.

- **RX**: Moderate to Severe Pain
- **Contra**: Use with caution in patient with known or suspected increased ICP, respiratory depression, decreased kidney or liver function.
- **Dose**: 800 micrograms transbuccally (up to 1 lozenge in each cheek between the cheek and gums) Patient self-administers/titrates initial and additional lozenges to achieve adequate analgesia. Additional doses titrated in 400 microgram increments to desired analgesic effect. Tape the lozenge-on-a-stick to casualty's finger as an added safety measure, or use the rubber-band prusik-knot to shirt technique
- **SE**: Rash, headache, vomiting, nausea, pruritus
- **AR**: Respiratory depression, sedation, decreased BP

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- PEDIATRIC For the acutely injured patient whose initial evaluation is still in progress, fentanyl offers a number of advantages. Fentanyl is metabolized in the liver to inactive compounds; however, this is not significantly altered in liver disease. Onset is within 5 minutes and therapeutic levels are achieved for 20 to 60 minutes. Typically, the opioid-naïve patient in severe pain is safely and effectively treated with an initial dose of 2 to 3 μg/kg of fentanyl. A continuous infusion can sustain therapeutic levels and allow careful titration. In addition, the literature shows growing interest in intranasal administration of fentanyl. This offers the obvious advantage of analgesia without intravenous access. Some studies suggest that a dose of 1.7 μg/kg of intranasal fentanyl is equivalent to 0.1 mg/kg of morphine.[67] In this author's experience, a higher dose of fentanyl (2-3 μg/kg) is required for mild-moderate pain. Oral transmucosal fentanyl is another option; however, effective doses by this route are associated with high rates (25%-50%) of nausea and vomiting.[68] Finally, hydromorphone offers several potential advantages to morphine and fentanyl including fewer allergic reactions, longer duration of action, and somewhat less tolerance when used for prolonged periods.

- PEDIATRIC Opioids are ideally dosed to maintain a steady state serum concentration and avoid peaks and troughs. Once pain control is achieved, it is important to anticipate the need for boluses of analgesia. Even small movements, turning the patient or inadvertently bumping a chest tube or endotracheal tube can cause significant exacerbations of pain. The patient with a femur fracture may appear to have good pain control when lying motionless but quickly loses that control when moved. Before moving the patient for x-rays or other reasons, consider a small (1-2 μg/kg of fentanyl) bolus administered several minutes in advance of anticipated

movement. If the patient seems excessively sedated fentanyl also has the advantage of a relatively short half-life. If opioid reversal is necessary in a stable but excessively sedated patient physicians should begin cautiously with small doses of naloxone (0.001 mg/kg per dose) to avoid excessive blockade of opioid and resulting severe pain.

Caution: Monitor for respiratory depression and if needed, reverse by IV titration of Naloxone (to respiratory effect). Ensure all unused portions are disposed of properly.

Ketamine (Dissociative Anesthetic)

Rx: For severe pain relief , prior to painful extraction, and sedation

Dose: Pain- 25 mg IM/IV q 5 min PRN
Sedation- 1-2 mg/kg IV or 2 mg/kg IM initial dose followed by 0.5 – 1 mg/kg IV q 2 min PRN

NOTE: avoid in known or suspected head trauma

NOTE: give Valium 2mg- IV or 5 mg IM for reaction of bizarre behavior (dysphoria), or agitation.

NOTE: use lower doses of opiates along with Ketamine for better pain control if desired

Contra: head injury, seizures, respiratory infection, glaucoma, cardiac problems, psychosis

SE: N/V, nystagmus, lacrimation/excess secretions,(suction), rare respiratory depression or laryngospasm

AR: dysphoria/ bizarre or psychotic behavior, increase heart rate/BP

Ibuprofen (Motrin): 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, 3rd trimester pregnancy.

Note: Should not be given to patients with a history of aspirin sensitivity or severe asthma.

- **SE**: nausea, vomiting, headache, dizziness, drowsiness
- **AR**: Prolonged bleeding time, tinnitus, edema, peptic ulcer

Ketorolac Tromethamine (Toradol): 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 w/in 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

Mobic (Meloxicam): NSAID (nonsteroidal anti-inflammatory)

- **RX**: Relief of the signs and symptoms of osteoarthritis and rheumatoid arthritis. Mild to moderate pain relief
- **Dose**: 7.5 mg or 15 mg daily. The maximum recommended daily oral dose is 15 mg.
- **Contra**: Allergy to NSAID class of drugs or Aspirin.
- **SE**: Allergic reaction, Anaphylactoid reactions including shock, Facial edema, Fatigue, Fever, Hot flashes, Malaise, Syncope, Dyspepsia

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

- **Rx**: Severe Pain, CHF. Alters perception & emotional response to pain
- **Contra**: Respiratory depression, hypotension, head injury
- **Dose**: 4-15 mg IV/IM slow push. Titrate to response. **Peds:** 0.1-0.2 mg/Kg IM/IV (max: 15 mg)
- **SE**: decreased RR, hypotension, bradycardia, N & V, dizziness, pruritus and skin flushing
- **AR**: Seizures with large doses, constipation, ileus, urinary retention
  Michael Greenwald, MD Pediatrics and Emergency Medicine, Emory University School of Medicine, Children's Health care of Atlanta, Atlanta, GA

- PEDIATRIC Morphine, the "gold standard" analgesic, has a relatively slow onset of action and a half-life of 2 to 3 hours. It is typically dosed as 0.05 to 0.1 mg/kg for the opioid-naïve patient in severe pain. Subsequent dosing of 0.02 to 0.05 mg/kg should take place every 10 minutes to desired level of analgesia. Although morphine is perhaps the most familiar opioid, it is sometimes not the ideal medication for trauma patients. Disadvantages include a slower onset, higher incidence of allergic reactions due to histamine release, more venodilation and risk of hypotension, and greater effects on gastrointestinal motility than other commonly used opioids.

Naloxone HCL (Narcan): Narcotic antagonist.

- **Rx**: Known or suspected narcotic induced respiratory depression.

Note: Have available when using any opioid narcotic (ie morphine, fentanyl).

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 SQ 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.

Proparacaine 0.5% Ophthalmic drops (Alcaine, Ophthaine, Ophthetic):

- **RX**: As a topical optic anesthetic (may aid in ocular exam to relieve blepharospasm); removal of foreign bodies
- **Dose**: 1 or 2 drops 2 to 3 minutes before procedure; or every 5 to 10 minutes for up to three doses
- **Contra**: Patients with hypersensitivity to ester-type local anesthetics, PABA or its derivatives. Use cautiously in patients with cardiac disease and hyperthyroidism. Not for prolonged use: may delay wound healing. Do not use discolored solution; keep opened containers in a cool place
- **SE**: None significant
- **AR**: Conjunctival redness, transient eye pain, hypersensitivity reactions

(Xylocaine) Lidocaine HCL 2%: 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: This is a different max dose than with IV lidocaine for ACLS use. 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 AV block, hypotension, Stokes-Adams Syndrome
- **SE**: slurred speech, altered mental status, tinnitus, edema
- **AR**: dermatologic reactions, status asthmaticus, anaphylaxis, and seizures

ANTIBIOTICS

CEPHALOSPORINS – GENERAL ANTIMICROBIAL SPECTRUM

1ST GENERATION: Gram positive (including Staph aureus); basic gram negative coverage. Examples: cefazolin, cephalexin, cefadroxil

2nd GENERATION: diminished Staph aureus, improved gram negative coverage compared to 1st generation; some with anaerobic coverage. Examples: cefotetan, cefoxitin, cefuroxime

3rd GENERATION: further diminished Staph aureus; further improved gram negative coverage compared to 1st and 2nd generation; some with Pseudomonal coverage & diminished gram positive coverage. Examples: ceftriaxone, cefotaxime, cefpodoxime, cefixime, cefoperazone.

QUINOLONES – GENERAL ANTIMICROBIAL SPECTRUM

1ST GENERATION:gram negative (excluding Pseudomonas), urinary tract only.Example: nalidixic acid

2nd GENERATION: gram negative (including Pseudomonas); Staph aureus but not Pneumococcus; some atypicals. Examples: ciprofloxacin, norfloxacin, ofloxacin

3rd GENERATION: gram negative (including Pseudomonas); gram positive (including Staph aureus and Pneumococcus); expanded atypical coverage. Example: levofloxacin

4th GENERATION: same as 3rd generation: plus broad anaerobic coverage. Examples: gatfloxacin, moxifloxacin, trovafloxacin

Cefotetan (Cefotan): Broad spectrum bactericidal antibiotic for IV/IM use (2nd gen 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

Cefoxitin sodium (Mefoxin): Broad spectrum antibiotic for IV/IM use (2nd gen cephalosporin). Similar to Rocephin, but covers GI organisms better. Does not cover CNS infections or penetrating trauma to CNS. Similar in coverage to Cefotetan.

- **Rx**: As an alternative to ceftriaxone. 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, increase temperature
- **AR**: eosinophilia, thrombocytosis, leukopenia; pain at injection site; induration, sterile abscess, tissue sloughing, phlebitis; thrombophlebitis with IV use

Ceftriaxone sodium (Rocephin): Broad spectrum bactericidal antibiotic for IV/IM use (3rd gen (cephalosporin)

- **Rx**: Serious 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. Draw 10cc NaCl from a 100cc bag. Inject 10cc NaCl into 1 gm Rocephin vial. Mix.
  2. 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, fever
- **AR**: eosinophilia, thrombocytosis, leukopenia; pain at injection site; induration, sterile abscess, tissue sloughing, phlebitis; thrombophlebitis with IV use

Cephalexin (Keflex): Broad spectrum bactericidal oral antibiotic (1st gen cephalosporin)

- **Rx**: Respiratory, genitourinary 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. Peds: 25-50 mg/kg/day divided q 6h.
- **SE**: dizziness, headache, malaise, nausea, vomiting, diarrhea, urticaria
- **AR**: neutropenia, eosinophilia, anemia, parethesias, abdominal cramps, skin disorders

Ciprofloxacin (Cipro): Broad spectrum oral antibiotic (2nd gen 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, parethesias, blurred vision, diplopia, tinnitus, joint or back pain, gout, acidosis, HTN, angina, AMI, bronchospasm

Ciprofloxan Hydrochloride Ophthalmic Solutions (Ciloxan): Ophthalmic antibacterial. Inhibits bacterial DNA gyrase, an enzyme needed for bacterial replication. May be bacteriostatic or bactericidal, depending on concentration

- **RX**: Corneal Ulcers and bacterial conjunctivitis
- **Contra**: Hypersensitivity to ciprofloxin or other fluoroquinolones
- **Dose**: For Corneal Ulcerations
  - Day 1: Two drops in affected eye every 15 minutes for the first 6 hours; then 2 drops every 30 minutes for the remainder of first day
  - Day 2: Two drops hourly
  - Day 3-14: Two drops every 4 hours
- For Bacterial Conjunctivitis
  - Day 1-2: One to two drops into conjunctival sac of affected eye every 2 hours while awake
  - Day 3-7: One to two drops every 4 hours while awake
- **SE**: Local burning or discomfort, foreign body sensation, corneal staining tearing, margin crusting, bitter/bad taste in mouth
- **AR**: Prolonged use may result in overgrowth of nonsusceptible organisms, including fungi

Ertapenem (Invanz): Classification: Broad spectrum beta-lactam antibiotic for IV/IM use in adults

- **RX**: Treatment of moderate to severe bacterial infections (pelvic, intraabdominal, urinary, pulmonary, skin and soft tissues). In the tactical environment, Ertapenem is indicated for wounded casualties in whom oral antibiotics are contraindicated (i.e., clinical shock &/or depressed level of consciousness)
- **Contra**: Patients with a known history of hypersensitivity to beta-lactam antibiotics (i.e., penicillins, cephalosporins).
- **Dosing**:
  - **Intravenous** – 1 gram IV q. 24 hours for up to 14 days. Inject 10 mL of 0.9% normal saline into 1 gram vial of Ertapenem. Shake well to thoroughly dissolve then immediately transfer to 50 mL (or larger) bag of IV Normal Saline for rapid IV infusion or bolus. If nausea occurs following rapid IV infusion of Ertapenem, consider giving 12.5-25 mg of promethazine IV.
  - **Intramuscular** – 1 gram IM q. 24 hours up to 7 days. Inject 3.2 – 3.5 mL of 1% lidocaine without epinephrine into 1 gram vial of Ertapenem. Shake well to form solution and thoroughly dissolve all medication. Immediately withdraw the entire contents of the vial and administer by deep IM injection into a large muscle mass such as the gluteal muscles or the lateral part of the thigh. The reconstituted medication for IM injection should be used within one hour of mixing.
- **SE**: Diarrhea, nausea, headache, vomiting, pain at injection site
- **AR**: Seizures, induration, sterile abscess, tissue sloughing; with IV use, phlebitis/thrombophlebitis.

-

Moxifloxacin (Avelox): Broad spectrum antibiotic with broad anerobic coverage for PO/IV administration (4th gen quinolone). Inhibits DNA preventing cellular replication and division

- **RX**: Acute exacerbation of chronic bronchitis, sinusitis, community-acquired pneumonia; and treatment of UTI, Complicated skin and skin structure infections, including diabetic foot infections, Complicated intra-abdominal infections, including polymicrobial infections such as abscesses Contra: Hypersensitivity to fluroquinolones; uncorrected hypokalemia
- **Dose**: 400 mg/day PO/IV for 7 to 14 days, IV infusion should be over 60 minutes, Avoid use with antacids; Decrease dose in renal impairment, Avoid using with antiarrhythmics-May cause prolonged QT interval
- **SE**: HA, nausea, diarrhea, photosensitivity,insomnia, vertigo,
- **AR**: Tendon rupture, use cautiously with NSAIDs due to increased CNS stimulation; prolonged **QT** interval, abnormal dreams

Polymyxin B/Bacitracin Ophthalmic Ointment(Polysporin Ophthalmic):

- **RX**: Superficial eye infections involving conjunctiva and cornea resulting from infection with Pseudomonas or other gram neg organism. Bactericidal.
- **Dose**: Apply a small amount of ointment into conjunctival sac one or more times daily or as needed until favorable response is observed
- **Contra**: Known hypersensitivity to any ingredient meds
- **SE**: Temporary blurred vision with ointment (few minutes)
- **AR**: Lid itching, selling, conjuncitival erythema

Tobramycin Ophthalmic Ointment/Solution (Tobrex): Ophthalmic antibiotic. Not to be confused with Tobradex or Trobicin

- **RX**: External ocular infection
- **Contra**: Known hypersensitivity to aminoglycosides
- **Dose**: Instill 1-2 drops into affected eye every 4 hours, or apply thin strip (1cm long) of ointment every 8-12 hours. In severe infections, instill 2 drops into infected eye every 30-60 minutes until condition improves then decrease frequency, or apply a thin strip of ointment every 3-4 hours until improvement, then reduce frequency
- **Proper Instillation of eye drops/ointment**
    - Wipe excessive exudates from area
    - Allow at least 5 minutes between instillation of 2 different solutions
    - Apply light pressure on lacrimal sac for 1 minute after drops are instilled
- **SE**: Burning or tingling on instillation, blurred vision with ointment, increased tearing
- **AR**: Lid itching or swelling, conjuctival erythema

Silvadene Cream (Silver sulfadiazine): Topical microbial

- **Rx**: Treatment and prevention of infection 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 silvadene 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

ANTIHISTAMINES

Diphenhydramine HCL (Benadryl): 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 q.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, breastfeeding females, increased intraocular pressure
- **SE**: sedation, blurred vision, nausea, vomiting, diarrhea, headache
- **AR**: insomnia, vertigo, palpitations, dry mouth, constipation, dysuria, urine retention

Promethazine Hydrochloride (Phenergan): Antihistamine. Prevents but does not reverse histamine mediated response. Phenergan can induce an acute dystonic reaction (symptoms may resemble a stroke). Treat with 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/IV q 4-6 h prn. (IM Injection is painful).
  - **Peds:** 0.5-1mg/Kg IM/IV q6-8h prn (max dose:25 mg) Give IV dose slowly (> 5 min) and through a free flowing IV line (not a saline lock). Dilute the 50-mg/ml formulation 25 mg/ml (50/50 dilution) or less giving IV. Dose: 12.5-25 mg q 6-8 h prn
- **Contra**: Additive effect w/ ALL other sedation medications. 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

Ranitidine (Zantac): 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 h for ulcers, burns, steroid use, GI bleeds, Urticaria,anaphylaxis. Oral dose: 150 mg BID. for ulcer, urticaria. **Peds:** 2-4 mg/kg/day IM/IV divided q 6-8 hrs
- **Contra**: Known/suspected liver disease
- **SE**: Headache, diarrhea/constipation, muscle aches, vertigo, dry mouth, nausea, vomiting
- **AR**: Thrombocytopenia, liver toxicity.

ANTI-INFLAMMATORIES

Dexamethasone (Decadron): Parenteral steroid. (glucocorticoid)

- **Rx**: Emergency treatment of AMS, HACE 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**: Loading dose for HACE: 8 mg IV/IM and then 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

Ibuprofen (Motrin): 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) and not to be taken for more than 7-10 days without physician supervision
- **Contra**: Penetrating trauma, suspected internal bleeding, or suspected intracranial bleeding, 3rd trimester pregnancy. **Note:** Should not be given to patients with a history of aspirin sensitivity or severe asthma.
- **SE**: nausea, vomiting, headache, dizziness, drowsiness
- **AR**: Prolonged bleeding time, tinnitus, edema, peptic ulcer

Ketorolac Tromethamine (Toradol): 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 w/in 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

Methylprednisolone (Solumedrol): Parenteral steroid. Decreases inflammation, reduces immune response in allergic conditions. (glucocorticoid)

- Rx: Severe inflammation, severe asthma, severe allergic reaction, anaphylaxis.
- 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)
  -
  - All persons started on the Solu-Medrol protocol should also receive ulcer prophylaxis of Ranitidine (Zantac) 50 mg IV or IM every 6-8 hours, or 150 mg po 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

MISCELLANEOUS

Albuterol: Sympathetic agonist selective for Beta-2 receptors

- **Rx**: Asthma, reversible bronchospasm associated with acute and chronic bronchitis
- **Dose**: 2 MDI puffs every 4-6 hours, or more often as needed for severe bronchospasm
- **Contra**: Known hypersensitivity to albuterol
- **SE**: Palpitations, anxiety, dizziness, headache, nausea
- **AR**: Arrythmias, chest pain, hypertension

Amyl Nitrite: Cyanide antidote

- **Rx**: Cyanide poisoning
- **Dose**: One to two ampules should be crushed and inhaled
- **Contra**: No contraindications when used to treat cyanide poisoning
- **SE**: Headache, weakness, dizziness, flushing, nausea, tachycardia
- **AR**: Syncope

Atropine Sulfate: Vagolytic

- **Rx**: Organophosphate or chemical poisoning, symptomatic bradycardia **Note:** Successful treatment of organophosphate or chemical exposure may require mass quantities and repeated administration of atropine.
- **Dose**:
  - Bradycardia: 0.5-1.0 mg q. 5 minutes (max total dose: 3 mg or 0.04 Mg/Kg).
  - Organophosphate poisoning: 2-5 mg IV q 15-30 minutes (treat symptoms, no max dose)
  - Pediatric: 0.015 mg/Kg up to a maximum dose of 0.04 mg/Kg.
- **Contra**: A-fib, A-flutter, glaucoma. Use extreme caution if Type ll AV block, 3rd degree block.
- **SE**: Dilated pupils, ↑HR, VT, VF, dry mouth
- **AR**: Delirium

Acetazolamide (Diamox): Non-diuretic antihypertensive (carbonic anhydrase inhibitor)

- **Rx**: Prevention and/or amelioration of symptoms associated with acute mountain sickness (AMS) in climbers attempting rapid ascent and those susceptible to AMS despite gradual ascent. Of minimal benefit in treatment of AMS, HACE, or HAPE
- **Dose**: 250mg PO bid or 500 mg (sustained release) PO qd. Start 24-48 hrs prior to ascent & cont until 48 hrs after peak ascent.
- **Contra**: Sulfa allergy.
- **SE**: Paresthesia in extremities, hearing dysfunction/tinnitus, loss of appetite, taste alterations, nausea, vomiting, diarrhea, polyuria, drowsiness and confusion.

Note: Use of Diamox results in a significant alteration in taste, carbonated beverages may be undrinkable. Diamox has diuretic effects → serious dehydration therefore increase fluid intake.

- **AR**: Transient myopia, urticaria, hematuria, flaccid paralysis, photosensitivity, convulsions.

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

- **Rx**: Acute anxiety, seizures/status epilepticus, muscle spasms, seizures due to nerve agent or organophosphate exposure. Valium has NO analgesic or anesthetic properties. Overdose may be reversed w/ Romazicon (Flumazenil) but may cause intractable seizures.
- **Dose**:
  - Status Epilepticus: 5-10 mg IV slow push
  - Acute anxiety: 5-15 mg IV slow push
  - Relaxation of skeletal muscle spasms: 5-15 mg IV slow push
  - Chemical Warfare/Organophosphates: 10-15 mg IV slow push (auto injector)

Note: Successful treatment of convulsions from organophosphate or chemical exposure may require large quantities and repeated administration of Diazepam (Valium).

- **Contra**: head injury, low 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, nausea,vomiting
- **AR**: bradycardia, CV collapse, amnesia, abdominal discomfort

Epinephrine (Adrenaline): 1st line drug for anaphylaxis & cardiac arrest. Causes bronchodilatation, vasoconstriction, increases BP and decreases edema/swelling due to allergic reactions.

Note: 1:1,000 dilution Epi (1mg in 1 cc) is standard Pararescue issue. 1:10,000 dilution Epi (1 mg in 10cc) is the standard 'Cardiac' concentration. May dilute 1:1,000 Epi to the 1:10,000 concentration by putting 1 cc of 1:1,000 Epi (1 mg epinephrine) in 9 cc of normal saline (total volume of 10 cc).

- **Rx**: Anaphylaxis, Allergic reactions (mild/moderate/severe), & Asthma
- **Dose**:
  - Anaphylaxis: 0.5 to 1 mL of 1:10,000 given over 10 minutes IV (5-10 mcg/min) [prepare as infusion: Put 1 mL of 1:1,000 Epi into 500 mL of NS (or 2 mL of 1:1,000 in 1 liter of NS) to make a 2 mcg/mL Epi concentration] or 0.3-0.5 mg (0.3-0.5 cc of 1:1,000 dilution) IM
  - Allergic reaction: 0.3-0.5 mg (0.3-0.5 cc of 1:1,000 dilution) IM
  - Asthma: 0.3-0.5 mg (0.3-0.5 cc of 1:1,000 dilution) IM
  - Pediatric: 0.01 mg/Kg IM. Not to exceed 0.5 mg
- **Contra**: 1:1,000 Epi is **NOT** given IV. Use caution in patients with a history of heart disease or over the age of 40. Do not inject 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

Hetastarch in NaCl (Hespan): Plasma Volume Expander (Artificial Colloid) Hextend (Hetastarch in lactated electrolyte solution [balanced salt solution]). Plasma Volume Expander (Artificial Colloid)

NOTE: Hespan, and Hextend are artificial colloids used to expand the plasma volume. These products give more volume expansion (compared to the same amount of crystalloids(NS or LR)) for a longer period of time. They are not blood or plasma replacements (no oxygen carrying capacity and no coagulation properties). These products should not be used to treat dehydrated patients.

- **Rx**: Treatment of shock secondary to hemorrhage.
- **Dose**: If in shock, first control any extremity hemorrhage, then:
  - Hextend® 500 mL IV bolus
  - Repeat once after 30 minutes if still in shock
  - No more than 1000 mL of Hextend®
- **Contra**: Known bleeding disorders or uncontrolled hemorrhage; CHF or renal impairment; not for use in children under 12 years. Use with caution in pregnancy.
- **SE**: Nausea/vomiting, peripheral and facial edema, urticaria, flushing chills
- **AR**: Severe anaphylaxis (rare)

Loperamide HCL (Imodium): Antidiarrheal (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: Best course of action for acute diarrhea is to allow it to "run its course". Ensure good 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 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

Mannitol: Osmotic diuretic

- **Rx**: ICP; Myoglobinuria secondary to crush syndrome and rhabdomyolysis
- **Dose**: If the patient shows signs of herniation (papillary dilation, hypertension and bradycardia, progression to decerbrate posturing) consider using Mannitol 1 g/kg bolus IV, followed by 0.25 g/kg rapid push q 4 hrs. NOTE: Do not use mannitol in hypotensive or under-resuscitated casualties. Takes effect w/in minutes of administration and can last 6-8 hours. Increases urine flow, making this an unreliable indicator of resuscitation.
- **Contra**: suspected/actual renal failure, suspected/actual intracranial hemorrhage
- **SE**: headache, nausea/vomiting, blurred vision, dizziness, rash, dehydration
- **AR**: seizures, pulmonary edema, cardiovascular collapse

Ondansetron (Zofran): Anti-serotonergic (blocks action of serotonin 5-HT_3 receptor). Orally disintegrating tablets contain phenylalanine.

- **Rx**: Motion sickness, nausea and vomiting.
- **Dose**: 4-8 mg PO/IM/IV q 6h prn. (IM Injection is painful & not as effective as IV). **Peds:** 2-4 mg PO/IM/IV q 6 hrs prn. (For children < 20 kg use dose of 0.1mg/kg IV) .
- **Contra**: Severe liver disease (don't exceed 8 mg total dose per day), known hypersensitivity
- **SE**: transient dizziness after IV injection, dry mouth, constipation, malaise, fatigue, headache, dizziness, diarrhea, constipation, fever
- **AR**: bronchospasm, anaphylaxis, transient blindness, QT prolongation

Oxymetazoline HCL (Afrin Nasal Spray): 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.
- **Contra**: Severe damage to tympanic membrane/sinuses from barotrauma (see Barotrauma)
- **SE**: Burning, sneezing and stinging of nasal mucosa
- **AR**: Rhinitis

Pralidoxime (2-PAM): Cholinesterase reactivator

- **Rx**: Used as an adjunct for severe organophosphate and nerve agent exposure
- **Dose**: 1-2 grams of 2-PAM placed in 500 cc of NS and infused over 30 minutes
- **Contra**: Should not be used in poisioning from carbamate insecticides or inorganic phosphates
- **SE**: salivation, dizziness, nausea, vomiting, blurred vision
- **AR**: Tachycardia, altered mental status

Sodium Nitrite: Cyanide Antidote

- **Rx**: Suspected cyanide poisoning
- **Dose**: Adult – 300 mg slow IV. Peds – 10 mg/kg IV
- **Contra**: Do not administer to asymptomatic patients. Do not administer if smoke inhalation also exists unless hyperbaric oxygen is available.
- **SE**: Hypotension with rapid IV push.

Sodium Thiosulfate: Cyanide Antidote

- **Rx**: Suspected cyanide poisoning, in conjunction with sodium nitrite
- **Dose**: Administer after sodium nitrite. Adults: 50 gm IV over 10 minutes. Peds: 400 mg/kg over 10 minutes.
- **Contra**: None
- **SE**: Nausea, vomiting, joint aches
- **AR**: Psychosis with high doses

ADVANCED CARDIAC LIFE SUPPORT DRUGS

Adenosine(Adenocard): Antiarrhythmic

- **Rx**: PSVT, WILL NOT convert atrial flutter, atrial fibrillation, or VT
- **Dose**: 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
- **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 potentiated by dipyridamole & carbamazepine

NOTE: warn patients that adenosine will make them feel like they are going to die but the sensation will pass quickly

Aspirin (ASA): Antiplatlet, Anti-inflammatory

- **RX**: Acute myocardial infarction (AMI), Unstable angina
- **Dose**: 160-325mg po (chewed) one time dose
- **Contra**: Known allergy, use with caution in asthma, ulcers GI bleeding or bleeding disorders
- **SE**: GI bleeding

Atropine sulfate: Vagolytic

- **Rx**: 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.
- **Dose**: 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). Administration of less than 0.5 mg can produce a paradoxical bradycardia. **Peds:** 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 ll AV block and in 3rd degree block.
- **SE**: Dilated pupils, ↑HR, VT, VF, dry mouth
- **AR**: Hypotension, CNS anticholinergic effects

Dopamine (Intropin): Adrenergic Inotropic Vasopressor

- **Rx**: Cardiogenic shock or significant hypotension in the absence hypovolemia secondary to hemorrhage. 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, N & V and ischemia
- **AR**: AMI, tissue necrosis from extravasation

Mix 400mg in 250ml of D5W (1600μg/ml)															
	Body Weight														
Dose ordered in μg/kg/min	**lbs**	**88**	**99**	**110**	**121**	**132**	**143**	**154**	**165**	**176**	**187**	**198**	**209**	**220**	**231**	**242**
	kg	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**
	Amount to infuse in μgtts/min or ml/hr															
2.5		**4**	**4**	**5**	**5**	**6**	**6**	**7**	**7**	**8**	**8**	**8**	**9**	**9**	**10**	**10**
5		**8**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
7.5		**11**	**13**	**14**	**15**	**17**	**18**	**20**	**21**	**2.1**	**24**	**25**	**27**	**28**	**30**	**31**
10		**15**	**17**	**19**	**21**	**23**	**24**	**26**	**28**	**30**	**32**	**34**	**36**	**38**	**39**	**41**
12.5		**19**	**21**	**23**	**26**	**211**	**30**	**33**	**35**	**38**	**40**	**42**	**45**	**47**	**49**	**52**
15		**23**	**25**	**211**	**31**	**34**	**37**	**39**	**42**	**45**	**48**	**51**	**53**	**56**	**59**	**62**
10		**30**	**34**	**38**	**41**	**45**	**49**	**53**	**56**	**60**	**64**	**68**	**71**	**75**	**79**	**83**
15		**23**	**25**	**28**	**31**	**34**	**37**	**39**	**42**	**45**	**48**	**51**	**53**	**56**	**59**	**62**
20		**30**	**34**	**38**	**41**	**45**	**49**	**53**	**56**	**60**	**64**	**68**	**71**	**75**	**79**	**83**
25		**38**	**42**	**47**	**52**	**56**	**61**	**66**	**70**	**75**	**80**	**84**	**89**	**94**	**98**	**103**
30		**45**	**51**	**56**	**62**	**67**	**73**	**79**	**84**	**90**	**96**	**101**	**107**	**113**	**118**	**124**
35		**53**	**59**	**66**	**72**	**79**	**85**	**92**	**98**	**105**	**112**	**118**	**125**	**131**	**138**	**144**
40		**60**	**68**	**75**	**83**	**90**	**98**	**105**	**113**	**120**	**128**	**135**	**143**	**150**	**158**	**165**
45		**68**	**76**	**84**	**93**	**101**	**110**	**118**	**127**	**135**	**143**	**152**	**160**	**169**	**177**	**186**
50		**75**	**84**	**94**	**103**	**111**	**122**	**131**	**141**	**150**	**159**	**169**	**178**	**188**	**197**	**206**
	-Administer 2.5-5μg/kg/min initially **-Increase increments of 5-10μg up to 50μg/kg/min as needed** **-Do not mix with sodium bicarbonate**															

Epinephrine 1:10,000 (Adrenaline): Antiarrhythmic

- **Rx**: Cardiac arrest from ventricular fibrillation or pulseless ventricular tachycardia unresponsive to initial countershocks; asystole, or pulseless electrical activity.
- **Dose**: Cardiac arrest: 1 mg (1:10,000) IV push followed by 20 cc saline flush q. 3-5/min. **Peds:** 0.01 mg/Kg IVP
- **Contra**: tachydysrhythmias, coronary artery disease

  Caution: Use extreme caution in pts with Type ll 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

Epinephrine Drip										
For a 1-10 mcg/min drip rate: Mix 1mg in 250ml of D5W. Run drip at desired rate.										
mcg/min	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Mcgtts/min or ml/hour	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**

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

Lidocaine Hydrochloride 2% (Xylocaine): Anti-arrhythmic

- **Rx**: Cardiac arrest, pulseless VT/VF. Second line antiarrhythmic agent (behind amiodarone) for use in the treatment of pulseless ventricular tachycardia and ventricular fibrillation.
- **Dose**: Adults: initial 1 to 1.5 mg/kg IV, may repeat 0.5 to 0.75 mg/kg IVP q 5-10 min to a max total dose of 3 mg/kg. Peds: 1 mg/kg rapid IV/IO push, max dose: 100 mg. Infusion: 20 to 50 mcg/kg/min
- **Contra**: 2nd degree, 3rd degree AV block, hypotension, Stokes-Adams Syndrome, wide compol

  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, uticaria, hives.**

Lidocaine Drip				
For a 1-4mg/min drip rate: Mix 1 gm in 250 ml D5W. Run drip at desired rate.				
Mg/min	**1mg**	**2mg**	**3mg**	**4mg**
Mcgtts/min	**15gtts**	**30gtts**	**45gtts**	**60gtts**
Reduce maintenance infusion by 50% if pt is >70 y.o., has liver disease, CHF, or in shock				

Nitroglycerine: Coronary artery dilator (vasodilator)

- **Rx**: Angina, Hypertension, CHF. Indicated for acute relief from an AMI or prophylaxis of angina pectoris due to coronary ischemia.
- **Dose**: 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 therapeutic 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): Antiarrhythmic

- **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**: 20mg/min IV until:
  - Arrhythmia is suppressed
  - Hypotension ensues
  - QRS complex widens by 50% of its original width
  - Max total dose given (see below)
  - **Adult**: Max total dose: 17 mg/kg.
  - **Peds:** Loading dose: 15 mg/kg IV or IO over 30 to 60 minutes
- **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.

- **SE**: PR, QRS, & QT widening, AV Block, hypotension, nausea and vomiting
- **AR**: Cardiac arrest, Seizures

Procainamide Drip				
For a 2-4mg/min-drip rate: Mix 1 gm in 250 ml D5W. Run drip at desired rate.				
Mg/min	**1mg**	**2mg**	**3mg**	**4mg**

mcgtts/min or ml/hr	15gtts	30gtts	45gtts	60gtts

Chapter 25: Weapons of Mass Destruction (WMD)

Guidelines and Considerations: The potential to cause physical destruction and death varies with each type of WMD. Conventional explosives can cause serious damage to a limited area, but rarely effect more than a city block or two. Nuclear bombs can cause utter destruction of property and very high death and injury rates in the area of the blast. Chemical weapons, at least in theory, can kill even more people because a small amount of agent can be spread over a wide area such as a densely populated metropolitan region. Physical destruction of property is minimal but environmental contamination can be serious and prolonged. Biological weapons, because of their insidious nature and ability to spread initially unnoticed, can potentially cause huge numbers of deaths. The table below provides a perspective on the comparative lethality of the various forms of WMD.

NOTE: The antidotes named in this section are not part of the standard PJ packing list. Prior coordination will be required to ensure they are carried if a WMD threat is anticipated.

Likelihood of Risk and Potential Overall Destructive Power		
Weapon	**Likelihood**	**Destructive power**
Conventional explosive	Highest	Lowest
Chemical agent	Moderate	Moderate
Biological agent	Moderate	Moderate-high
Nuclear weapons	Lowest	Highest

Pre-hospital approach: The general pre-hospital approach to dealing with WMD is similar to that of any disaster. The principles of disaster response remain the same, with few additions. Local regional and state disaster plans should consider the possibility of WMD attacks. Consider the following in the approach to WMD response:

- Personal and public safety
- Contain the hazard
- Control access
- Implement appropriate Incident Command System (ICS)
- Triage and treat casualties
- Protect the crime scene.

The current state of society and technology makes incidents more likely both at home and overseas. The PJ role in the face of this threat is to:

- plan and prepare for the event
- respond safely
- provide the triage needed
- provide decontamination
- perform assessment
- perform patient care
- provide transport

Five forms of mass destruction weapons typically the acronym used for these weapons is B-NICE:

1. **b**iological contamination
2. **n**uclear detonation
3. **i**ncendiary fires
4. toxic **c**hemical release
5. conventional **e**xplosives

Care of Explosive and Incendiary Injuries: Bombs and incendiary devices remain the weapon of choice for terrorists. The most common is the Improvised Explosive Device (IED). IEDs often inflict multiple injuries upon a patient, making individualized treatment for each wound difficult, if not impossible in certain settings. Primary focus remains on the airway, control of bleeding, resuscitation, immobilization, and splinting.

CARE OF CHEMICAL AGENT INJURIES

There are five major types of chemical agents:

1. Nerve Agents
2. Vesicants
3. Cyanide
4. Pulmonary agents
5. Riot control agents

Nerve agents: The signs and symptoms of nerve agent poisoning will depend on the dose and route of the exposure. In general, larger doses and direct inhalation of nerve agent vapor results in quicker onset and greater severity of effects. The most important effects of nerve agents are on the lungs, airway and the nervous system. Nerve agents exert their toxic effects by inhibiting or blocking the action of acetylcholinesterase (AChE), a critical enzyme. AChE is found in the plasma, red blood cells and nervous tissue. Although nerve agents will affect the enzyme in all three areas, it is the neurological effects which are the most important.

Signs and Symptoms of Nerve Agent Exposure		
Vapor	Small exposure	Miosis, rhinorrhea, mild dyspnea
	Large exposure	Sudden unconsciousness, convulsions, apnea, copious secretions, miosis
Liquid	Small exposure	Localized sweating, nausea, vomiting, fatigue
	Large exposure	Sudden unconsciousness, convulsions, apnea, paralysis, copious secretions

The mnemonic SLUDGE helps identify some of these findings:

- **S**alivation
- **L**acrimation
- **U**rination
- **D**efecation
- **G**astric
- **E**mptying

Key Measures in Resuscitating Nerve Agent Patients
• Secure the airway and provide positive pressure ventilation
• Administer atropine and 2-Pam-Chloride
• Administer Valium
• Repeat atropine as needed

Guidelines for Initial Antidote Dosing in Nerve Agent Exposure for Adults			
Symptoms	**Who administers**	**Drug**	**Route**
MILD miosis, blurry vision, mild dyspnea, runny nose	Self or medic	Atropine 2mg plus 2-Pam-Chloride 600mg (one Mark I). repeat in 10 minutes	autoinjector
SEVERE above plus severe dyspnea, generalized fasiculations, convulsions, unconscious	Medic	Atropine 6mg plus 2-Pam-Chloride 1800mg (three Mark I's). Valium 10mg	autoinjector IV, IM
Continued rescucitaion	Medic	Above plus, atropine 2mg every 5min up to 20mg total. plus Valium 5mg every 5min up to 20mg total	IV, IM, ET or autoinjector

Vesicants: Vesicants are a group of chemical agents that cause damage to exposed skin, lungs, and eyes and can also cause generalized illness if a significant amount is absorbed. They have been traditionally called "blister agents". These agents will cause localized blistering, burning and tissue damage on contact. All vesicants except phosgene oxime are thick oily liquids.

Assessment: Vesicant agents cause

- Burning
- Erythema
- Blistering
- Necrosis of exposed skin

Eye contact results in:

- Stinging
- Tearing
- Ulcer formation
- Blindness

Inhalation of vesicant vapors causes:

- Shortness of breath
- Cough
- Wheezing
- Pulmonary edema

Other nonspecific symptoms include:

- Nausea
- Vomiting
- Fatigue
- Lethargy

Emergency Care: The most important action when caring for a vesicant-exposed patient is immediate removal of the agent. Immediate irrigation with water or a chemical decontamination kit is crucial. Medical treatment includes continuing irrigation and decontamination. The type and amount of irrigation used is dependent on the available water supply. Ideally a hose (low pressure) provides plenty of water, when necessary a canteen can be used because small amounts of irrigation are better than none. Saline from an IV bag is also useful and particularly suited for eye irrigation. Never delay irrigation of the eyes while searching for sterile solutions. Use plain uncontaminated water instead.

Once blistering or other damage occurs, emergency care is the same as for ordinary chemical burns. The fluid within the blisters caused by vesicants is sterile and exposure to this fluid will not cause further injury. Dry sterile dressings are applied loosely. Severe eye injuries should be patched. Most patients will experience significant pain and should receive IV or IM morphine in 2mg increments. Unlike thermal burns, most serious vesicant patients do not require fluid resuscitation.

Cyanide: Cyanide is a rapidly acting lethal agent that directly poisons the body's cellular metabolism. It is the representative agent of what used to be called "blood agents". This old term is a misnomer, since the site of action of cyanide is not the blood or red blood cells. Related chemicals with similar toxicities include hydrogen cyanide (AC), cyanogen chloride (CK) and cyanogen bromide. Although it is a potent poison, cyanide is 25-50 times less toxic by inhalation route than the nerve agent sarin.

Signs and Symptoms of Cyanide Poisoning	
High concentration-Inhaled	• 30-60 sec loss of consciousness • Convulsions • 2-3 min apnea • 6-8 min cardiac arrest
Ingestion or Low Concentration Inhaled	• Tachycardia • Tachypnea • Dizziness • Nausea • Weakness • May progress to LOC, apnea and death

Adult Dose and Administration of Cyanide Antidotes			
Antidote	**Dose**	**Route**	**Comments**
Oxygen	High flow	NRB/BVM	Ventilatory support may be needed
Amyl nitrite	1 amp	Inhaled	Only if no IV access
Sodium nitrite	300 mg	IV	Primary antidote
Sodium thiosulfate	12.5 mg	IV	Use only after sodium nitrite is given

Pulmonary agents: Pulmonary agents include phosgene (CG), other halogen compounds and various nitrogen-oxygen compounds. These agents act primarily to cause lung injury, hence the obsolete term "choking agents"

Assessment: Relatively low concentrations of phosgene irritate the mucous membranes so initial symptoms will reflect:

- Tearing
- Runny nose
- Throat irritation

If the patient is exposed to a higher concentration, airway and lung damage may also occur. However symptoms of pulmonary edema will take several hours to develop. Thus a key point in dealing with phosgene patients is realizing that initially mild symptoms may lead to a serious condition within a few hours.

Note: exertion can worsen symptoms.

Treatment of Pulmonary Agent Exposure	
Mild Symptoms • Mild dyspnea • Wheezing • Cough	Beta-agonist nebulizer (albuterol) Oxygen Rest
Severe Symptoms • Pulmonary edema • Severe dyspnea • Stridor • Airway obstruction	Above plus, Airway management Positive pressure ventilation

Riot control agents: Riot control agents include the common terms “tear gas” and “mace”. Specific agents include CS, CN, CA, CR and pepper spray (OC). Their common effect is intense irritation to the eyes, nose, and other mucous membranes. In the concentrations employed for field use, these agents are all considered non-lethal. Under most field conditions, emergency care is limited to removal of the patient to fresh air. The effects of riot control agents are self-limited and no further treatment is usually needed. On occasion, a patient may experience severe shortness of breath and wheezing. This should be treated with a beta-2 agonist.

BIOLOGICAL AGENT ILLNESSES

Biological weapons are living organisms or toxins produced by living organisms. They are deliberately used to cause disease in the target populations. Biological weapons are generally no different than naturally occurring disease except that they are concentrated and delivered with the intent to cause harm. There are about a dozen biological agents which are militarily significant. They can be roughly divided into four groups:

1. Pneumonia-like agents
2. Encephalitis-like agents
3. Biological toxins
4. Miscellaneous biological agents

Pneumonia-like Agents:
- Anthrax
- Plague
- Tularemia
- Q-fever

Encephalitis-like Agents
- Smallpox
- Venezuelan Equine Encephalitis (VEE)

Biological toxins
- Botulinum
- Staphylococcal Enterotoxin B (SEB)
- Ricin

- Trichothecene Mycotoxins (T2)

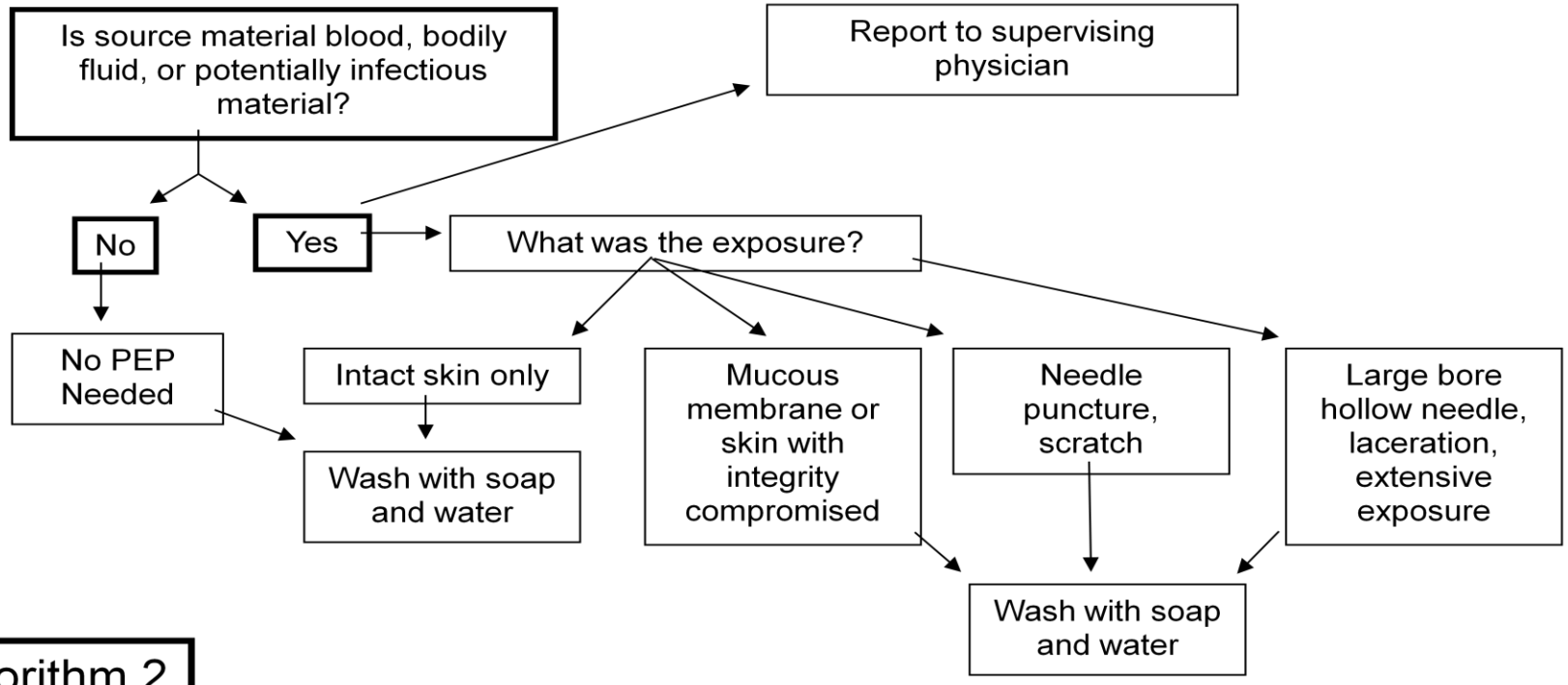
Miscellaneous Biological Agents

- Cholera
- Brucellosis
- Viral Hemorrhagic Fevers (VHF)

Emergency Care: A number of principles are important when faced with patients exposed to biological agents. Recognition is crucial to the successful management of these patients and a top priority is self protection. Physicians or trained health care personnel will be needed to prescribe the proper antibiotic and antitoxin treatment so crucial in treating biological agent exposure. Infectious disease and biological agent experts plus laboratory support will also be needed to help positively identify the agent and recommend further treatment. As much as practical in the field, isolate biological patients from unaffected individuals. The usual principles of emergency care apply to the care of these patients. Priority goes to securing and maintaining an airway and ensuring adequate ventilation. A mainstay of treatment for many biological agents is use of specific antibiotics or antitoxins. These treatments require the expertise of a physician or PA in selecting the right drug, dose, and route. It is beyond the scope of practice and beyond the expectations of PJs to initiate this therapy. The PJ does play a crucial role in summoning the assistance of a physician when necessary, and can assist the physician's treatment of biological patients with antibiotics or antitoxins. For purposes of familiarization, some antibiotics and antitoxins are listed below. Selection and use of these medications is best left to a physician.

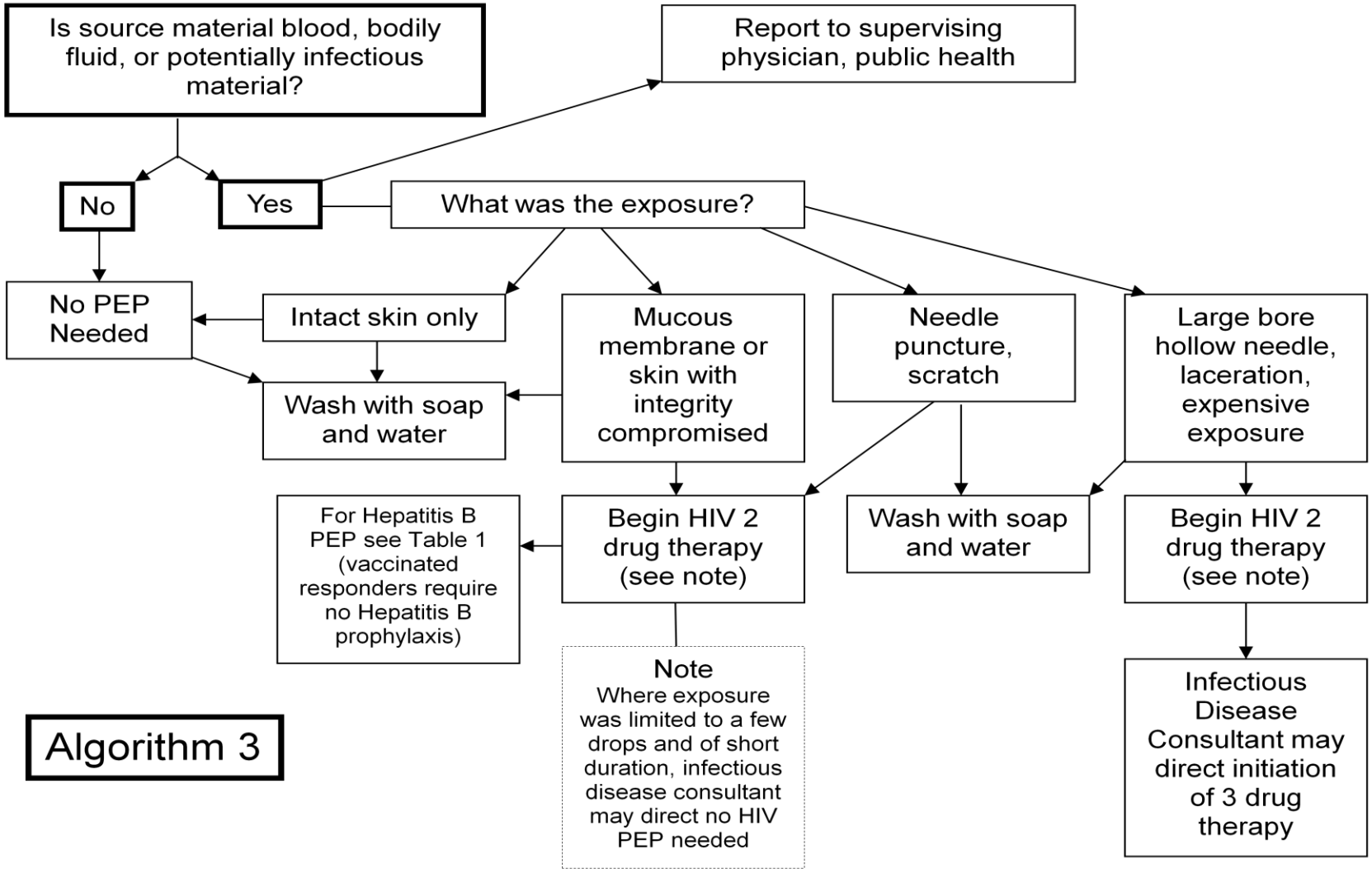
Immunization and Prophylaxis Strategies for Some Potential Biological Agents	
Agent	**Strategy**
Anthrax	Vaccine, or ciprofloxacin/doxycycline prophylaxis
Plague	Vaccine, or doxycycline prophylaxis
Q fever	Vaccine (experimental) or tetracycline prophylaxis
Brucellosis	Doxycycline and rifampin prophylaxis
Tularemia	Vaccine (experimental) or tetracycline prophylaxis
Smallpox	Vaccine
Venezuelan equine encephalitis	Vaccine (experimental)
Viral hemorrhagic fevers	Vaccine (experimental)
Botulinum	Vaccine

HIV Post Exposure Prophylaxis
Source HIV Negative



Algorithm 2

HIV Post Exposure Prophylaxis (PEP)
Source HIV Positive or Status Unknown



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HIV POST EXPOSURE PROPHYLAXIS

- HIV Drug regimen
  - For infectious status unknown use 2 drug therapy
    - Combivir®, (lamivudine / zidovudine)
      - 1 bid x 28 days
      - NDC # 00173-0595-02
      - NSN# 6505-01-518-1648
    - Start within 2 hours of exposure
    - Large volume exposure with HIV contaminated material may consider 3 drug treatment
  - Infectious disease monitors therapy
  - Side effects
    - Bone marrow suppression
    - Myopathy
    - Hepatitis
  - How to get it?
    - Base pharmacy – physician prescribed prior to deployment
      - Requires coordination with pharmacy
    - PJs have to self-identify need for specific missions

NUCLEAR INJURIES

Nuclear detonation energy is released as light and thermal energy, a shock wave with severe wind blast, and direct radiation, followed by fallout. Potential injuries include light damage to the eye, burns to the skin, blast injury and radiation exposure. These injury mechanisms often combine during nuclear detonation, presenting an assessment and care challenge. Your role as a PJ at the disaster is to provide search and rescue, triage, evacuation, decontamination, and limited emergency care. Nuclear detonation yields injury or death through three mechanisms. They are:

1. Radiation
2. Blast
3. Thermal bums

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.

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**
3. **SHIELDING**

To minimize personal risk, spend the shortest time in the contaminated area and stay as far from the radiation source as you can. If possible keep some shielding (dirt, rocks, whatever) between you and the radiation 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 equipment 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.

Chapter 26: Water Purification in the Field

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 but 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. The following water treatment methods only address elimination of infectious contaminants; they do nothing to eliminate or reduce chemical contamination of water sources.

Chemical Purification (Iodination and Chlorination)

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.

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.

Note: Chlor-Floc Tablets have a flocculation material in it to clear up turbid water. Solution must be strained through a T-Shirt (or equivalent) before drinking.

- **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: Most water filters **DO NOT** eliminate viruses, the source of over 50% of diarrheal disease. The Katadyne® and MSR® filter units stocked by several ST squadrons are **NOT** purification units and will **NOT** eliminate viruses. **NO FILTER WILL DESALINATE SALT WATER** other than reverse-osmosis filters, which are currently too bulky and slow for practical use in the normal Pararescue environment.

Chapter 27: Laser Eye Injuries

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 the eye to damage. Directed weapons have the capability to cause ocular hemorrhages, corneal damage through thermal deposition, retinal damage and induced glare and flash blindness.

Signs & Symptoms:

Symptoms vary depending on distance 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
- Eye pain.

Treatment:

1. Assess visual acuity with Snellen Chart (Chapter 7 Face and Eye Injury) 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 and Visual Acuity check. Any person with a new defect on Amsler Grid testing should be evacuated at once.

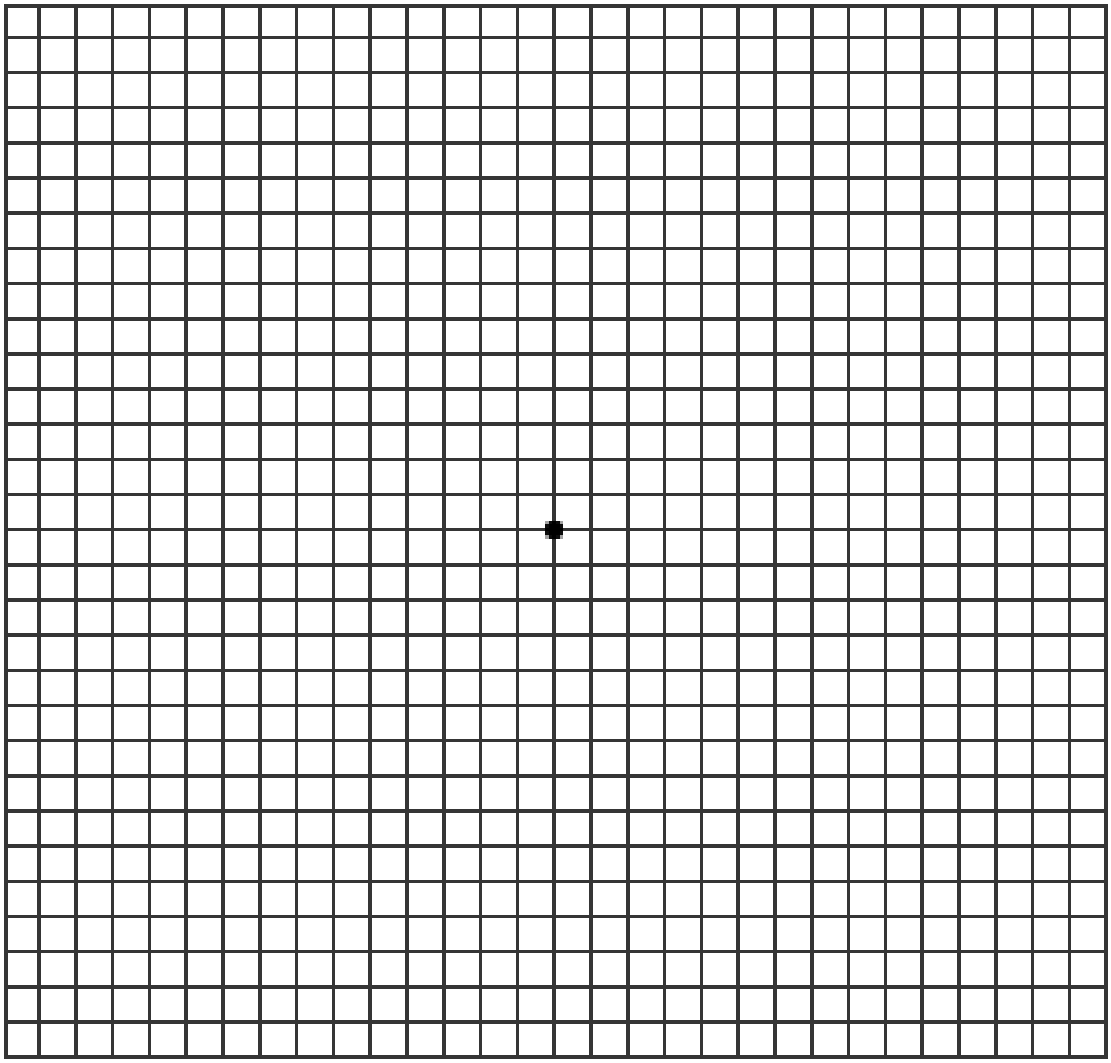
Visual Acuity Testing:

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.

AMSLER GRID



Chapter 28: Miscellaneous Information

Nine-Line MEDEVAC Request

Line item	Explanation	Explanation
1. Location of pickup site.	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	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
2. Radio frequency call sign and suffix.	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.	Required so that evacuation vehicles can contact requesting unit while en route to obtain additional information or change in situation or directions
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 liter 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.

1. Line 1-(give encrypted grid coordinates)
2. Line 2- (Give call sign and encrypted frequency of pick-up site)
3. Line 3- BRAVO 2, DELTA 2
4. Line 4- ALPHA
5. Line 5-LIMA 2, ALPHA 2
6. Line 6-BREAK (no need for line 6 in combat situations, wounds are assumed to be trauma)
7. Line 7-ALPHA, CHARLIE (encrypt as needed)
8. Line 8-ALPHA (encrypt as needed)
9. 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.

APGAR

(Accomplished 1min after birth and 5min after birth)

Appearance	Blue or pale Body pink, extremities blue Completely pink	0 1 2
Pulse Rate	Absent Below 100 Above 100	0 1 2
Grimace	No response Grimaces Cries	0 1 2
Activity	Limp Some flexion of extremities Active motion	0 1 2
Respiratory	Absent Slow, irregular Good, strong cry	0 1 2

APGAR < 4 = Serious condition requiring some degree of resuscitation
APGAR 4-6 = Condition is guarded
APGAR 7-10 = Normal stable infant

Useful Mnemonics

Causes of Coma/Decreased Level of Consciousness

A - Alcohol (and other drugs), Acidosis (hyperglycemic coma/DKA)
E - Electrolyte abnormality, Endocrine problem, Epilepsy
I - Insulin (diabetes/hypoglycemic shock)
O - Oxygen (Hypoxia), Opiates, Overdose (or poisoning)
U - Uremia (renal failure/insufficiency)
T - Trauma; Temperature (hypothermia, heat stroke)
I - Infection (e.g., meningitis, encephalitis, sepsis)
P - Psychogenic ("hysterical coma")
S - Stroke or Space-occupying lesions in the cranium; Seizure; Shock

Coma Assessment

D - Depth of coma (verbal or painful stimuli)
E - Eyes (PERRLA)
R - Respiration (rate and rhythm)
M - Motor (posturing; loss of movement/sensation)

Level of Consciousness

A - Alert
V - Responds to Verbal stimuli
P - Responds to Painful stimuli
U - Unresponsive

Patient History / Pain Assessment

A - Allergies
M - Medications
P - Past medical history (illness, injury)
P - Pain (PPQRST)
L - Last intake (food, fluid)
E - Ever happen before?

P – Pain (sharp or dull)
P – Palliative &/or Precipitating (exacerbating) measures related to the pain
Q – Quality (diffuse, pinpoint, or localized)
R -- Radiating
S – Severity (scale of 1-10)
T – Timing: Time of onset; frequency; duration

Pupil Reaction

P - Pupils
E - Equal
R - Round
R - Reactive to
L - Light and
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)

Useful Conversions

TEMPERATURE		WEIGHT		OTHER
°F	°C	POUNDS	KILOGRAMS	WEIGHTS & MEASURES
106	41.1	396	180	**Volume**
105	40.6	374	170	1 cc = 1ml
104	40	352	160	1 tsp = 5 cc
103	39.4	330	150	1 tbsp = 15 cc
102	38.9	308	140	1 fl. oz. = 30 cc
101	38.3	286	130	1 jigger = 45 cc
100	37.8	264	120	1 pt = 473 cc
99	37.2	242	110	2 pt = 1 qt
98.6	**37**	220	100	1 qt = 946 cc
98	36.7	209	95	4 qt = 1 gal
97	36.1	198	90	1 gal = 8 lbs
96	35.6	187	85	**Length**
95	35	176	80	1 cm = .39 in
94	34.4	165	75	1 in = 2.54 cm
93	33.9	154	70	1 yard = 3 ft
92	33.3	143	65	1 ft = .31 m
91	32.8	132	60	1 m = 3.3 ft
90	32.2	121	55	1 km = .62 miles
85	29.4	110	50	1 mi = 1.61 km
80	26.7	99	45	1 mi = 5280 ft
75	23.8	88	40	**Weight**
70	21.1	77	35	1 gr = 65 mg
				15 gr = 1 gm
				1000 mg = 1 gm
				1 oz. = 28 gm
				454 gm = 1 lb
To convert **°F** to **°C** • (**°F** – 32) divide by 1.8		To convert lbs to kg • Divide lbs x 2.2		1000 gm = 1 kg 1 kg = 2.2 lbs
To convert **°C** to **°F** • (**°C** x 1.8) + 32		To convert kg to lbs • Multiply kg x 2.2		1 metric ton = 2,000 lbs 1 ton = 2,240 lbs
ADDITIONAL CONVERSIONS		ADDITIONAL CONVERSIONS		ADDITIONAL CONVERSIONS

Abbreviations

Medical Terms	Anatomic Locations
@ -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 DKA – Diabetic Ketoacidosis Dx -diagnosis ET -Endotracheal Tube ETOH -ethyl alcohol FB -Foreign Body FROM -Full Range of Motion Fx -Fracture gtts -drops GSW -Gun Shot Wound hr -hour HTN -Hypertension KVO -Keep Vein Open kg -kilogram LMP -Last Menstrual Period lpm – liters per minute LR – Lactated Ringers mmHg -millimeters of mercury MOI –Mechanism of Injury NaCl -sodium chloride NG -Nasogastric NPO -Nothing by mouth NS -Normal Saline N&V -Nausea and Vomiting OCP -Oral Contraceptive Pills PE -Physical Exam PERRLA -Pupils Equal, Round, 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 Pos -positive NEG -negative	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 -Temporomandibular Joint T1-T12 -Thoracic Spine

CONSOLIDATED MISSION REPORT

GUARDIAN ANGEL CONSOLIDATED MISSION REPORT			
1. MISSION NUMBER:	2. OPERATION/EXERCISE NAME:	3. TASKING AGENCY:	4. MISSION DATE (S):
5. BRIEF DESCRIPTION OF MISSION TASKING:			

6. EXECUTING ORGANIZATION (Address/ phone#):

8. Report Prepared By [include email]:

7. TEAM MEMBERS:

Team Position	Rank & Name	Unit
1.		
2.		
3.		
4.		
5.		
6.		

SECTION 1 – NOTIFICATION, IP/E & INCIDENT INFORMATION

9. NOTIFICATION DATE/TIME:	10. AGENCY/INDIVIDUAL:	11. METHOD:
12. INITIAL SITUATION REPORTED:		
13. LOCATION:	14. NUMBER OF ISOLATED PERSONNEL (IP):	
15. REPORTED INJURIES OR MEDICAL CONDITION:		

SECTION 2 – EMPLOYMENT & RECOVERY

16. **INSERTION**	
a. INFIL PLATFORM TYPE:	b. INSERTION METHOD:
c. NUMBER OF PERSONNEL:	d. DEPLOYMENT ALTITUDE:
e. WEATHER:	f. SEA STATE:
g. INSERTION SUMMARY:	

17. **ACTIONS ON OBJECTIVE**	
a. TERRAIN TYPE:	b. ALTITUDE:
c. SURFACE TRAVEL REQUIRED [Y/N]:	d. DISTANCE:
e. METHOD OF TRAVEL:	f. GROUND TIME INFIL TO EXFIL:
g. IP AUTHENTICATION METHOD:	h. METHOD OF IP LOCATION USED:
i. NUMBER OF IP's:	j. TECHNICAL RESCUE REQUIRED (Y/N):
k. MEDICAL TREATMENT REQUIRED ON SCENE:	
l. SURFACE OPERATIONS SUMMARY:	

18. **RECOVERY**	
a. IP RECOVERY PLATFORM:	b. IP RECOVERY METHOD:
c. TEAM RECOVERY PLATFORM:	d. TEAM RECOVERY METHOD:
e. MEDICAL TREATMENT REQUIRED ENROUTE:	
f. RECOVERY LOCATION:	

g. RECOVERY SUMMARY:

SECTION 3 - EQUIPMENT USED

19. MISSION PLANNING:

20. ENROUTE TO OBJECTIVE:

21. INFILTRATION:

22. ON SCENE (include communications, navigation, extrication tools, technical rescue, UAV):

23. EXFILTRATION:

24. ENROUTE TO RECOVERY/TRANSLOAD LOCATION:

25. MISSION EQUIPMENT DEFICIENCIES/LIMITATIONS NOTED:

SECTION 4 – ISOLATED PERSONNEL / EVADER (IP/E) MEDICAL TREATMENT

26. CHIEF COMPLAINT**:**

27. PATIENT HISTORY (i.e., MECHANISM OF INJURY AND/OR HISTORY OF PRESENT ILLNESS):

28. PRIMARY SURVEY & IMMEDIATE CORRECTIVE ACTIONS WITH PT. RESPONSE: (i.e., Initial ABCDE's to include LOC with AVPU):

29. INITIAL VITAL SIGNS:
TIME:
BP:
PULSE:
RESP. RATE:
LOC:
TEMP:
OTHER/PRE & POST BLOOD USE :

30. SECONDARY SURVEY (i.e., Complete head-to-toe exam findings. Include LOC – e.g., AVPU or GCS):

31. REPEAT VITAL SIGNS (Must include final set of vitals & LOC prior to transfer of pt. care. If not obtained, so state with explanation why.)**:**

TIME(S): BP: PULSE: RESP. RATE: BREATH SOUNDS: O_2 Sat: LOC: TEMP: OTHER/PRE & POST BLOOD USE:	TIME(S): BP: PULSE: RESP. RATE: BREATH SOUNDS: O_2 Sat: LOC: TEMP: OTHER/PRE & POST BLOOD USE :

32. MEDICAL TREATMENT/ PROCEDURES PERFORMED & PT. RESPONSE (Do not need to repeat that already reported in the PRIMARY SURVEY (block 28):
33. MEDICATIONS ADMINISTERED (i.e., Med, dose, route, time, pt. response):
34. BLOOD USE: (i.e., total # of units used; annotate pre and post vitals above):

SECTION 5 – REPATRIATION

35. SERE DEBRIEF INFORMATION		
a. SERE DEBRIEFER:	b. LOCATION:	c. EMAIL:
d. IP/E START LOCATION:	e. RECOVERY LOCATION:	
f. SURVIVAL/EVASION EQUIPMENT/PRODUCTS USED:		
g. POSITIVE OR NEGATIVE SERE EQUIPMENT/TRAINING/PROCEDURE ISSUES IDENTIFIED BY IP/E:		
h. CRO/SERE REPATRIATION LESSONS LEARNED:		

SECTION 6 – OVERALL LESSONS LEARNED

36. MISSION PLANNING:

37. COMMAND/CONTROL/COMMUNICATIONS:
38. TRAINING/EDUCATION:
39. EQUIPMENT:
40. DOCTRINE/TACTIC/TECHNIQUE/ PROCEDURE:
41. LOGISTICS & SUPPORT:
42. GENERAL:

SECTION 7 - MISSION TEAM LEADER

RANK/NAME:	DATE:
COMMENTS:	

SECTION 8 – FLIGHT SURGEON/MEDICAL OVERSIGHT REVIEW

STATUS:	HOME STATION PJ MEDICAL OVERSIGHT		DEPLOYED LOCATION PJ MEDICAL OVERSIGHT	
PHYSICIAN RANK/NAME:			DATE:	
COMMENTS:				

SECTION 9 – SQUADRON DO RELEASE APPROVAL

RANK/NAME:	DATE:
COMMENTS:	

SECTION 10 – MAJCOM FUNCTIONAL REVIEW (USAFE/PACAF/AETC/ANG/AFR)

RANK/NAME:	DATE:
COMMENTS:	

SECTION 11 – HQ AFSOC REVIEW

CRO FUNCTIONAL MANAGER	
RANK/NAME:	DATE:
COMMENTS:	
PARARESCUE FUNCTIONAL MANAGER	
RANK/NAME:	DATE:
COMMENTS:	
SERE FUNCTIONAL MANAGER	
NAME/RANK:	DATE:
COMMENTS:	

SPECIAL TASK CERTIFICATION AND RECURRING TRAINING

TASK OR RECURRING TRAINING AND TECHNICAL REFERENCES A.	DATE COMPLETED B.	SIGNATURE OF CERTIFYING OFFICIAL C.	INITIAL OF TRAINEE D.	EVALUATION OF TRAINING			
				SCORE OR HOURS E.	TYPE F.	FRE-QUENCY G.	DUE DATE H.

NAME OF TRAINEE *(Last, First, Middle Initial)*	GRADE	UNIT AND OFFICE SYMBOL

AF IMT 1098, 19850401, V2 PREVIOUS EDITION WILL BE USED.

JOB QUALIFICATION STANDARD CONTINUATION/COMMAND JQS

CRITICAL TASK	TASK NUMBER	TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	CERTIFICATION				
			START DATE	COMPLETION DATE	TRAINEE'S INITIALS	TRAINER'S INITIALS	CERTIFIER'S INITIALS (IF REQUIRED)
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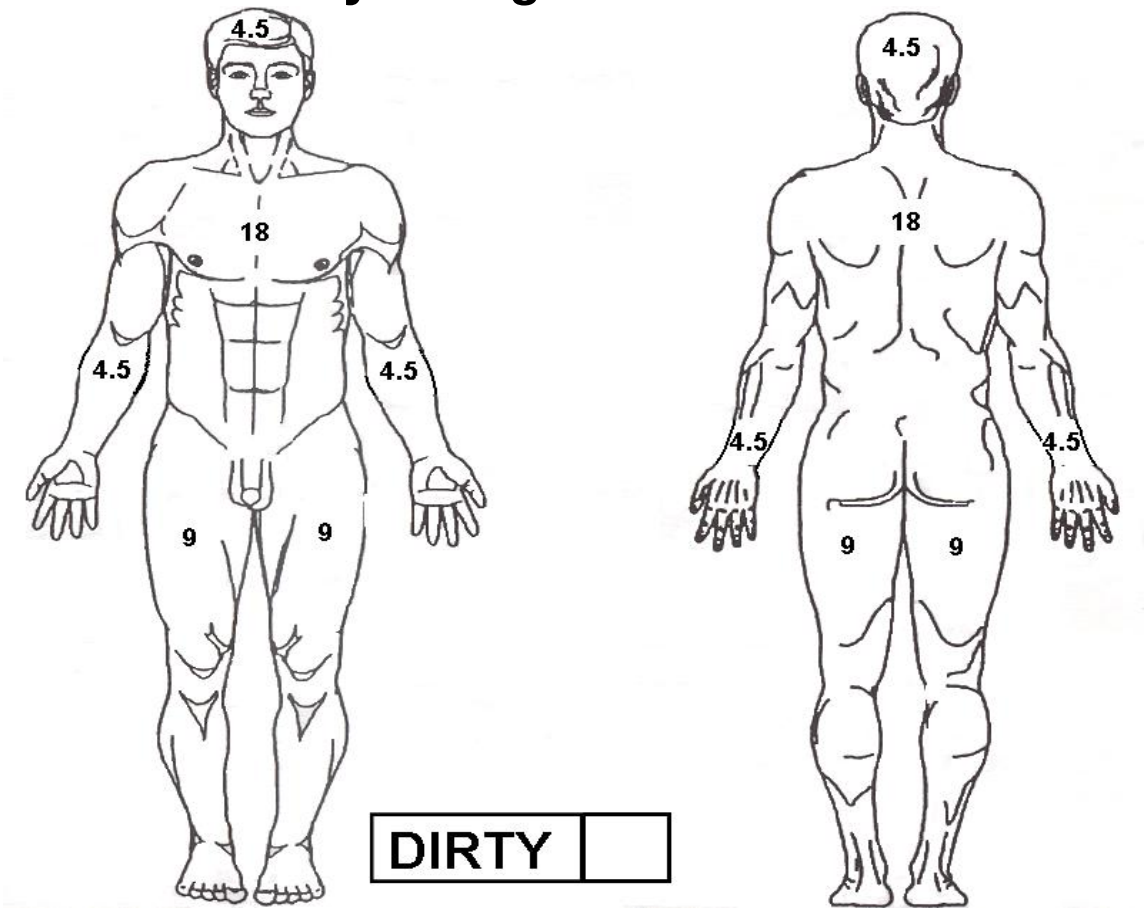
TRAINEE NAME	CFETP/JQS NUMBER	PAGE NO.

AF IMT 797, 20020801, V3 PREVIOUS EDITIONS ARE OBSOLETE

Cax Name _____

Medic's Name _____

Incident: Day or Night



TIME				
AVPU				
Pulse				
RESP				
BP				

Immediate	Delayed	Expectant	Minimal
RED	GREEN	BLUE	NO Chem.LT
Urgent (2hrs)	Priority (4hrs)	Routine (24hrs	

A: JTube NTube ETtube King LT Cric

B: ODressing NDecompression ChestTube

C: IV CutDown EJugular IO SalLock

Tourniquet HemostaticDx PackedWound

FLUIDS: NS / RL 500 1000 1500

Hextend 500 1000

DRUGS:

PAIN

ABX

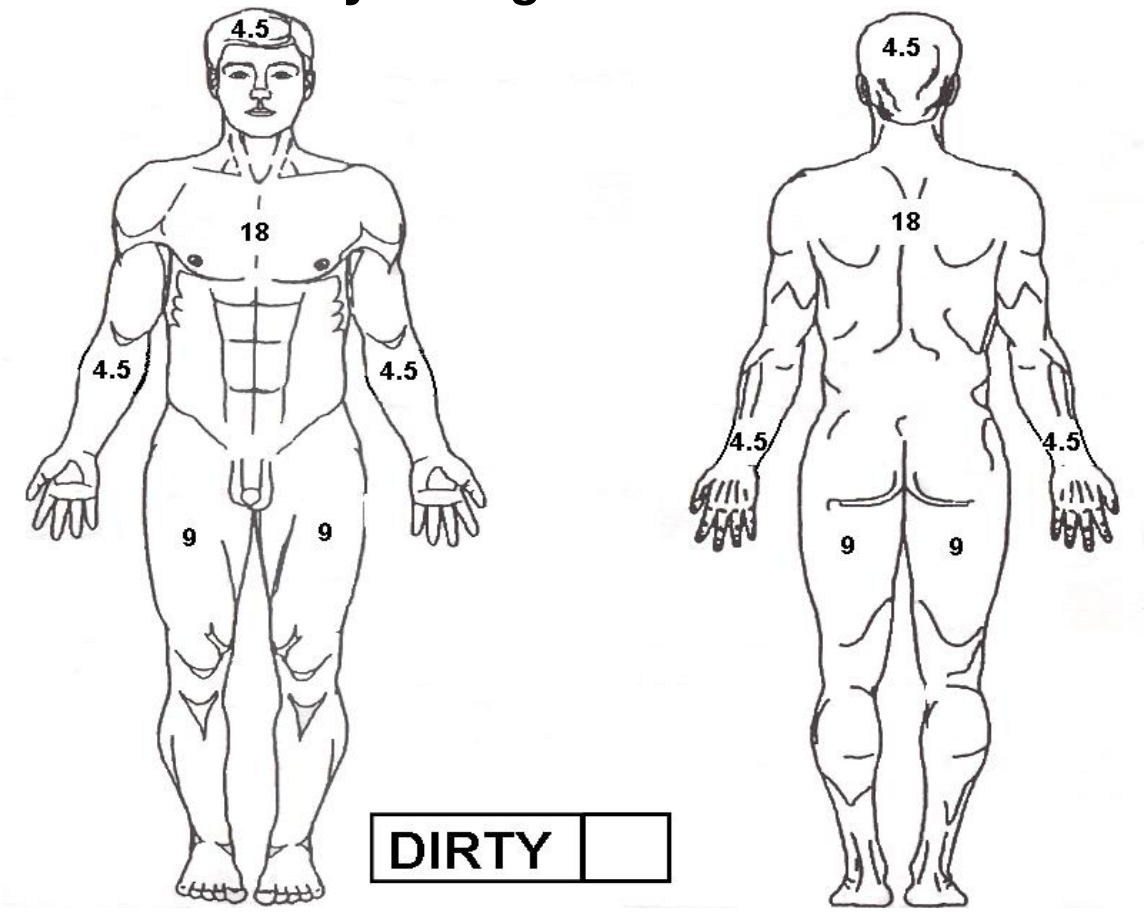
CWPP

Mech. Of Injury - Treatments

Cax Name _____

Medic's Name _____

Incident: Day or Night



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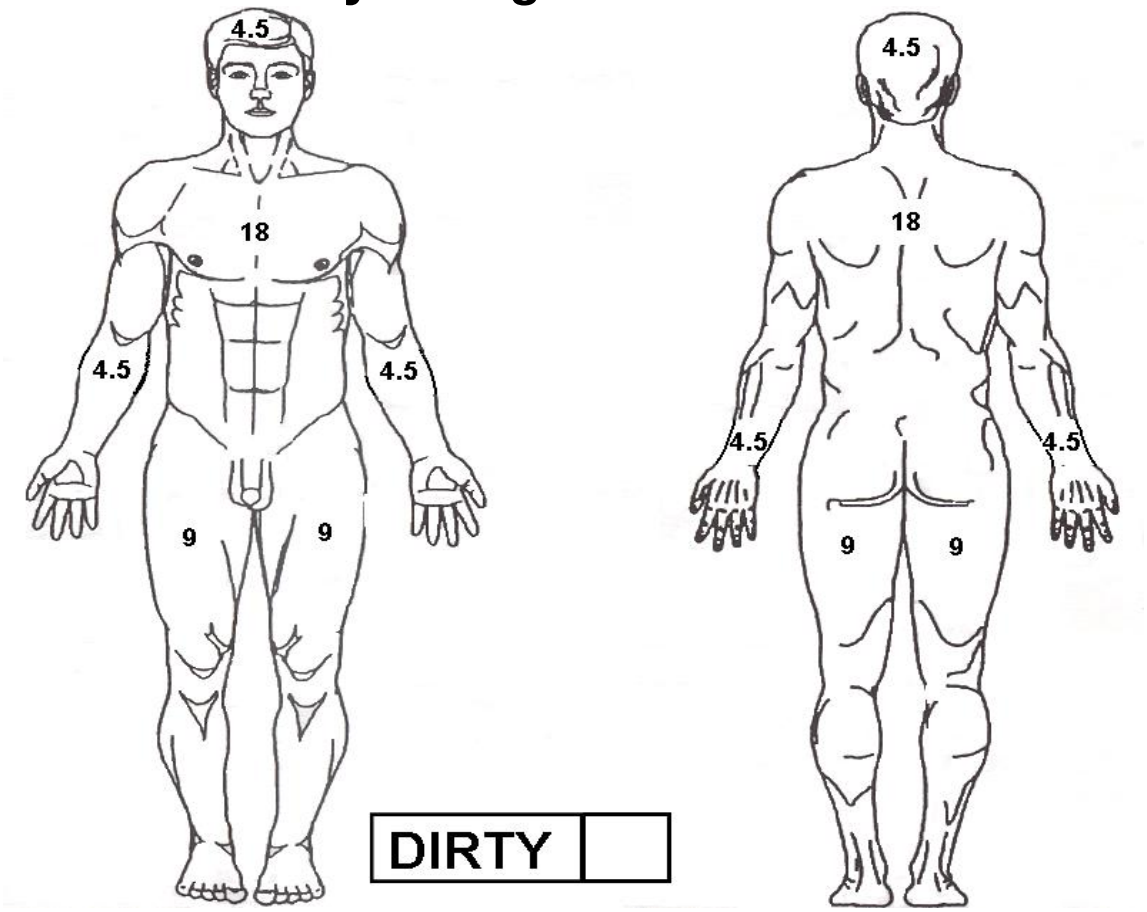

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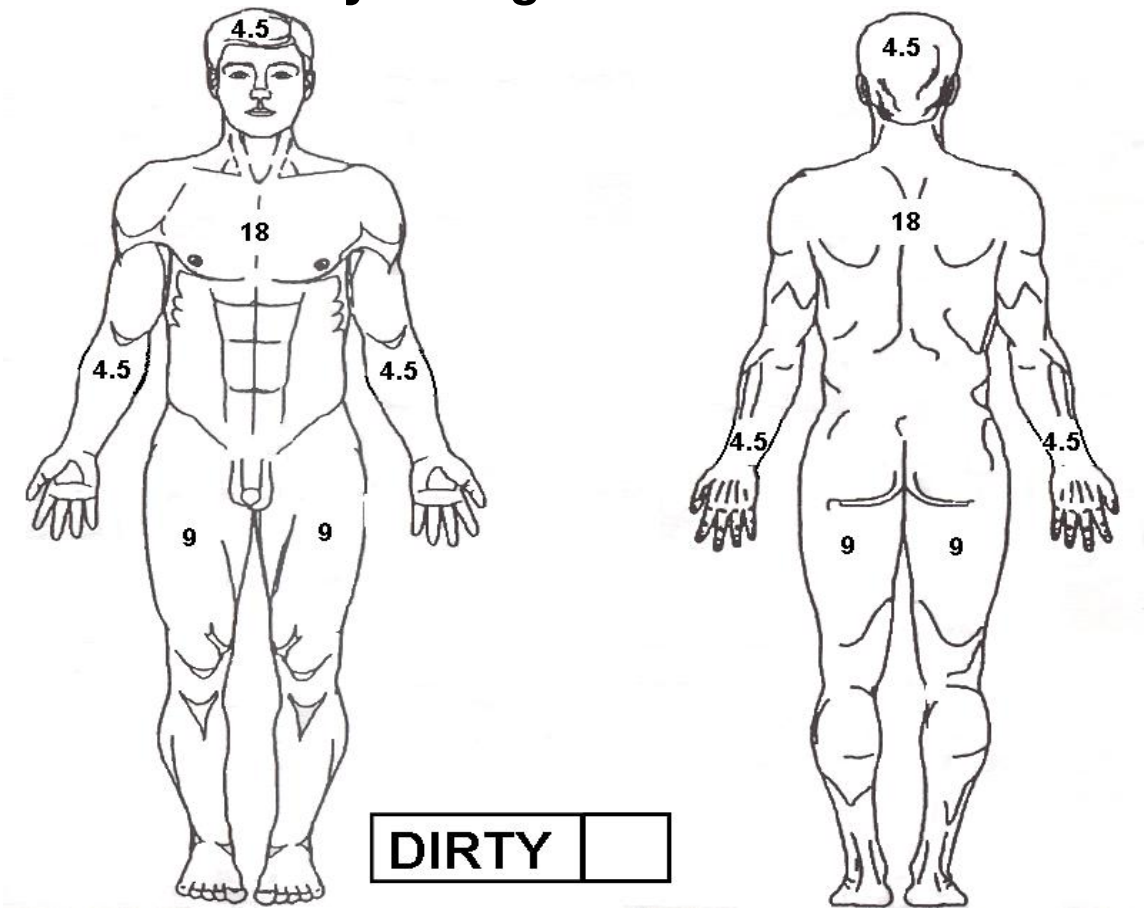

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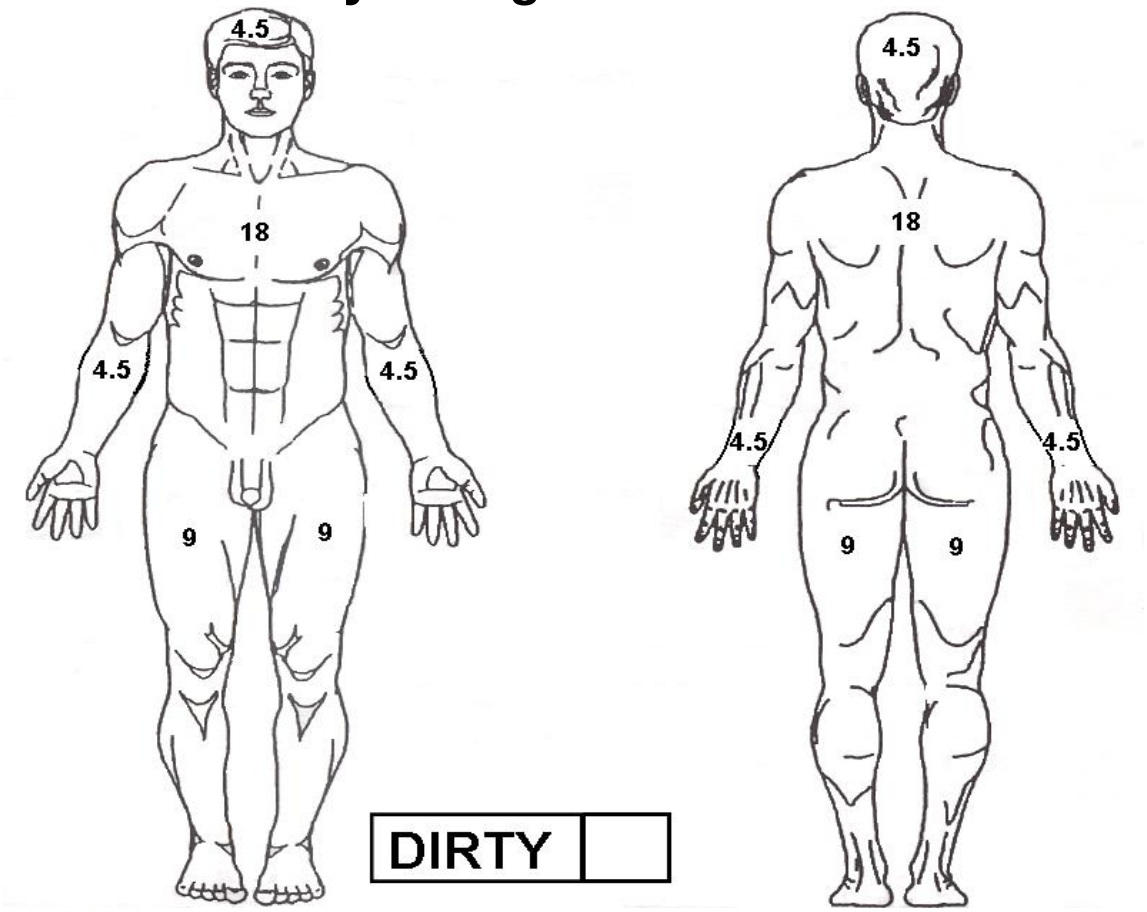

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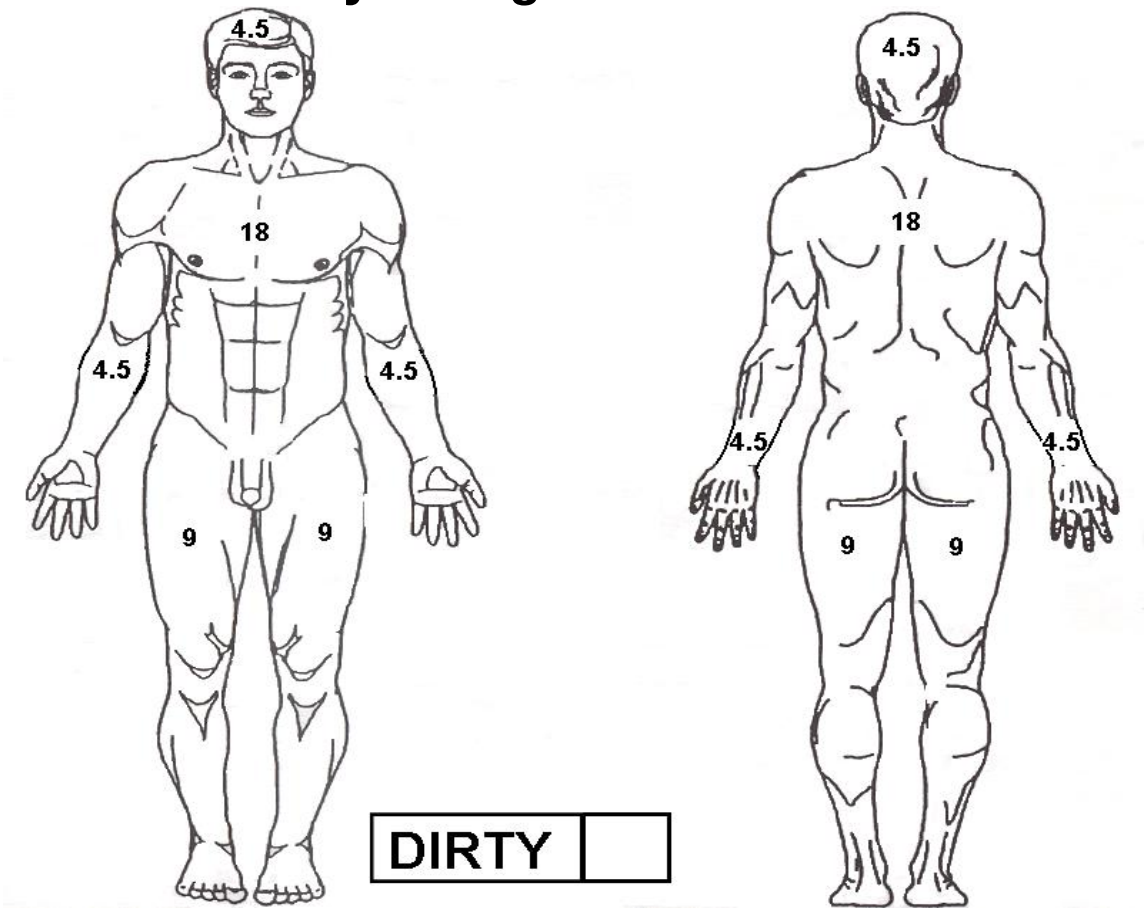

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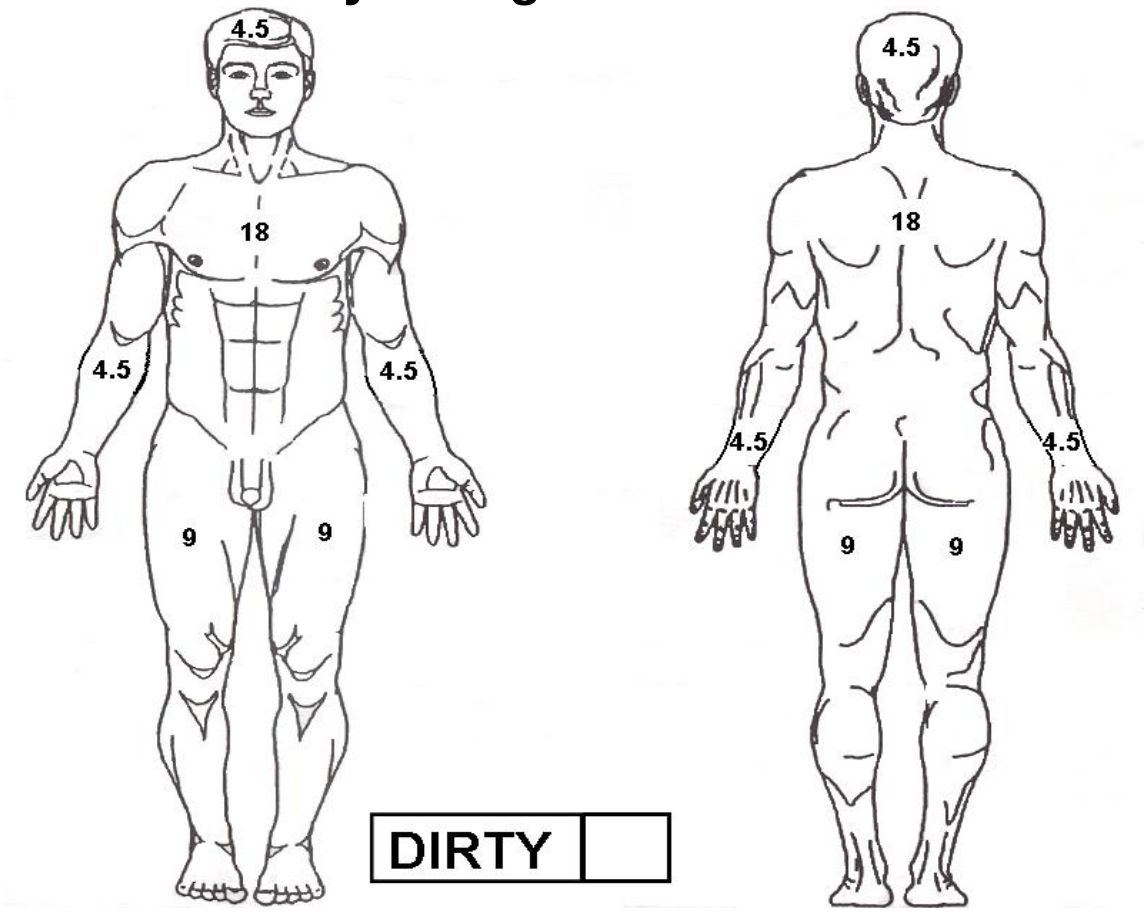

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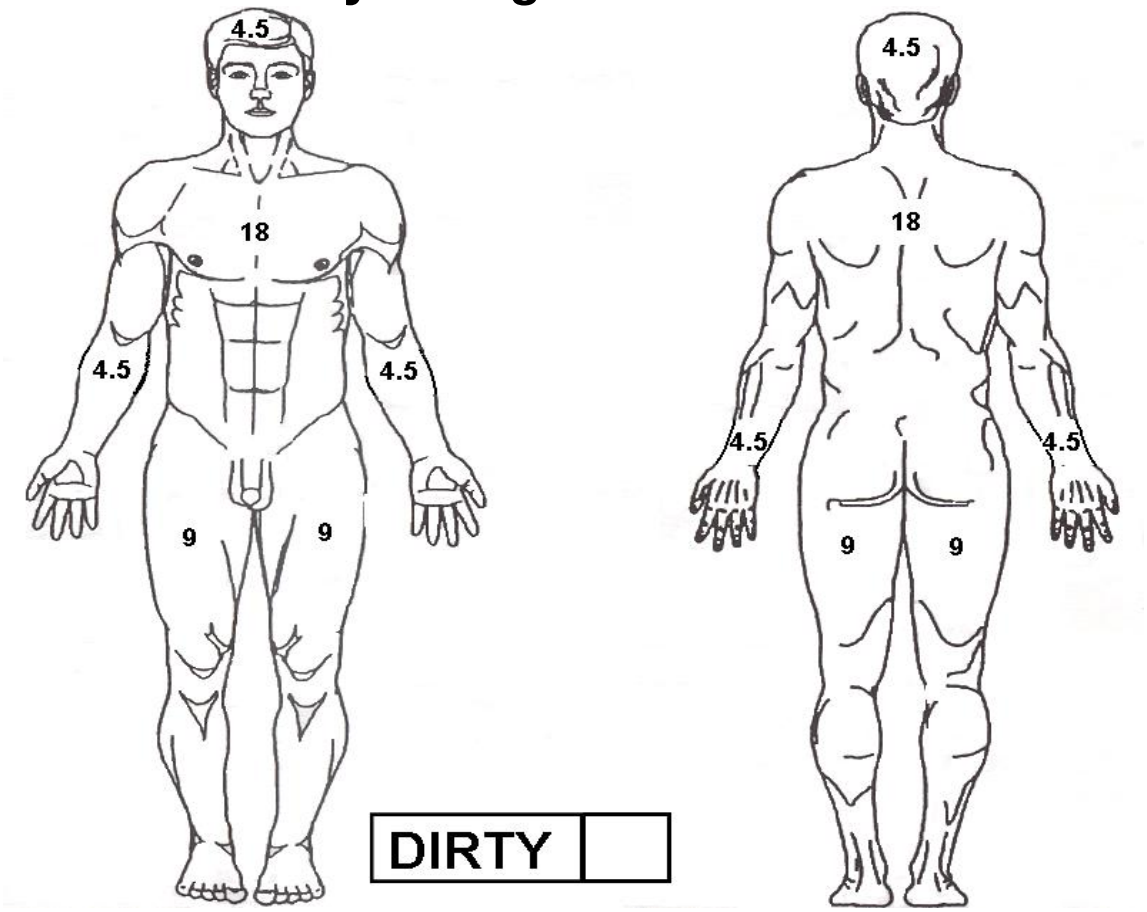

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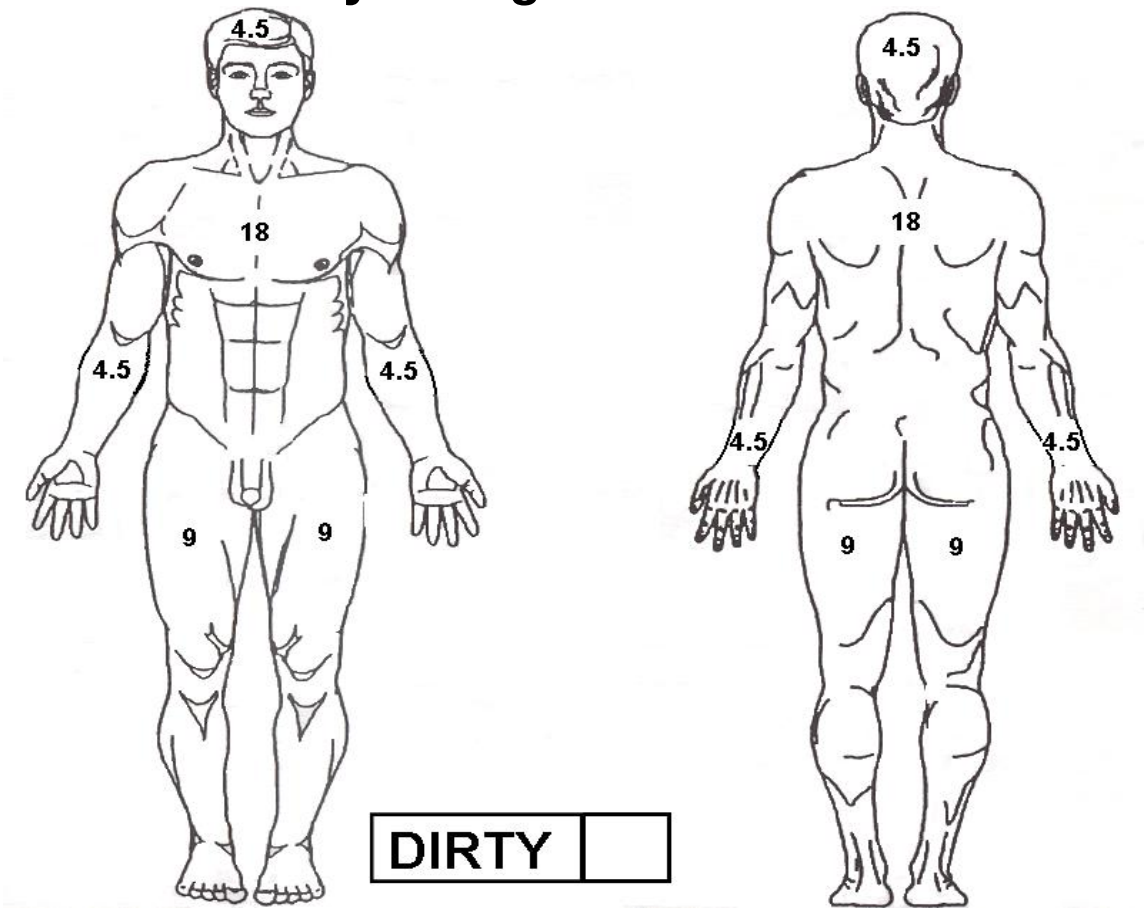

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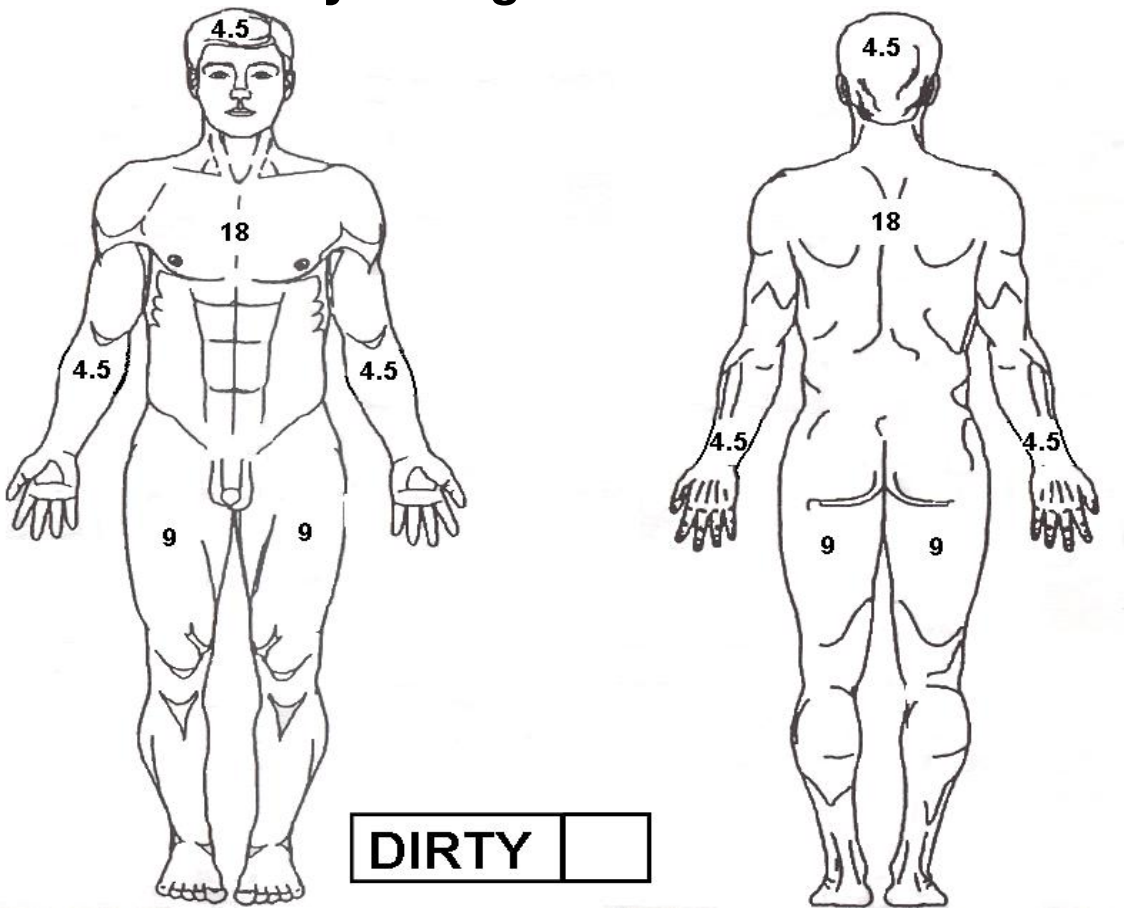

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